CONCESION

PA/E/1999/193633

193633

TITULAR(ES): UNIVERSIDAD DE GUANAJUATO

02095

DOMICILIO(S): LASCURAIN DE RETANA N°. 5, 36000, GUANAJUATO, GUANAJUATO, MEXICO

DENOMINACION: MAQUINA SEMBRADORA NEUMATICA DE PRECISION PARA AJO

CORREO FACTURA No. 12

CLASIF.INT[5]: A01C7/04

INVENTOR(ES): JOSE MANUEL CABRERA SIXTO, RYSZARD SERWATOWSKI

NUMERO: 9505318 **FECHA DE PRESENTACION:** 15 DE DICIEMBRE DE 1995 **HORA:** 12:45

PAIS: **FECHA:** **NUMERO:**

6 DE OCTUBRE DE 1999

LIC. JORGE AMIGO CASTAÑEDA

FORMATO UNICO DE INGRESOS POR SERVICIOS

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PERIFERICO SUR 3106,
COL. JARDINES DEL PEDREGAL,
DELEG. ALVARO OBREGON
01900 MEXICO, D.F.

NUMERO DE FOLIO	NUMERO DE SOLICITUD:	No. PATENTE, REGISTRO O PUBLICACION:
1019246-6	EXP.DE PAT.950531/8	193633

- [ ] PATENTE
- [ ] CERTIFICADO DE INVENCION
- [ ] NOMBRE COMERCIAL
- [ ] MODELO DE UTILIDAD
- [ ] MARCA
- [ ] DENOMINACION DE ORIGEN
- [ ] DISEÑO INDUSTRIAL
- [ ] AVISO COMERCIAL
- [x] OTROS

SECRETARIA DE HACIENDA Y CREDITO PUBLICO SUBSECRETARIA DE INGRESOS TESORERIA DE LA FEDERACION FOLIO D0536834

CONCEPTO	ARTICULO TARIFA	INCISO TARIFA	IMPORTE
EXPEDICION DE TITULO	1	a	$ 672.00
4ª y 5ª ANUALIDAD	2	a	$ 391.00
6ª, 7ª Y 8ª ANUALIDAD	2	b	$ 1,089.00

Fecha legal 15-12-95

95-1
96-2
97-3
98-4
99-5-9 ANUALIDAD.

193633

DIRECCION DE PATENTES

OCT 7 PM 2 19

INSTITUTO MEXICANO DE LA PROPIEDAD INDUSTRIAL

03885

50% DE DESCUENTO MICRO Y PEQUEÑA EMPRESA			
INSTITUCIONES DE INVESTIGACION DEL SECTOR PUBLICO	X	TOTAL TARIFAS	$ 2,152.00
INSTITUCIONES EDUCATIVAS		RECARGOS	$
INVENTORES INDEPENDIENTES		I.V.A.	$ 323.00
		TOTAL DEL PAGO	$ 2,475.00

DATOS DEL TITULAR O SOLICITANTE

NOMBRE UNIVERSIDAD DE GUANAJUATO

DOMICILIO LASCURAIN DE RETANA No. 5
CALLE, NUMERO, COLONIA Y CODIGO POSTAL

C.P. 36000 GUANAJUATO GTO.

POBLACION/ESTADO

R.F.C. U G U 4 5 0 3 2 5 K Y 2

FIRMA DEL TITULAR O REPRESENTANTE

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ORIGINAL CLIENTE/EXPEDIENTE DEL SOLICITANTE

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NUMERO DE FOLIO	NUMERO DE SOLICITUD:	No. PATENTE, REGISTRO O PUBLICACION:
1095885 8	EXP. PAT. 950531B	193633

- [ ] PATENTE
- [ ] CERTIFICADO DE INVENCION
- [ ] NOMBRE COMERCIAL
- [ ] MODELO DE UTILIDAD
- [ ] MARCA
- [ ] DENOMINACION DE ORIGEN
- [ ] DISEÑO INDUSTRIAL
- [ ] AVISO COMERCIAL
- [x] OTROS

CONCEPTO	ARTICULO TARIFA	INCISO TARIFA	IMPORTE
EXPEDICION DE TITULO PAGO COMPLEMENTARIO 9ª ANUALIDAD 193633	2	b	191.85

50% DE DESCUENTO MICRO Y PEQUEÑA EMPRESA INSTITUCIONES DE INVESTIGACION DEL SECTOR PUBLICO INSTITUCIONES EDUCATIVAS INVENTORES INDEPENDIENTES	[ ]		TOTAL TARIFAS $ 191.85 RECARGOS $ I.V.A. $ TOTAL DEL PAGO $ 192.00

DATOS DEL TITULAR O SOLICITANTE

NOMBRE UNIVERSIDAD DE GUANAJUATO

DOMICILIO LASCURAIN DE RETANA Nº 5
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PRINTER, S.A. DE C.V. TRIGO 129 COL. GRANJAS ESMERALDA C.P. 09810 MEXICO, D.F. TELS.: 5445-1600 IMPRESOR AUTORIZADO EN EL DIARIO OFICIAL DE LA FEDERACION DEL 10-VII-95 R.F.C. PRI-941220-FP9
FECHA DE IMPRESION: AGOSTO DE 1999 "ESTE DOCUMENTO TIENE UNA VIGENCIA DE DOS AÑOS A PARTIR DE SU FECHA DE IMPRESION" FOLIOS DEL 1000001 AL 1185000

COMPROBANTE UNIVERSAL SUCURSALES

FOLIO 5569344

14:34 1003 192 06/10/1999

PLAZA: CUAUTLA, MOR.
SUCURSAL: CUAUTLA

DEPOSITO CUENTA CHEQUES PLAZA DISTINTA FIRME
CUENTA No. 8145571 PLAZA: MX 0101
NOMBRE DEL CLIENTE : INSTITUTO MEX REFERENCIA:0010192466

TOTAL DE DOCUMENTOS DE INVERLAT	:	$100.00
TOTAL DOS OTROS BANCOS	:	$100.00
TOTAL EN EFECTIVO	:	$2,475.00
TOTAL DEL DEPOSITO	:	$2,475.00

EN CASO DE DEVOLUCION DEL O LOS DOCUMENTO(S) DE OTROS BANCOS
SE CARGARA EL IMPORTE DEL O LOS MISMO(S) A SU CUENTA

INVERLAT BANCO
BANCO INVERLAT, S.A.
Lorenzo Boturini 202
Col. Tránsito, 06820 México, D.F.
R.F.C.BIN941202BL9

SHCP

FOLIO

SECRETARIA DE HACIENDA Y CREDITO PUBLICO

SUBSECRETARIA DE INGRESOS

CEDULA DE IDENTIFICACION FISCAL

BIN941202BC9

CLAVE DEL REG. FED. DE CONTRIBUYENTE
BANCO INVERLAT SA

NOMBRE, DENOMINACION O RAZON SOCIAL

20/04/95

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formularios e impresos, s.a. de c.v. R.F.C. FIM 710127 PE9 MEXICO, D.F., AV. MEXICO COYOACAN No. 350 TEL. 6-04-1
C.P. 03340 IMPRESOR AUTORIZADO EN EL DIARIO OFICIAL DEL 31 DE MARZO DE 1992.

IMPRESO POR:

INVERLAT
BANCO

038985

PAT. 193633

INSTITUTO MEXICANO DE LA PROPIEDAD INDUSTRIAL

Octubre 7 de 1999.

1999 OCT 7 PM 2 19

DIRECCION DE PATENTES

INSTITUTO MEXICANO DE LA
PROPIEDAD INDUSTRIAL
SUBDIRECCION DE EXAMEN DE
FONDO DE PATENTES
DEPTO. DE EXAMEN DE FONDO
AREA MECANICA

RE :EXPEDIENTE DE PATENTE
No. 9505318

Me refiero a la solicitud de patente que se menciona al rubro y particularmente a su oficio No.21044 de fecha 02 Agosto de 1999,, mediante el cual se nos comunica la concesión de dicha solicitud por lo que me permito comunicar a usted lo siguiente:

1. - Se presenta comprobante de pago por expedición del título correspondiente y pago por 5ª. a 9ª. anualidad.

2.- Copias de pruebas finas de la figura 2, según artículos 57 y 60 de la Ley de la Propiedad Industrial.

Toda vez que se ha cumplido con lo solicitado, ruego a usted de la manera más atenta, se continúe con los trámites de expedición del título correspondiente.

Atentamente.

ING. JOSE H. FLORES CORTES.
APODERADO.

CIRCUITO RIO PRESAS No. 14 Col. PASEOS DE CHURUBUSCO C.P. 09030
MEXICO D.F.
TEL/FAX 5654 7258

FORMATO UNICO DE INGRESOS POR SERVICIOS

ESTE FORMATO ES DE DISTRIBUCION GRATUITA

Instituto Mexicano de la Propiedad Industrial IMPI

PERIFERICO SUR 3106,
COL. JARDINES DEL PEDREGAL,
DELEG. ALVARO OBREGON
01900 MEXICO, D.F.

R.F.C. IMP 9312 11 NE1

NUMERO DE FOLIO	NUMERO DE SOLICITUD:	No. PATENTE, REGISTRO O PUBLICACION:
328231	Exp. Pat. 193633	

- [ ] PATENTE
- [ ] CERTIFICADO DE INVENCION
- [ ] NOMBRE COMERCIAL
- [ ] MODELO DE UTILIDAD
- [ ] MARCA
- [ ] DENOMINACION DE ORIGEN
- [ ] DISEÑO INDUSTRIAL
- [ ] AVISO COMERCIAL
- [x] OTROS

CONCEPTO	ARTICULO TARIFA	INCISO TARIFA	IMPORTE
POR LA EXPEDICION DE COPIAS CERTIFICADAS DE DOCUMENTOS (22 hojas)	27	a	$ 66.00

50% DE DESCUENTO MICRO Y PEQUEÑA EMPRESA INSTITUCIONES DE INVESTIGACION DEL SECTOR PUBLICO INSTITUCIONES EDUCATIVAS INVENTORES INDEPENDIENTES	[ ]	TOTAL TARIFAS RECARGOS I.V.A. TOTAL DEL PAGO	$ 66.00 $ $ 9.90 $ 76.00

DATOS DEL TITULAR O SOLICITANTE

NOMBRE UNIVERSIDAD DE GUANAJUATO

DOMICILIO CARR. IRAPUATO SILAO Km. 9 EX HADA.
CALLE, NUMERO, COLONIA Y CODIGO POSTAL

EL COPAL, IRAPUATO, GUANAJUATO

POBLACION/ESTADO

R.F.C.

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FIRMA DEL TITULAR O REPRESENTANTE

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ORIGINAL CLIENTE/EXPEDIENTE DEL SOLICITANTE

PRINTER, S.A. DE C.V. TRIGO 129 COL. GRANJAS ESMERALDA C.P. 09810 MEXICO, D.F. TEL. 5445-1600 IMPRESOR AUTORIZADO EN EL DIARIO OFICIAL DE LA FEDERACION DEL 10-VII-95 R.F.C. PRI-941220-FF9
FECHA DE IMPRESION: ABRIL DEL 2000. "ESTE DOCUMENTO TIENE UNA VIGENCIA DE DOS AÑOS A PARTIR DE SU FECHA DE IMPRESION". FOLIOS [redacted] "285001 AL 1335000

11 JUL. 2000

Julio 11, de 2000

INSTITUTO MEXICANO DE LA
PROPIEDAD INDUSTRIAL
DIRECCION DE PATENTES
DEPARTAMENTO DE EXAMEN
DE FORMA

REF : Patente
No. 193633
De fecha:
15 de Diciembre de 1995

Me refiero a la Patente con el número de expediente que se menciona al rubro, para manifestar a usted sea tan amable de proporcionarme copia certificada de dicho documento.

En relación a mi petición ya procedo a enterar los derechos que se deriven.

Anticipo a usted las gracias por la atención que se sirva usted prestar a la presente.

Recibí copia certificada
José H. Flores C.
Julio 31, 2000

ATENTAMENTE
APODERADO

ING. JOSE H. FLORES CORTES

CIRCUITO RIO PRESAS No 14 COL. PASEOS DE CHURUBUSCO
C.P. 09030 MEXICO D.F.
TEL/FAX 654 72 58

Hoja de Resultados

Consulta: *maquina sembradora ajo FSOL<=19951215...*

1 documentos encontrados, mostrados del 1 al 1

◉ Cambiar la consulta ○ Página siguiente ○ Página anterior

◉ Ver todos los documentos ◉ Vista múltiple ◉ Agregar al buzón Gaceta ▼

Seleccione el icono del artículo de su interes

710	MAQUINA SEMBRADORA NEUMATICA DE PRECISION PARA AJO.	A01C-007/000	31/06/1997	10.00	Solicitudes

◉ Cambiar la consulta ○ Página siguiente ◉ Página anterior

◉ Ver todos los documentos ◉ Vista múltiple ◉ Agregar al buzón Gaceta ▼

United States Patent [19]
Deckler

[11] 3,999,690
[45] Dec. 28, 1976

[54] METERING APPARATUS FOR A SEED PLANTER

[75] Inventor: **Harry C. Deckler**, South Bend, Ind.
[73] Assignee: **White Farm Equipment Company**, Cleveland, Ohio

[22] Filed: **Sept. 17, 1975**
[21] Appl. No.: **614,074**
[52] **U.S. Cl.** **222/194**; 221/211; 222/410
[51] **Int. Cl.²** **B67D 5/54**; G01F 11/20
[58] **Field of Search** 222/194, 410; 221/211

[56] **References Cited**

UNITED STATES PATENTS

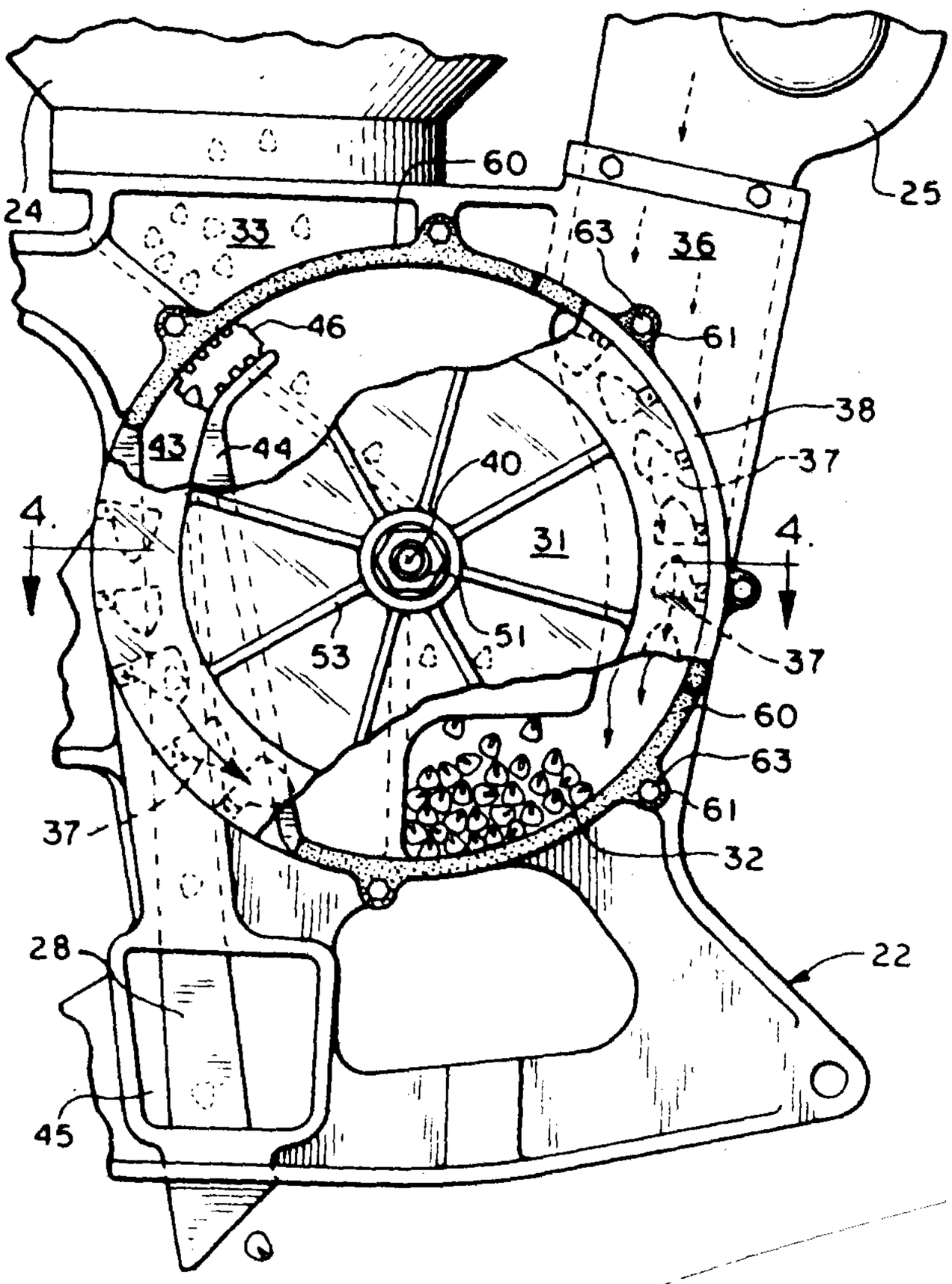
2,314,031	3/1943	Colburn	222/194
3,412,908	11/1968	Ferrault	222/194
3,693,833	9/1972	Weitz	221/211

Primary Examiner—Allen N. Knowles
Assistant Examiner—Hadd Lane
Attorney, Agent, or Firm—Lockwood, Dewey, Zickert & Alex

[57] **ABSTRACT**

An improved seed metering apparatus for use in a seed planter of the type having a seed storage hopper and a drop chute for depositing seeds into an underlying furrow comprises a rotatably driven seed metering disc having a plurality of seed receiving pockets about its periphery. As the planter is pulled forward the metering disc rotates and each pocket is caused to pass through a pressurized chamber wherein a predetermined number of seeds are picked up, and then to pass through a compartment of reduced pressure wherein the seeds are released into the drop chute. A pressure-sealed wear-resistant engagement is obtained between the seed metering disc and the chamber walls by means of replaceable wear plates mounted on the wall edges and a coil spring carried on the disc mounting shaft which causes the metering disc to bear against the wear plates during operation.

6 Claims, 6 Drawing Figures



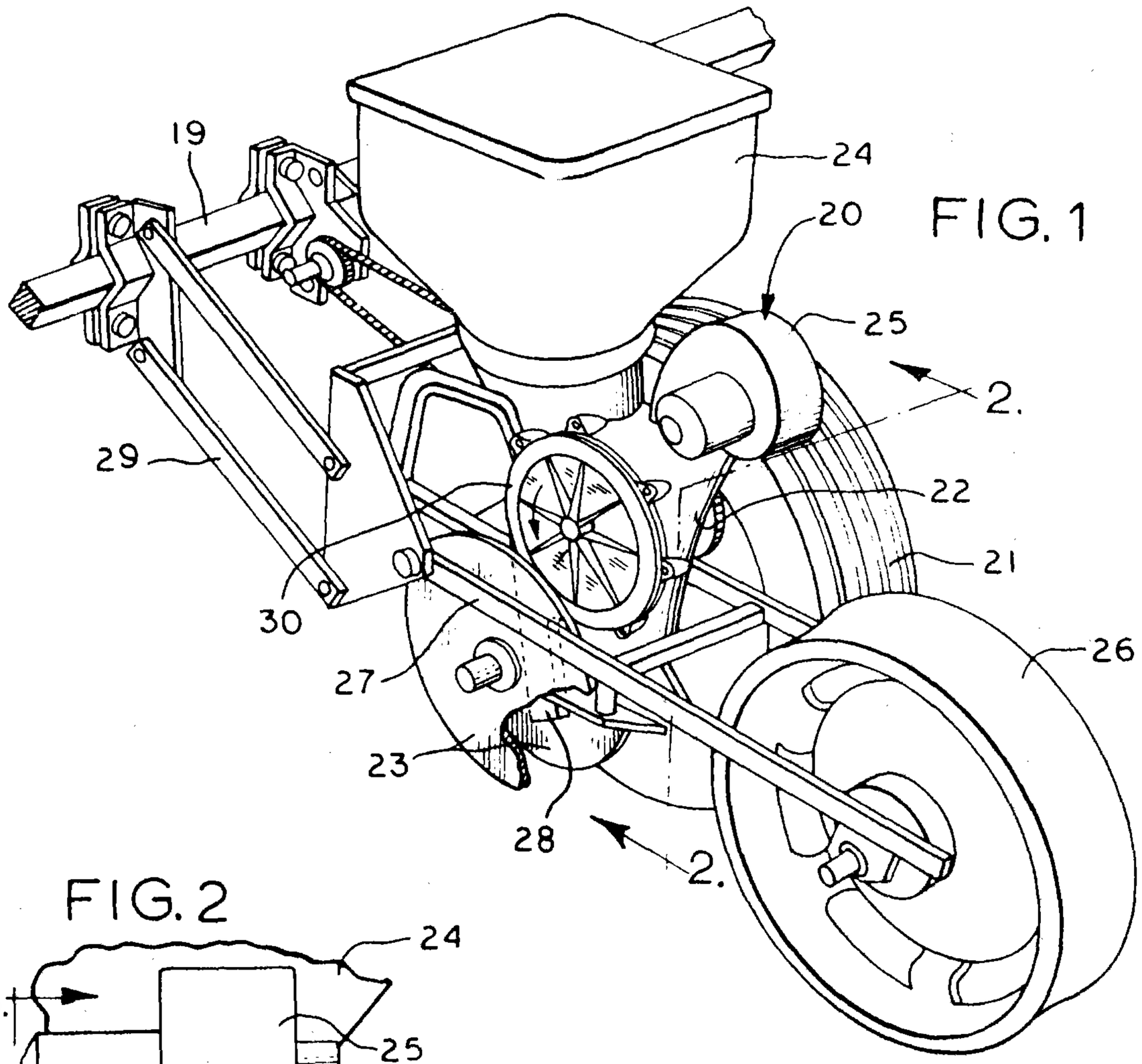


FIG. 1

FIG. 2

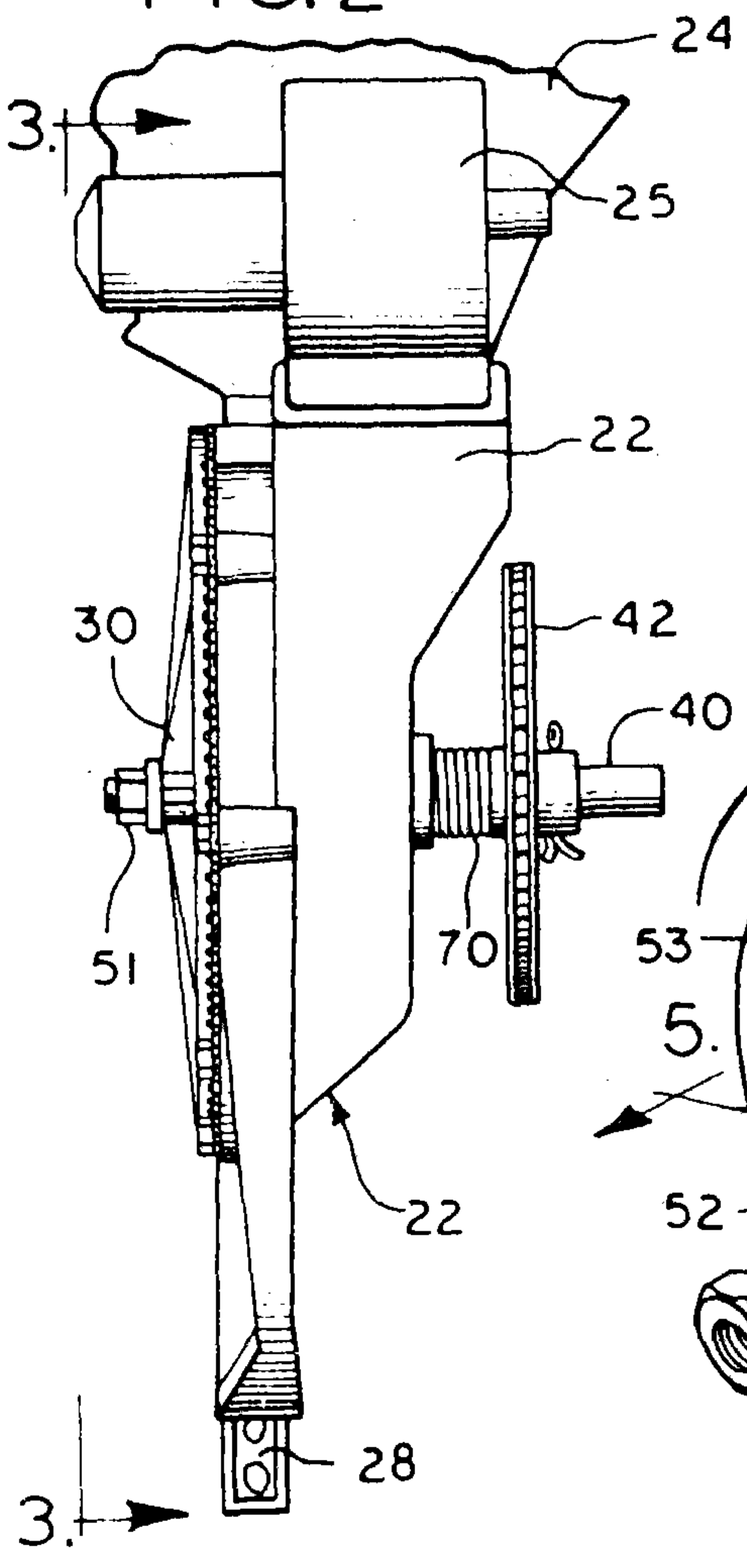
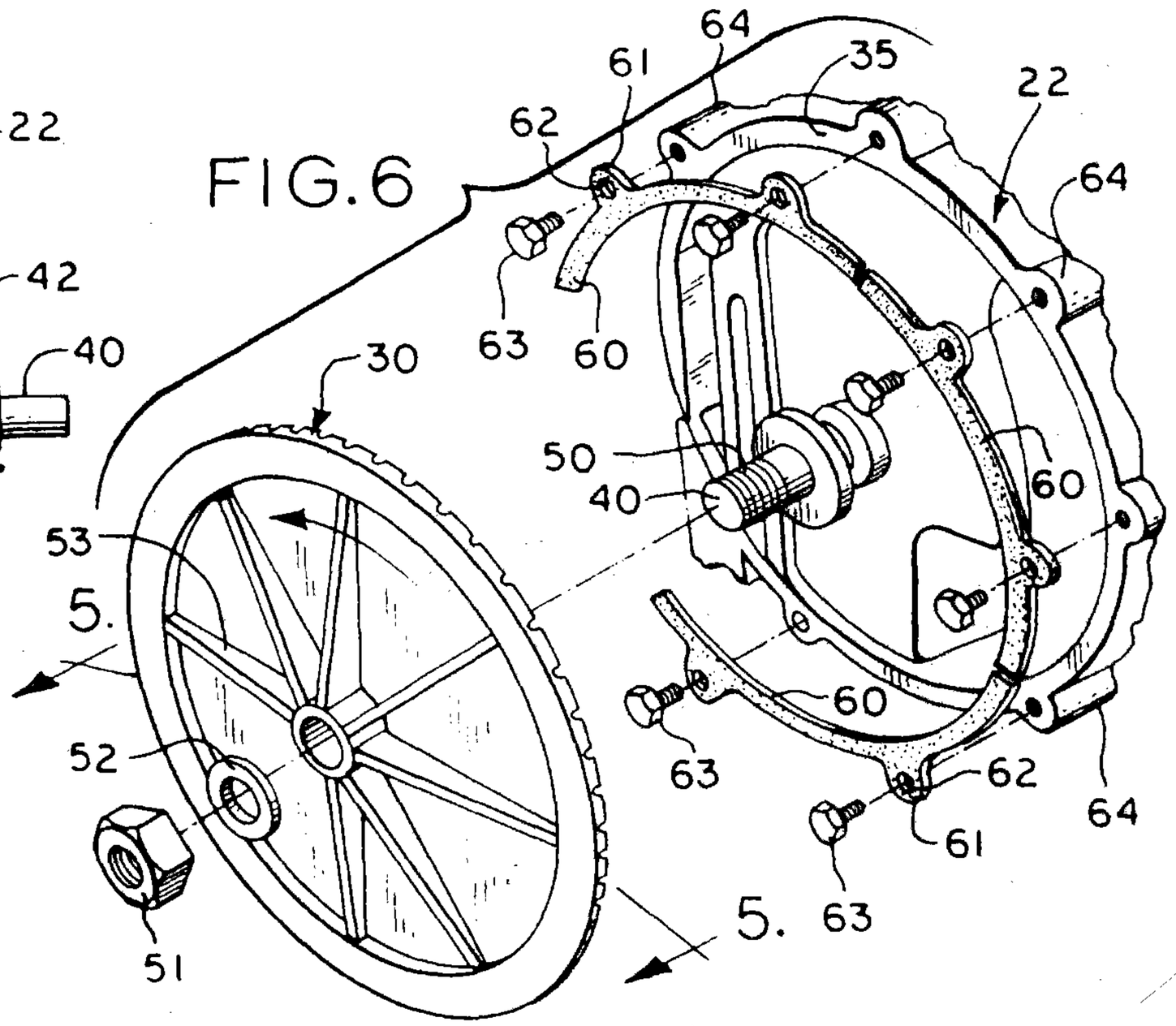


FIG. 6



METERING APPARATUS FOR A SEED PLANTER

BACKGROUND OF THE INVENTION

This invention is directed generally to seed planters, and more particularly to an improved seed metering apparatus for seed planters wherein seeds are deposited from a gravity-feed hopper into an underlying furrow with improved accuracy and speed.

Modern high-production farming operations require a seed planter capable of accurately planting a variety of different seeds at the highest possible speed. One seed planter which has provided particularly good performance in this respect is described in U.S. Pat. No. 3,888,387, dated June 10, 1975, and assigned to the present assignee. In this seed planter an air pressure source is utilized to hold seeds in seed pockets along the periphery of a rotatably driven wheel, the seeds being dropped with precise regularity from the pockets through a drop chute into an underlying furrow.

The present application is directed to an improved construction for such metering apparatus which provides increased wear resistance and improved performance.

Accordingly, it is a general object of the present invention to provide a new and improved apparatus for metering seed flow in a seed planter.

It is another object of the present invention to provide a new and improved metering apparatus for a seed planter which deposits seeds with improved accuracy and speed.

It is another object of the present invention to provide a new and improved metering apparatus for a seed planter which is less susceptible to wear.

It is another object of the present invention to provide a new and improved metering apparatus for a seed planter wherein components most subject to wear can be readily replaced.

It is another object of the present invention to provide a new and improved metering apparatus for a seed planter which incorporates an improved pressure seal.

SUMMARY OF THE INVENTION

The invention is directed, in a seed planter of the type which deposits seeds from a hopper into an underlying furrow at regular intervals, and which has metering apparatus including a housing defining a chamber having an opening with a margin lying in a single plane, means including a drop chute for discharging seeds into the furrow, gravity feed means for conveying seeds from the hopper to the chamber, a disc-shaped seed metering member having a flat inwardly-facing peripheral portion overlying the margin of the opening and having a plurality of pockets each dimensioned to receive a predetermined number of the seeds, the metering member being rotatably mounted so as to bring each of the pockets sequentially in communication with the chamber and the drop chute, and each of the pockets being provided with a pressure-relief passageway communicating to the outside of the housing, means for supplying pressurized air to the chamber to urge the seeds into the pockets, means for at least substantially isolating the pockets from the pressurized air while the pockets are in communication with the drop chute to allow the seeds in the pockets to fall into the drop chute, and means for rotating the metering member as the seed planter moves along the furrow, to the improvement comprising wear reduction means including a wear plate removably mounted on the housing so as to overlie at least a portion of the margin of the opening for coacting with the peripheral portion of the seed metering member to establish at least a partial wear-resistant pressure seal between the metering member and the housing.

The invention is further directed, in a seed planter having metering means for feeding seeds from a gravity discharge seed supply hopper into a chute, the metering means comprising a housing having an opening at least a portion of the outer margin of which is defined by an arcuate surface lying in a plane, and having a seed-receiving portion wherein seeds collect in gravity-fed communication with the seed supply hopper and with the opening; and having a seed-discharging portion in gravity-discharge communication with the chute means, a rotatable cover for the housing opening having an annular surface with a curvature at least approximately equal to the curvature of the arcuate surface and lying in a single plane, the cover having a plurality of arcuately arranged seed-receiving pockets opening into the annular surface and in seed pickup communication with the seed-receiving portion of the housing as the cover rotates, means for rotatably mounting the cover whereby the annular surface thereof continuously moves over the arcuate surface in juxtaposed relation thereto; means for rotating the cover operatively connected therewith, means for producing sufficient pneumatic pressure within the housing to hold the seeds within the pockets as the cover rotates, and means for at least substantially shielding the seed pockets from the air flow as the pockets pass the seed-discharging portion whereby seeds fall from the pockets into the chute means, to the improvement comprising means including a wear plate disposed on at least a portion of the margin of the opening for coacting with the peripheral portion of the seed metering member to establish at least a partial wear-resistant pneumatic seal between the metering member and the housing.

The invention is further directed, in a seed planter of the type which deposits seeds from a hopper into an underlying furrow at regular intervals, and which has seed metering apparatus including a housing defining a chamber having an opening with a margin lying in a single plane, means including the drop chute for discharging seeds into the furrow, gravity feed means for conveying seeds from the hopper to the chamber, a disc-shaped seed metering member having a flat inwardly-facing peripheral portion overlying the margin of the opening and having a plurality of pockets each dimensioned to receive a predetermined number of the seeds, the metering member being rotatably mounted so as to bring each of the pockets sequentially in communication with the chamber and the drop chute, and each of the pockets being provided with a pressure-relief passageway communicating to the outside of the housing, means for supplying pressurized air to the chamber to urge the seeds into the pockets, means for at least substantially isolating the pockets from the pressurized air while the pockets are in communication with the drop chute to allow the seeds in the pockets to fall into the drop chute, and means for rotating the metering member as the seed planter moves along the furrow, to the improvement comprising retaining means operative along the axis of rotation of the seed metering member for urging the peripheral portion of the metering member into sliding engagement with the margin of the opening.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of the present invention, which are believed to be novel, are set forth with particularity in the appended claims. The invention, together with the further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawings, in the several figures of which like reference numerals identify like elements, and in which:

FIG. 1 is a perspective view of a seed planter incorporating a seed metering apparatus constructed in accordance with the present invention.

FIG. 2 is a view of the seed metering apparatus employed in the seed planter of FIG. 1 taken along lines 2—2 of FIG. 1.

FIG. 3 is an enlarged front elevational view of the seed metering apparatus.

FIG. 4 is a view of the seed metering apparatus taken along lines 4—4 of FIG. 3.

FIG. 5 is an enlarged view of a portion of the seed metering disc employed in the seed metering apparatus showing the seed pockets contained thereon.

FIG. 6 is an exploded perspective view of the principal components of the seed metering apparatus.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the figures, and particularly to FIG. 1, a seed metering apparatus constructed in accordance with the invention is shown in conjunction with a seed planter **20**, which, with the exception of the metering system, may be conventional in design and construction. A preferred construction for this planter is described in the aforementioned U.S. Pat. No. 3,888,387.

Seed planter **20** is, in this instance, a trailer-type planter, having a support tire **21** which is utilized to transport the planter when not planting and to provide drive power to the planter when planting. To enable the simultaneous planting of a plurality of parallel rows, the seed planter comprises a plurality of individual planter units arranged side-by-side. Each unit, as shown in FIG. 1, includes a casting or housing **22**, a pair of furrow-opening discs **23**, a gravity feed seed hopper **24**, a blower **25**, a soil firming or tamping wheel **26**, a generally horizontal frame member **27**, and a drop chute **28**. The frame members are connected by means of individual parallel-arm linkages **29** to a main frame **19**, which is coupled to the tractor (not shown) by means of an appropriate hitch (not shown).

Referring to FIGS. 2–4, each planter unit incorporates a seed metering apparatus for dispensing seeds from a hopper **24** at a controlled rate into a drop chute **28**. The drop chute **28** deposits the seeds into furrows prepared by the furrow-opening discs **23** associated with the planter units, the soil firming wheels **26** at the rear of the planter units closing and firming the soil around the seeds as the seed planter is drawn forward.

The housing **22** of each planter unit, which may be molded of metal or other suitable material, includes an internal chamber **31** to which the seeds **32** to be planted are gravity fed from hopper **24** by way of a feed chute **33**, which may be an integral part of the housing **22** as shown, or a separate element suitably attached thereto. The chamber **31** is provided with a generally annular opening **34** (FIG. 4) having a flat marginal surface **35** disposed in a single plane about its periphery. Air under pressure is introduced into the chamber **31** by way of an air duct **36** which communicates with blower **25**.

To control the dispensing of seeds **32** the seed metering apparatus incorporates a seed metering disc **30** overlying opening **34** so as to at least partially pressure-seal chamber **31**. As best seen in FIGS. **3–5**, this metering disc **30** has a plurality of equi-spaced inwardly-facing seed-receiving pockets **37** about its periphery, each of which is equipped with a passageway **38** which extends radially on the inside surface of the disc to the exterior of the housing.

The metering disc **30** is mounted on a shaft **40**, which extends through a bearing sleeve **41** (FIG. **4**) in housing **22**. A sprocket **42** on the other end of shaft **40** and a coacting drive chain (not shown) rotatably couple the metering disc **30** to the planter support wheel **21** so that the metering disc rotates as the planter is drawn forward.

A second chamber **43** (FIG. **2**) is formed in housing **22** at the upper end of drop chute **28** along the arcuate path followed by the pockets **37** as the metering disc **30** rotates. This chamber is pneumatically isolated by a baffle **44** from the pressurized chamber **31** so as to reduce the air pressure exerted on pockets **37** to the extent that seeds **32** seated therein drop into the underlying portion of the drop chute **28** and into the underlying furrow when the pockets come into communication with the chamber.

Housing **22** may also be provided with a third chamber **45** disposed along drop chute **28** for accommodating means for detecting the presence of seeds in the drop chute. By providing a suitable detector in this chamber it is possible to automatically warn the operator should the planter become inoperative or run out of seeds, preventing loss of crops and wasted effort.

The seed metering disc **30** may be molded of a high impact flexible plastic material, and is preferably transparent to allow the operator to visually confirm the presence of seeds in the pockets and the availability of an adequate supply of seeds. A plurality of radially extending ribs **53** may be molded into the metering disc to increase its rigidity, and the disc may be formed slightly inwardly concave to provide a more positive pressure seal with the margins of housing **22**.

The seed metering disc **30** is preferably mounted on shaft **40** by means of a threaded portion **50** (FIG. **6**) on the end of the shaft and a hex nut **51** which is tightened on this threaded portion over a washer **52** so as to bear against the metering disc. Shaft **40** may be keyed and disc **30** may be provided with a coacting keyway to assure locked rotation between these elements. While metering disc **30** is shown with a plurality of wedge-shaped seed-receiving pockets **37** about its circumference, which are particularly well adapted for metering kernels of corn, it will be appreciated that for other seed planting applications other sizes and shapes of pockets may be desirable, the metering disc **30** being readily removable from shaft **40** to facilitate such substitution.

In operation a metering disc **30** having seed-receiving pockets **37** appropriate for the seeds **32** being planted is selected and installed on shaft **40** by tightening hex nut **51** over the threaded portion **50** of the shaft. A quantity of seeds **32** to be planted is next loaded into hopper **24** and allowed to drop through feed chute **33** into chamber **31**. To commence planting blower **35** is energized and chamber **31** is pressurized through duct **36**. As the planter **20** is pulled along the ground by the

tractor, a furrow is opened immediately ahead of the planter by the disc 23. At the same time, the seed metering disc 30 rotates counterclockwise (as viewed in FIG. 2) at a speed proportional to the speed of the planter, the seed-receiving pockets 37 being carried in an arcuate path into communication with the seeds 32 in chamber 31. In passing through chamber 31 each pocket 37 picks up a predetermined number of the seeds 32 by reason of the pressurization within chamber 31 and the pressure differential generated across the seeds as the pressurized air escapes through the passageway 38 associated with the pocket.

The seed-receiving pockets 37 next pass through the non-pressurized chamber 43, wherein the seeds drop into drop chute 28 for conveyance into the associated underlying furrow. A resilient flap-like pressure gate 46 may be provided between the pressurized chamber 31 and the non-pressurized chamber 43 to make this release more positive and to remove excess seeds from the pockets. After the pockets 37 have released their seeds, they continue counterclockwise to again enter chamber 31 and pick up another quantity of seeds.

In accordance with one aspect of the invention, the wear resistance of the pressure seal between the marginal surface 35 of chamber 31 and metering disc 30 is enchanced by the provision of a plurality of wear plates 60 on surface 35. Referring to FIG. 6, these wear plates are preferably formed as thin arcuate segments which, when joined end-to-end, extend substantially around the margins of chamber 31. Each of the wear plates 60 includes a pair of radially-projecting tab portions 61 to facilitate mounting on housing 22. These tab portions 61 include apertures 62 through which threaded fasteners in the form of machine screws 63 are inserted for threaded engagement with complementarily threaded bores provided on flanges 64 on housing 22.

The wear plates 60 may each be formed of a thin sheet of stainless steel or other metallic material having good wear resistant properties. In one embodiment wear plates formed of 304 series 0.025 inch thick half hard stainless steel stock provided good results in conjunction with a plastic metering disc having a diameter of approximately 10 ⅝ inches operating under a net compressive force of 2–5 pounds. However, it will be appreciated that other materials may be used to form the wear plates and that epoxy coatings or other wear resistant surfaces may be provided.

Absent wear plates 60, the plastic metering disc 30, by reason of its relative softness, tends to accumulate dust particles on its surfaces, these dust particles becoming embedded in the soft surface of the disc and tending to act as an abrasive agent against the coacting surface 35 of housing 22 so as to cause unnecessary wear to the housing. Use of the replaceable wear plates 60 not only reduces this tendency to wear, but also enables replacement of the wear surface by merely removing machine screws 53. This prolongs the life of metering disc 30 and housing 22, and hence the useful life of the seed planter.

While wear plates 60 have been shown as three semi-arcuate segments disposed about the periphery of housing 22, it will be appreciated that these plates can be provided in other forms. For instance, a greater or lesser number of plates could be provided and the plates need not necessarily be arcuate to provide the necessary protection against wear for housing 22. Furthermore, the wear plates 60 can be either flush mounted on surface 35 as shown in the figures, or may be partially recessed in an appropriately dimensioned channel or depression provided on surface 35.

In accordance with another aspect of the invention, to maintain the margins of metering disc 30 snugly engaged to wear plates 60 a compression spring 70 (FIG. 4) is fitted over the end of shaft 40 between housing 22 and sprocket 42. This spring exerts an axial force on shaft 40 in a direction away from the rear side of housing 22, thereby tending to draw the metering disc 30 up against the wear plates. This enhances the seal between housing 22 and the metering disc 30, and helps to overcome dimensional variations resulting from production tolerances and wear between the two elements.

In one embodiment a spring having a diameter of approximately 15/16 inches, an uncompressed length of approximately 1 ⅛ inches, a compressed length of approximately 9/16 inches, and exerting an axial force of approximately 12 pounds, provided good results when used in conjunction with a metering disc having a diameter of approximately 10 ⅝ inches mounted on a shaft having a diameter of ⅜ inches and a length of approximately 8 inches, and on which a net axial force of 8 pounds was exerted by pressurized air in chamber 31.

The capability of the aforedescribed seed metering apparatus to operate at high speed with great accuracy is enhanced by the improvements provided by the invention, which result in improved operating efficiency and extended operating life without significantly adding to the complexity or cost of manufacture of the seed planter.

While a particular embodiment of the invention has been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from the invention in its broader aspects, and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of the invention.

I claim:

1. In a seed planter of the type which deposits seeds from a hopper into an underlying furrow at regular intervals, and which has seed metering apparatus including

a housing defining a chamber having an opening with a margin lying in a single plane;

means including a drop chute for discharging seeds into said furrow;

gravity feed means for conveying seeds from said hopper to said chamber;

a disc-shaped seed metering member having a flat inwardly-facing peripheral portion overlying and in pressure engagement with said margin of said opening, said metering member having a plurality of pockets each dimensioned to receive a predetermined number of said seeds, and being rotatably mounted so as to bring each of said pockets sequentially in communication with said chamber and said drop chute;

means for urging said seeds into said pockets from said chamber and retaining said seeds in said pockets as said metering member rotates;

means for releasing said seeds from said pockets while said pockets are in communication with said drop chute to allow the seeds in said pockets to fall into said drop chute; and

means for rotating said metering member as said seed planter moves along said furrow;

the improvement comprising;

wear reduction means including a wear plate removably mounted on said housing so as to overlie at least a substantial portion of said margin of said opening engaged by said seed metering member to establish at least a partial wear-resistant engagement between said metering member and said housing.

2. A metering apparatus for a seed planter as defined in claim 1 wherein said wear reduction means include a plurality of arcuate wear plate segments arranged around said margin of said opening.

3. A metering apparatus for a seed planter as defined in claim 1 wherein means are provided for biasing said peripheral portion of said metering member against said wear plate.

4. In a seed planter having a metering means for feeding seeds from a gravity discharge seed supply hopper into a chute, said metering means comprising

a housing having an opening at least a portion of the outer margin of which is defined by an arcuate surface lying in a plane, and having a seed-receiving portion wherein seeds collect in gravity-fed communication with said seed supply hopper and with said opening; and having a seed-discharging portion in gravity-discharge communication with said chute;

a rotatable cover for said housing opening having an annular surface with a curvature at least approximately equal to the curvature of said arcuate surface and lying in a single plane, said cover having a plurality of arcuately arranged seed-receiving pockets opening into said annular surface and in seed pickup communication with said seed-receiving portion of said housing as said cover rotates;

means for rotatably mounting said cover whereby said annular surface thereof continuously moves over said arcuate surface in juxtaposed relation thereto;

means for rotating said cover operatively connected therewith;

means for producing sufficient pneumatic pressure within said housing to hold said seeds within said pockets as said cover rotates; and

means for at least substantially shielding said seed pockets from said air flow as said pockets pass said seed-discharging portion whereby seeds fall from said pockets into said chute means;

the improvement comprising:

means including a wear plate disposed on at least a substantial portion of said margin of said opening for coacting with said peripheral portion of said seed metering member to establish at least a partial wear-resistant pneumatic seal between said metering member and said housing.

5. A metering apparatus for a seed planter as defined in claim 4 wherein said wear reduction means include a plurality of arcuate wear plate segments arranged around said margin of said opening.

6. A metering apparatus for a seed planter as defined in claim 4 wherein means are provided for biasing said peripheral portion of said metering member against said wear plate.

* * * * *

United States Patent [19]

Harrer et al.

[11] **4,047,638**

[45] **Sept. 13, 1977**

[54] **SEED DISC FOR AN AIR PLANTER**

[75] Inventors: **Paul H. Harrer; LeRoy Langford,** both of LaPorte, Ind.

[73] Assignee: **Allis-Chalmers Corporation,** Milwaukee, Wis.

[21] Appl. No.: **680,332**

[22] Filed: **Apr. 26, 1976**

Related U.S. Application Data

[63] Continuation of Ser. No. 511,385, Oct. 2, 1974, abandoned.

[51] **Int. Cl.²** **A01C 7/04; B65G 29/00**

[52] **U.S. Cl.** **221/266;** 111/77; 221/278

[58] **Field of Search** 221/211, 265, 266, 278; 111/78, 77; 222/369

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Primary Examiner—Robert B. Reeves

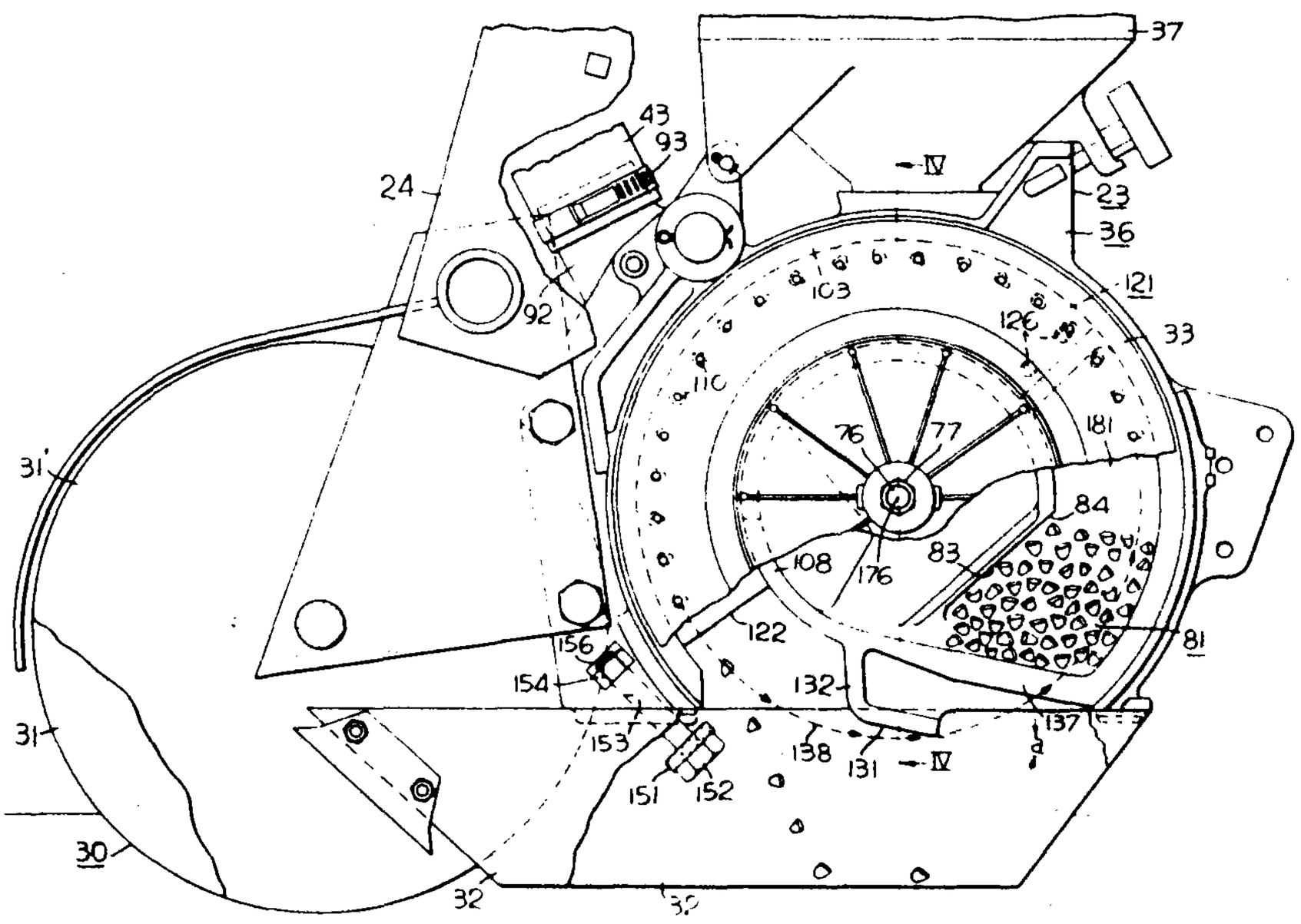
Assistant Examiner—Francis J. Bartuska

Attorney, Agent, or Firm—Charles L. Schwab

[57] **ABSTRACT**

A rotating disc has perforated seed pockets which pick up individual kernels of seed from an air pressurized cavity of a planter housing. Air flowing through the perforated pockets creates a pressure differential which moves a kernel into each pocket as the pocket moves on a circular path upwardly through the cavity. The pocket then moves into axially confronting relation with a flat sealing surface. The flat sealing surface holds the seed in the pocket as the disc rotates further to bring the pocket to the lower part of the housing where the seed falls by gravity into the soil. Each of the circumferentially spaced pockets has an opening in its bottom which is large enough to permit air flow therethrough but smaller than the seed kernels to be planted. The pockets are clam shell shaped with the more gentle slope on the side of the pocket toward the direction of rotation of the disc during planting. The opposite side of the pocket has a steep slope whereby the seed in the pocket is mechanically assisted in its assent from the seed cavity. The seed disc for corn includes a camming groove extending from each pocket which cams corn kernels radially outwardly toward the pocket as it passes upwardly through the seed cavity.

6 Claims, 18 Drawing Figures



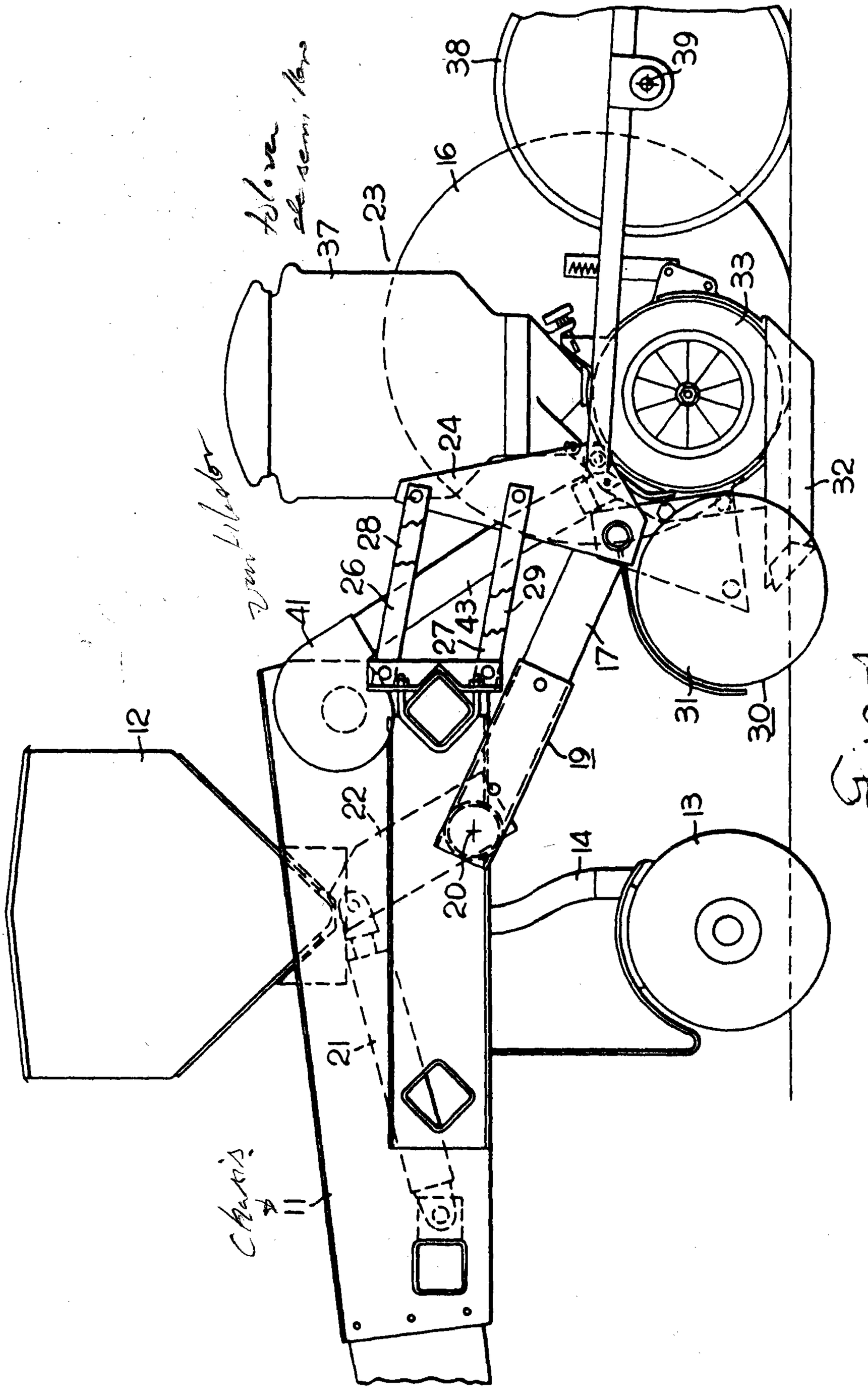


Fig. 1-A

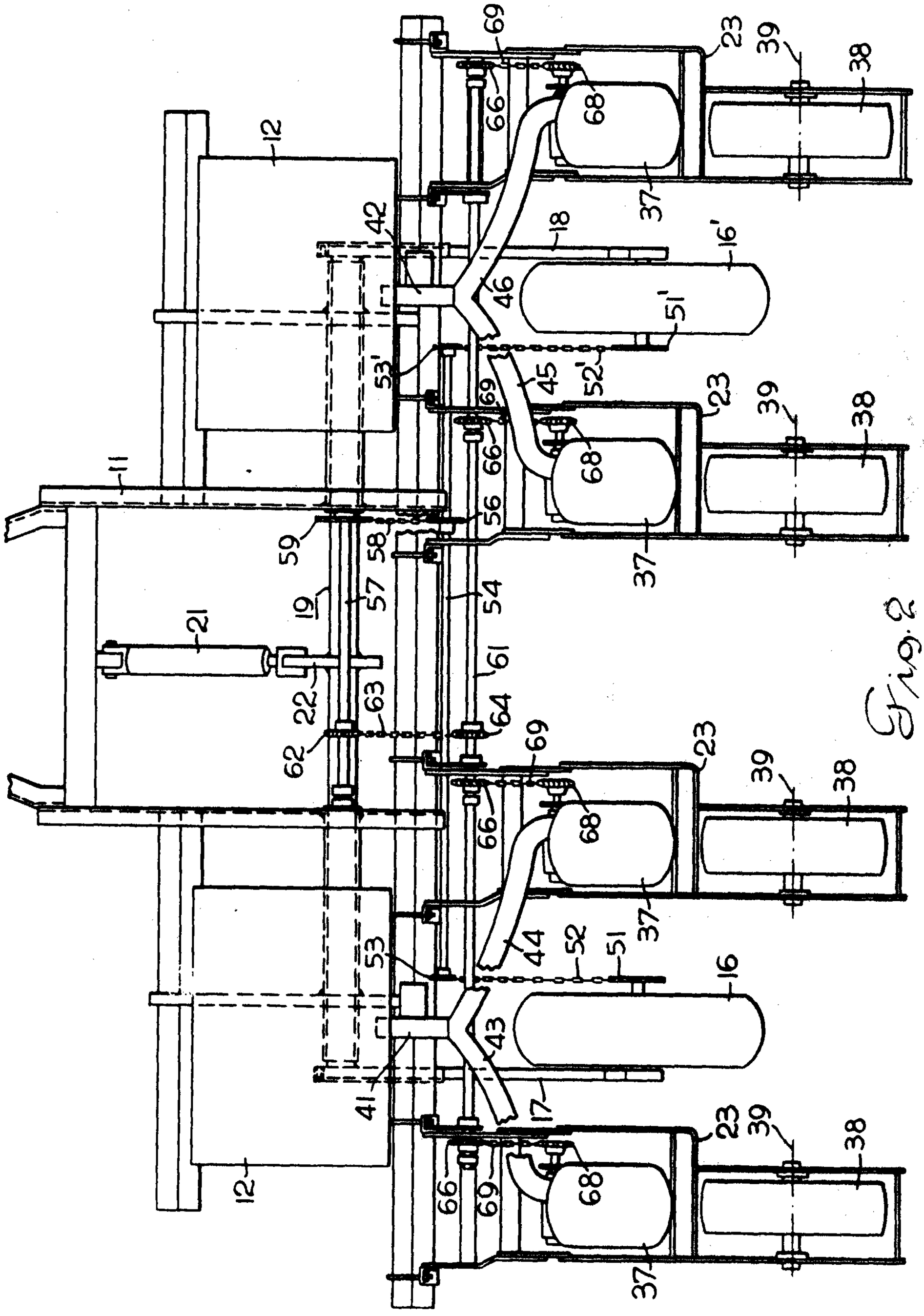

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Fig. 2

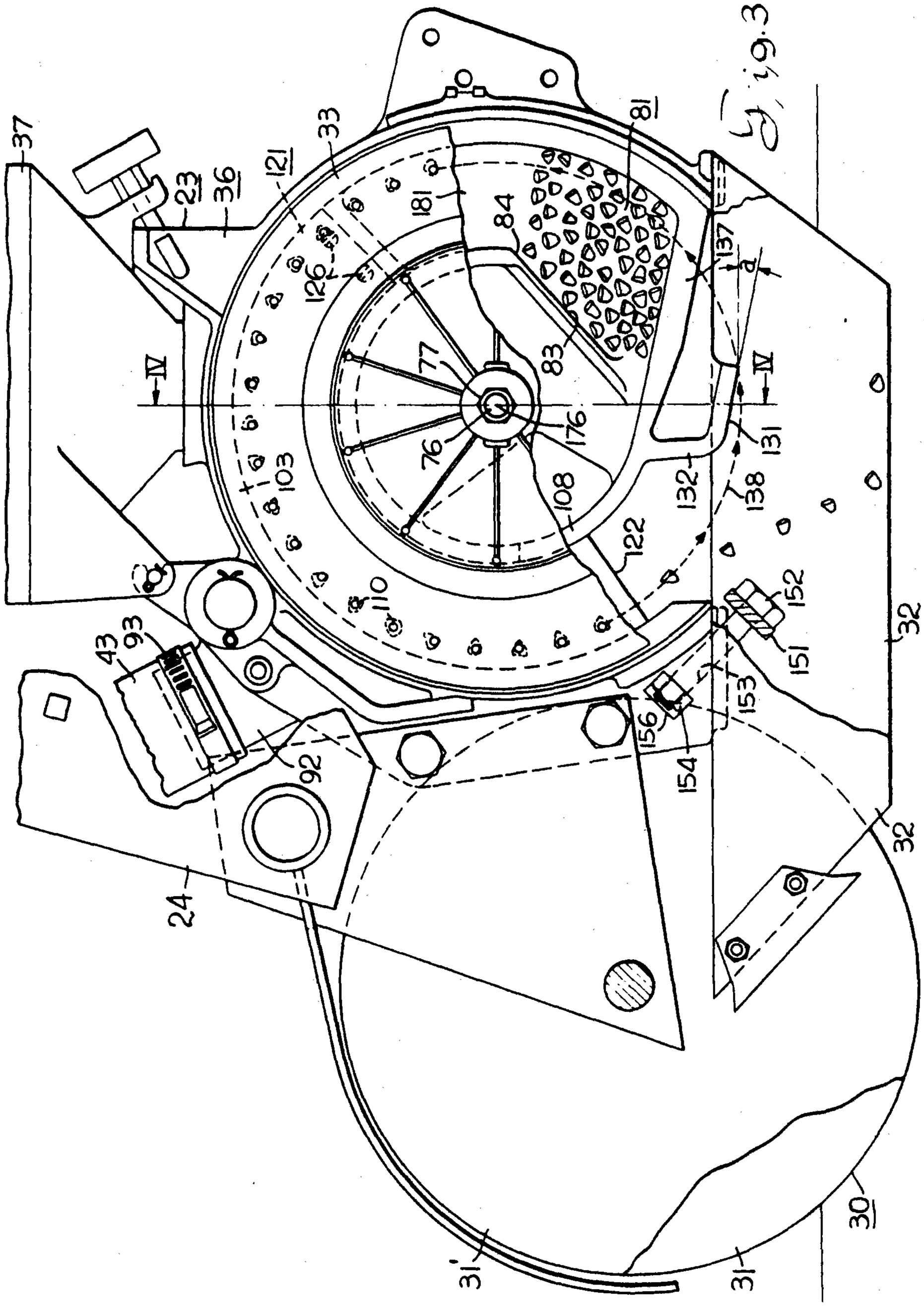
Fig. 3
37
23
36
121
33
81
84
137
d
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77
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IV
IV
76
176
103
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131
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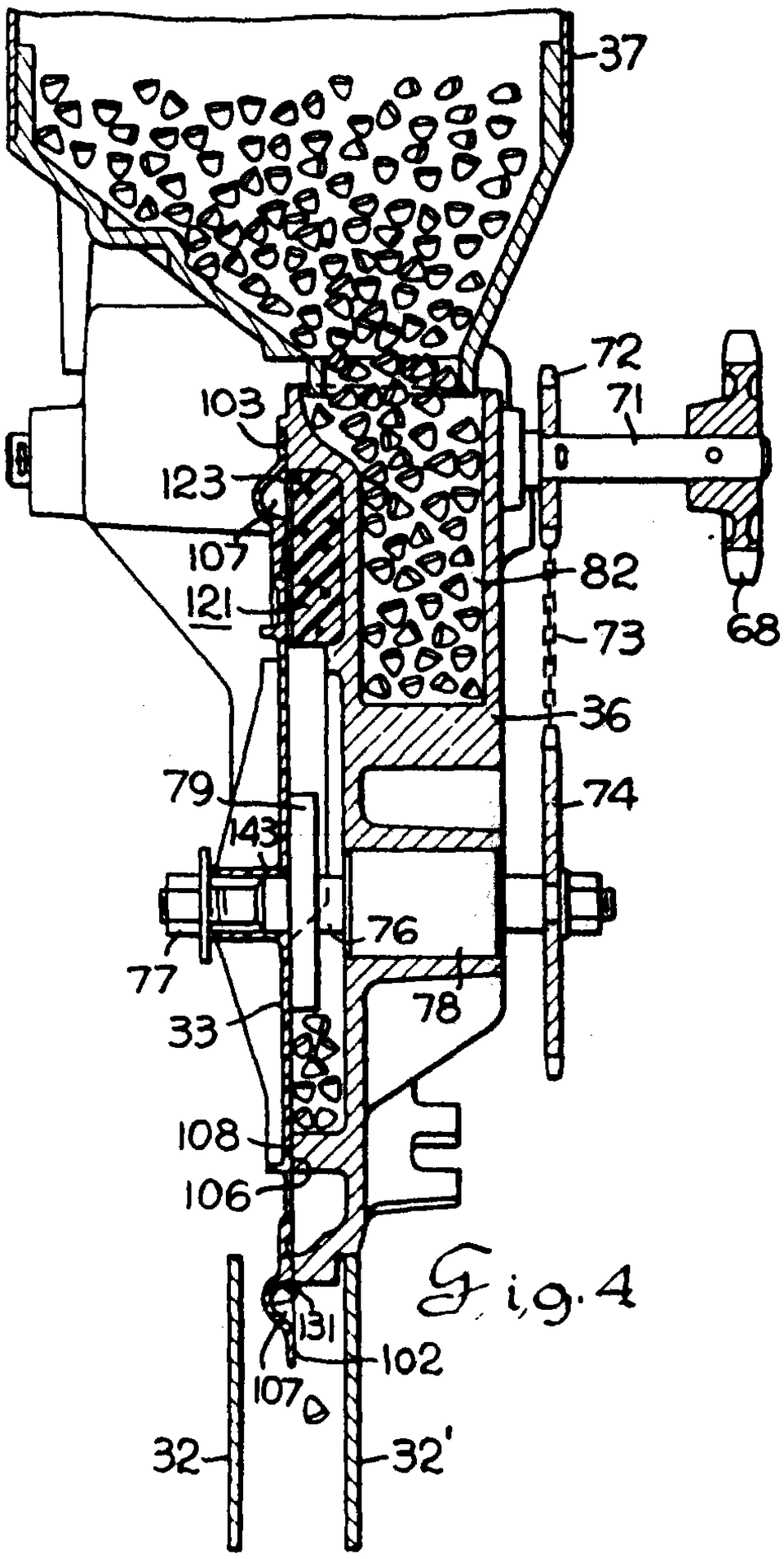
32
24
31'
31
30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103
123
107
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107a
32
32'

Fig. 4

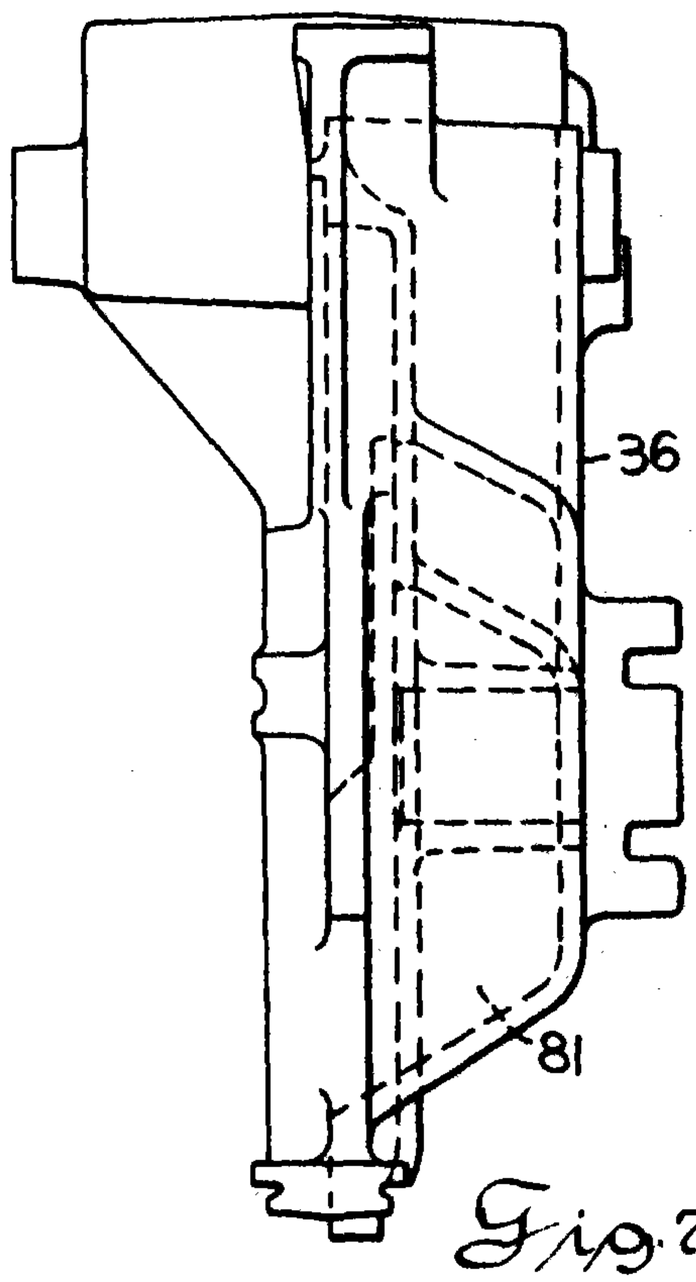
36
81

Fig. 7

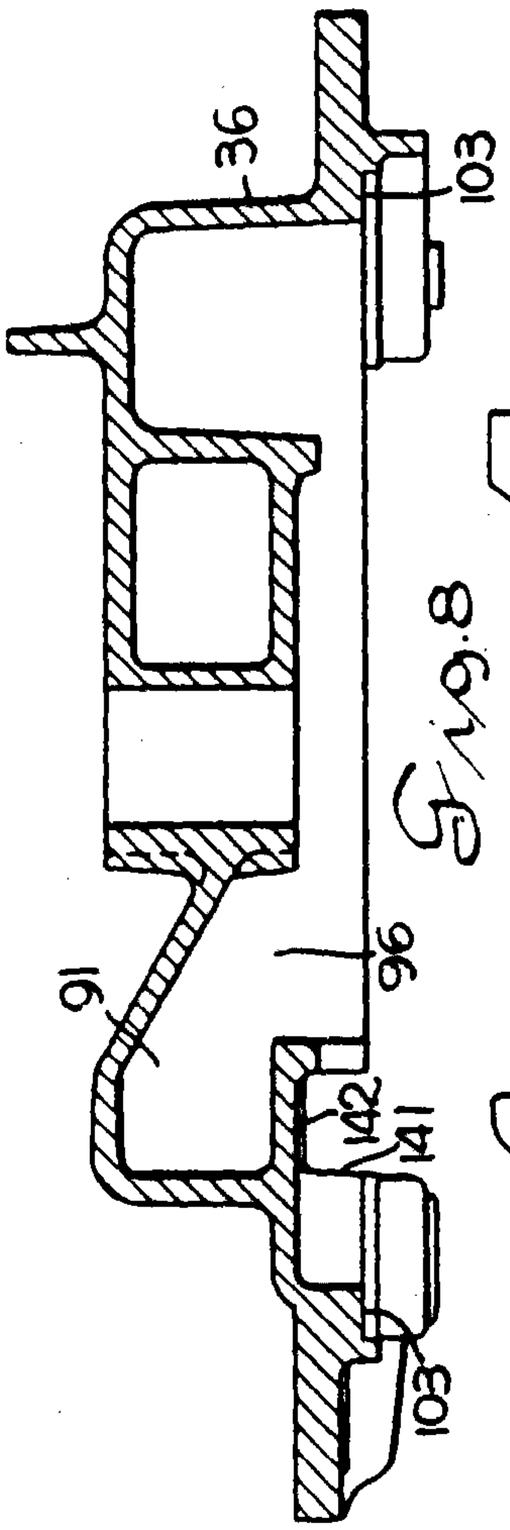

Fig. 8

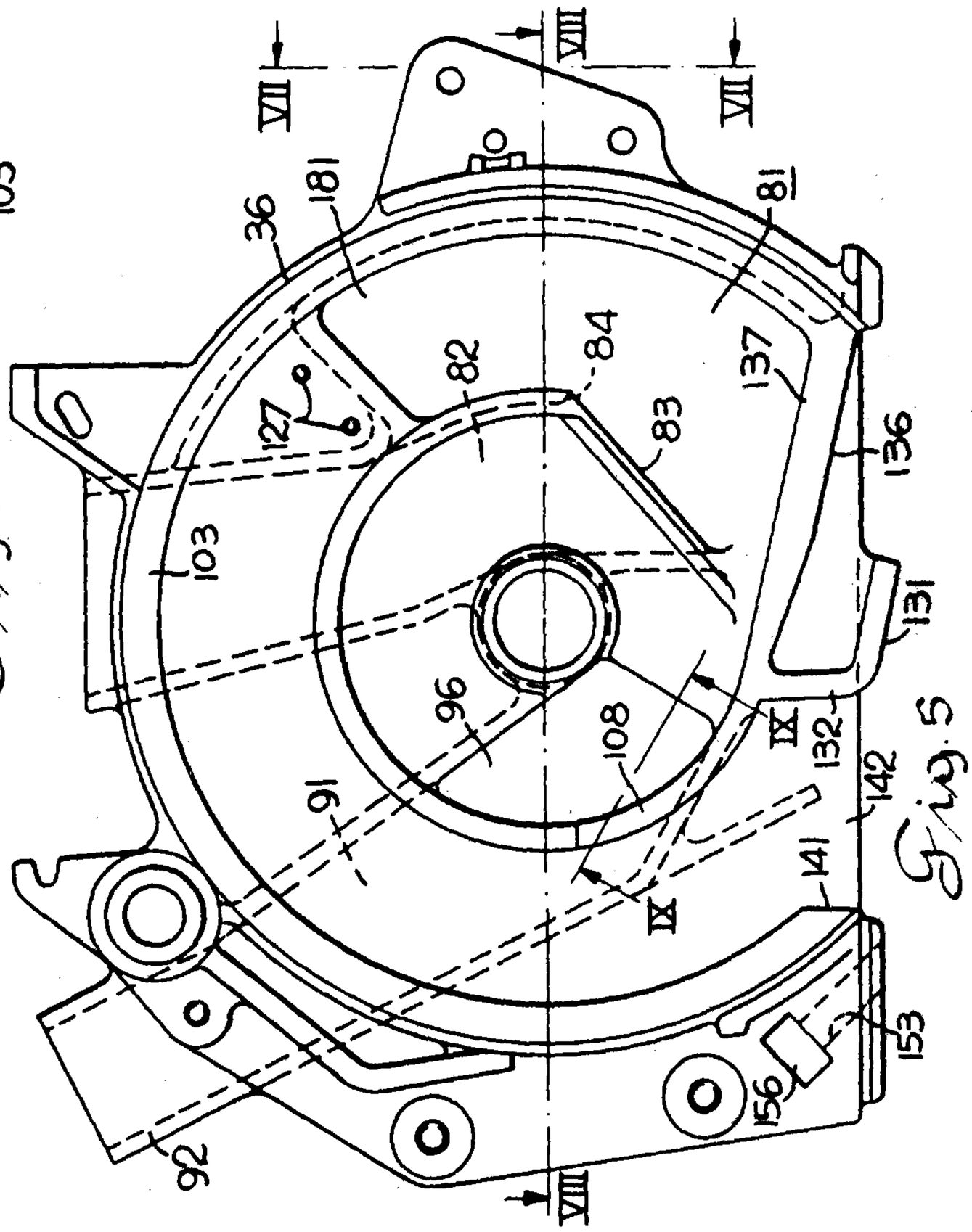

Fig. 5

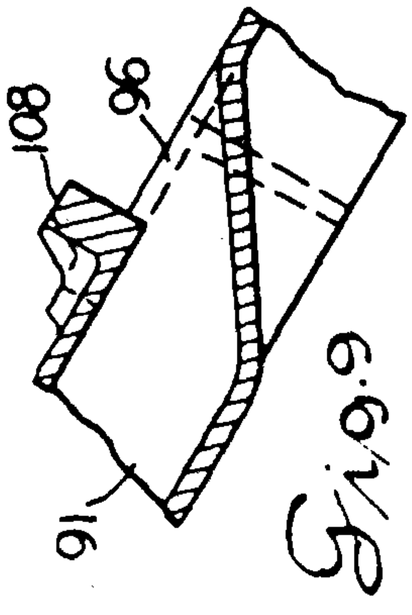

Fig. 6

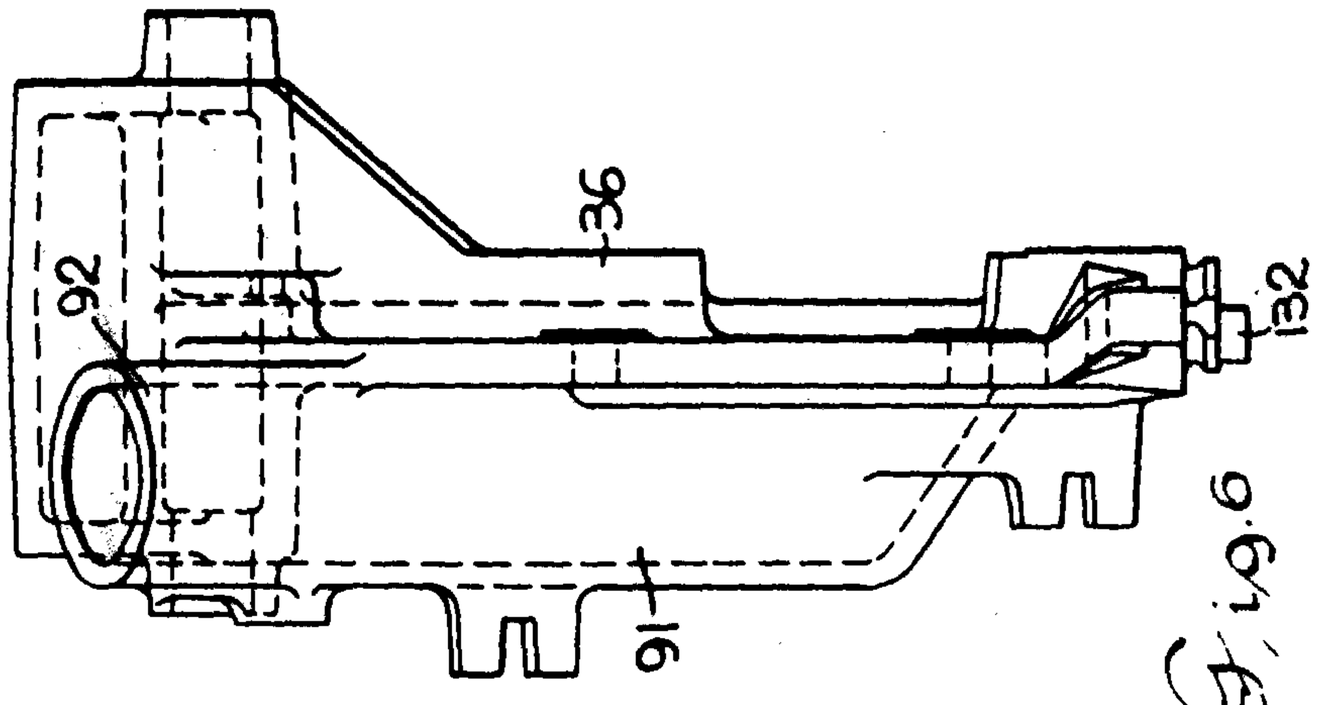

Fig. 9

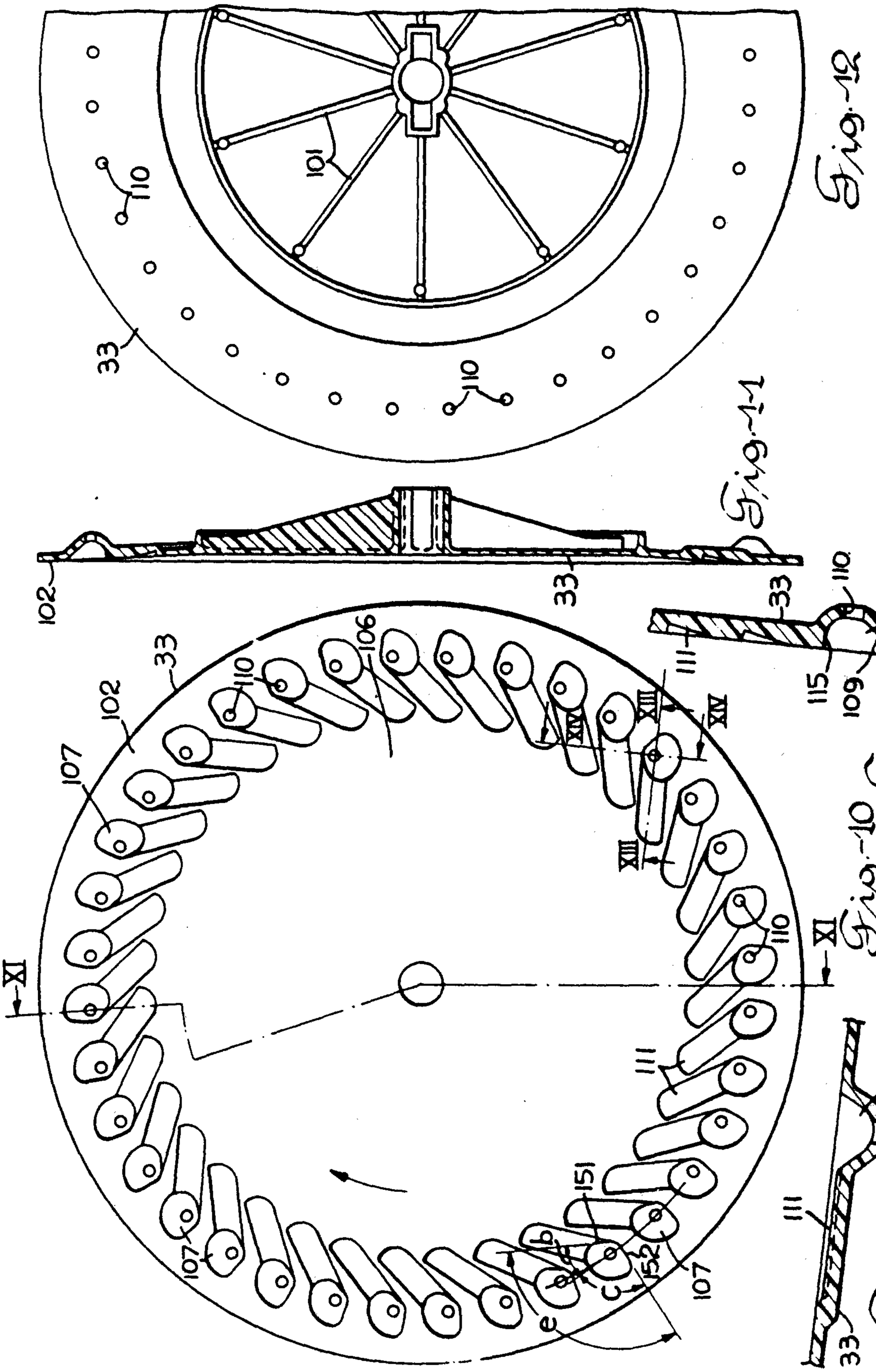

Fig. 12

Fig. 11

Fig. 14

Fig. 10

Fig. 13

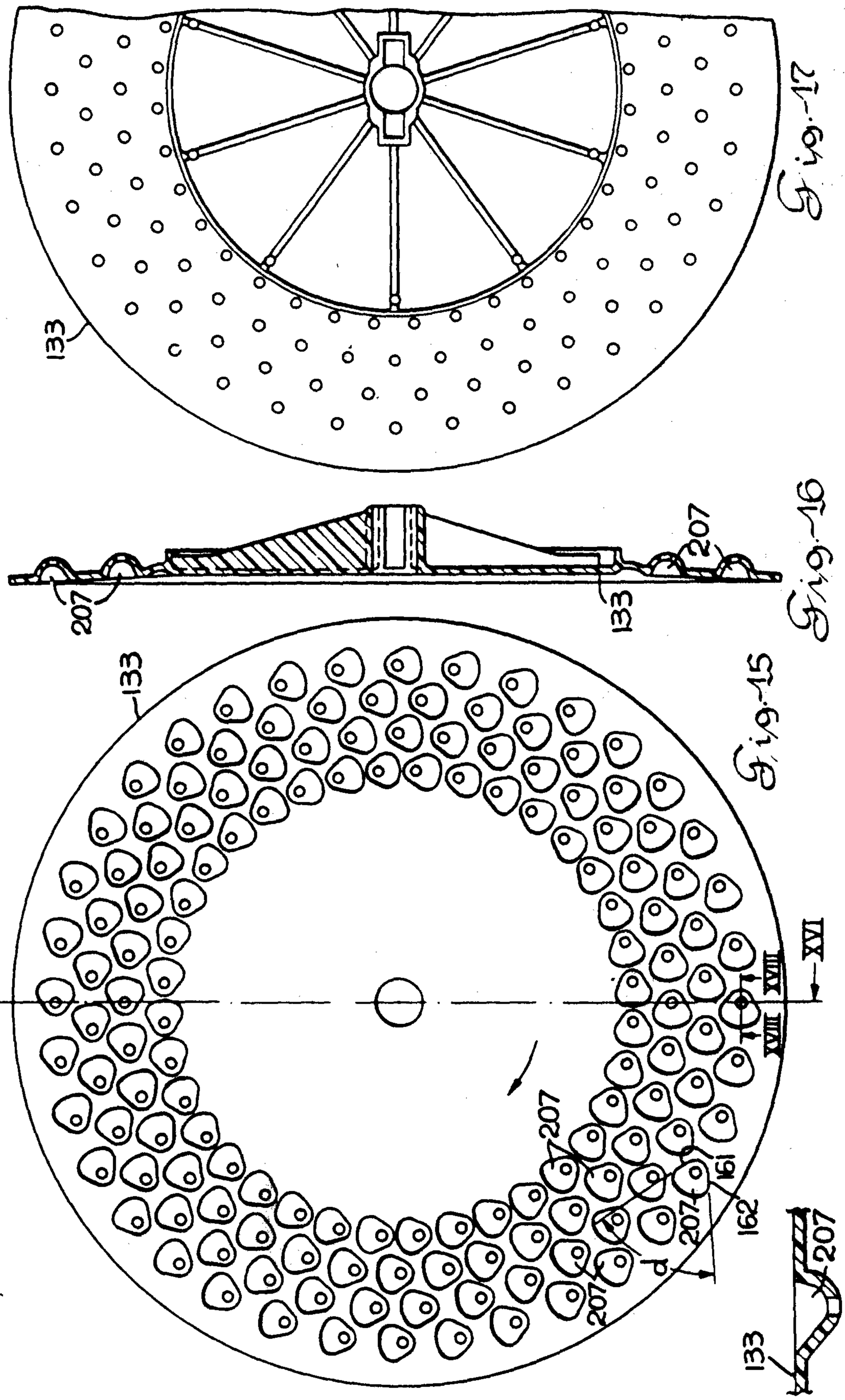

Fig. 9-17

Fig. 9-16

Fig. 9-15

Fig. 9-18

SEED DISC FOR AN AIR PLANTER

This is a continuation of application Ser. No. 511,385 filed Oct. 2, 1974, now abandoned.

RELATED APPLICATIONS

A copending U.S. Pat. application Ser. No. 508,672 of Charles E. Adams, Harold E. Quackenbush, Paul H. Harrer, LeRoy Langford and Alvin L. Cleek for Compressed Air Seed Planter shows the seed planting discs of this invention.

BACKGROUND OF THE INVENTION

The use of air pressure or vacuum to induce separation of kernels of grain from a bulk quantity is well known in the art. The use of a rotating drum with apertures is shown in U.S. Pat. Nos. 1,006,984; 3,156,201; 3,322,080; 3,542,242; 3,637,108; 3,731,842 and 3,762,603. The use of rotating discs in air or vacuum assist planters is shown in U.S. Pat. Nos. 1,046,199; 1,331,235; 2,991,909; 3,434,437 and 3,608,787.

BRIEF SUMMARY OF THE INVENTION

A seed disc of this invention is adapted for use in an air planter wherein flowing air is used to trap the seeds in perforated pockets in the vertically disposed disc as it rotates through or beside a pressurized housing cavity which contains seed. The perforated pockets are clam shell shaped with the gently sloping side being at the leading edge. The steeply sloping side at the trailing edge assists in mechanically lifting the seed, once it is in the pocket, as the pocket moves upwardly on a curved path towards its apex. When the seed carrying pockets pass to an open area at the bottom of the planter housing, they fall by gravity down the gentle slope of the pocket into the soil. The perforations in the pockets are smaller than the seed being planted and the air passing therethrough and differential pressure produced thereby induces the seeds to move into the pockets where they are maintained by the pressure differential between the cavity and the atmosphere. The seed disc rotates about an axis transverse to the direction of travel of the planter during planting and is so designed as to serve as a side cover for planter housing and for the seed cavity therein.

It is a general object of this invention to provide a seed planting disc which efficiently singulates kernels of seed from a bulk supply.

It is a further object of the present invention to provide a seed planting disc which is adapted to rotate about a transverse axis in sealing relation to one transverse side of a planter housing having a pressurized seed containing cavity.

It is a further object of this invention to provide a seed planting disc which has perforated clam shell shaped pockets spaced circumferentially about one axial side thereof.

It is a further object of this invention to provide a seed planting disc with perforated seed pockets shaped to afford a gentle slope at the leading edge side of the pocket and a steep seed retaining slope at the trailing edge side of the pocket.

It is a further object of this invention to provide a seed planting disc as hereinbefore described and additionally having a camming groove for each pocket extending circumferentially in the direction of rotation and radially inwardly so as to urge seed radially outwardly into the pocket as the latter passes by the seed containing cavity of the planter housing.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects and advantages of this invention will be apparent on reference to the drawings in which:

FIG. 1 is a side view of a planter incorporating a seed disc of the present invention;

FIG. 2 is a top view of the planter shown in FIG. 1;

FIG. 3 is an enlarged side view of one planter unit of the planter shown in FIG. 1;

FIG. 4 is a section view taken along line IV—IV in FIG. 3;

FIG. 5 is a side view of the housing part of the planter unit of the present invention;

FIG. 6 is a front view of the housing shown in FIG. 5;

FIG. 7 is a rear view of the housing shown in FIG. 5;

FIG. 8 is a section view taken along the lines VIII—VIII in FIG. 5;

FIG. 9 is a section view taken along the lines IX—IX in FIG. 5;

FIG. 10 is a side view of a corn planting disc of the present invention;

FIG. 11 is a section view taken along the lines XI—XI in FIG. 10;

FIG. 12 is a side view of the corn planting disc as seen from the opposite side of FIG. 10;

FIG. 13 is a section view taken along the lines XIII—XIII in FIG. 10;

FIG. 14 is a section view taken along the lines XIV—XIV in FIG. 10;

FIG. 15 is a side view of a soybean planting disc of the present invention;

FIG. 16 is a section view taken along the lines XVI—XVI in FIG. 15;

FIG. 17 is a side view of the soybean planting disc shown as seen from the opposite side from FIG. 15; and

FIG. 18 is a section view taken along the lines XVIII—XVIII in FIG. 15.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring to FIGS. 1, 2 and 3, the planter includes a main frame 11 on which fertilizer hoppers 12 are disposed which deposit fertilizer behind the furrow openers 13 by way of tubes 14. The furrow openers 13 are not shown in FIG. 2 and form no part of the present invention. Wheels 16, 16' are rotatably mounted on ends of legs 17, 18 of a lift frame 19 which is pivotably positioned about an axis 20 by a hydraulic ram 21 interconnected between the frame 11 and an arm 22 of the lift frame 19. The wheels 16 not only support the planter, but also, on expansion of ram 21, raise planting units 23 out of their illustrated planting position. A planting unit subframe 24 is connected to main frame 11 by substantially parallel links 26, 27, 28, 29. A suitable disc-type furrow opener structure 30 is provided for the planting unit 23 and includes a pair of discs 31, 31' and a pair of transversely spaced runners or shoes 32, 32'. The shoes have their longitudinally central portions disposed on opposite sides of a seed planting disc 33 and converge at their front ends which carry scrapers for the inner, confronting sides of discs 31, 31'. The subframe 24 carries a housing 36 and a seed hopper 37. A press wheel 38 is mounted in trailing relation to the subframe 24 on a transverse axis 39 and serves to close the seed

planting furrow to cover the seed. A pair of blowers 41, 42 mounted on frame 11 supply air to the housings 36 by way of suitable conduits 43, 44, 45, 46.

As shown in FIGS. 2 and 4, the seed planting discs 33 are ground driven by means of a power train which includes sprockets 51, 51' on wheels 16, 16' connected by endless drive chains 52, 52' to sprockets 53, 53' secured for rotation to a shaft 54. A sprocket 56 on the shaft 54 drives a parallel shaft 57 by means of an endless drive chain 58 in power transmitting relation to sprocket 56 and a sprocket 59 on the shaft 57. A third shaft 61 is parallel to shafts 54, 57 and is driven by shaft 57 by means of a sprocket 62 secured for rotation with shaft 57, a sprocket 64 connected for rotation with shaft 61 and a chain 63 operatively interconnecting the sprockets 62, 64. A sprocket 66 is provided on shaft 61 for each of the planter units 23 and each sprocket 66 is connected to a sprocket 68 on the associated planter unit 23 by a drive chain 69.

The sprocket 68 is nonrotatably connected to a shaft 71 to which a sprocket 72 is also nonrotatably connected. The sprocket 72 drives the disc 33 by means of a chain 73 and a sprocket 74, the latter being secured for rotation with a shaft 76 to which the disc 33 is secured by releaseable fastening means in the form of a nut 77. The shaft 76 is mounted in the housing 36 by a suitable bearing 78 and includes an enlarged radial flange 79 in axially abutting relation to the disc 33.

As shown in FIGS. 3, 4, 5, 7 and 8, the housing 36 includes a cavity 81 into which seeds from the bulk seed hopper 37 flow by gravity by way of a downwardly extending seed passage 82 which is formed by walls in the housing 36. The upper lip 84 of a bottom opening 83 in passage 82 tends to regulate the height to which the grain will flow into the cavity 81. Pressurized air is delivered by blower 41 by way of the conduit 43 to the upper end 92 of an air delivery passageway 91 of the housing 36. The upper end 92 of the passageway 91 has a tubular configuration suitable for fastening to the conduit 43 by a band-type fastening member 93. As shown in FIGS. 5, 6, 8 and 9, the air delivery passageway 91 extends downwardly terminating in an opening 96 at the forward side of the cavity in which seed is deposited through the passage 82 from the seed hopper 37.

Referring again to FIG. 3, the side land shoes 32, 32' are interconnected by a bridging brace 151 welded at its transversely opposite ends to the confronting sides of the plates 32, 32' and the assembly thus formed is held in place on the housing 36 by releaseable fastening means in the form of a bolt 152 extending through opening 153 in the housing 36 and a nut 154 disposed in a rectangular shaped window 156 in the housing 36 and in threaded engagement with the bolt 152.

Referring to FIGS. 10, 11, 12, 13 and 14, the construction of a corn planting disc 33 of the present invention is illustrated. The disc 33 is constructed of a relatively stiff flexible plastic material with radial ribs 101 to provide rigidity and strength for the central portion of the disc. The radially outer portion of the disc is somewhat more flexible to permit deflection of the disc from its slightly cupped shape as shown in FIG. 11 to a flattened installed condition as shown in FIG. 4 wherein the radially outer portion of the flat surface 102 confronting the housing 36 is in sealing engagement with a flat axially facing sealing surface 103. In other words, the axial surface 102 changes from a concave noninstalled condition to a substantially flat condition when installed in a planter. When installed, as shown in FIG. 4, the disc acts like a belleville washer to provide an axial force to insure sealing engagement between the axial facing radially outer portion of surface 102 (disposed radially outwardly of the pockets 107) and the complementary flat sealing surface 103 of the housing. The radially outer portion of the disc 33 includes walls defining a plurality of circumferentially spaced seed pockets 107 on the axial side of the disc which confronts the cavity 81. An annular sealing area 106 is provided by surface 102 radially inwardly from the seed pockets 107 which cooperates with a complementary sealing surface 108 formed on the housing in the area adjacent where the seed drops from the disc.

As shown in FIGS. 13 and 14, the seed pockets 107 each include a steep side surface 115 at its trailing edge which is nearly perpendicular to the disc 33 and a gradually sloping surface 109 at its leading edge. Each of the pockets is perforated through provision of an axial opening 110 which is smaller than the corn seed to be planted. The radially opposite sides 151, 152 of each pocket are disposed at acute angles *b* and *c* to the direction of rotation whereby the sides serve to cam seed in the pocket toward the opening 110 as the pocket moves through the seed in cavity 81. In other words, the sides 151, 152 of the pocket 107 diverge in the direction of rotation of the disc. For corn seed, it has been found desirable to provide seed loading assistance ramps or camming grooves 111 which extend circumferentially in the direction of rotation and radially inwardly from the pockets 107. As shown in FIG. 14, the seed camming grooves 111 are tapered to increasing depth when moving from leading to trailing sides thereof. Stated differently, the grooves 111 taper to decreasing depth in the direction of rotation of the disc. As shown in FIG. 10, the disc rotates in a clockwise direction and the camming grooves 111 are in leading relation to the pockets 107 thereby tending to cam the kernels of corn radially outwardly into the pockets 107 as the disc rotates the pockets and ramps upwardly through the seed corn deposited in the cavity 81.

FIGS. 15, 16, 17 and 18 illustrate a second embodiment of the present invention in the form of a seed planting disc 133 for soybeans. It will be noted that four concentric circular rows of circumferentially spaced pockets 207 are provided. These pockets 207 are similar in shape to those for the corn planting plates illustrated in FIGS. 10 through 13; however, they do not have the camming grooves 111 and their shape is slightly different. Specifically it will be noted that the radially opposite sides 161, 162 of pocket 207 define an acute angle *d* whereas the sides 151, 152 of pocket 107 defines an obtuse angle *e* between 90 and 120 degrees. The alignment and spacing of the pockets 207 in soybean disc 133 is such that the seeds drop into the soil in spaced relation to one another in the direction of travel.

OPERATION

Referring to FIGS. 3 and 4, as the corn seed planting disc 33 rotates, the pockets pass upwardly by the seed cavity 81 which is disposed at about the 4 o'clock position as viewed in FIG. 3. As each pocket moves by the edge of the bulk seed in the cavity, a kernel of corn is induced to move into the pocket by air flowing from the pressurized cavity 81 to atmosphere by way of the opening 110 in each pocket 107. The trailing surface 115 of the pocket 107 being nearly horizontal, at this point

of rotation of the disc, provides a shelf to support the seed kernel as the pocket moves upwardly.

As the disc continues its counterclockwise rotation, as viewed in FIG. 3, each pocket will move adjacent a flexible pad 121, at about the 1 o'clock position, which serves to retain the single kernel of seed in the pocket until the trailing edge 122 of the pad 121 is passed, at about the 8 o'clock position, at which point the seed drops into the furrow opened by discs 31, 31' and held open by vertically disposed shoes 32, 32' of furrow opener structure 30. The arcuate resilient pad 121 is made of suitable flexible plastic material of uniform thickness with an outer layer of tough plastic presenting a flat surface 123 confronting the pockets 197. As shown in FIG. 3, the pad 121 is fastened to the housing by a pair of screws 126 threadedly engaging drilled and tapped openings 127 (shown in FIG. 5). As shown in FIG. 4 the resilient pad 121 has been compressed to a reduced thickness. The pad serves to seal the cavity 81 by its engagement with the disc 33 between the housing sealing surfaces 103 and 108. The bottom of the cavity 81 is closed by sealing engagement between the disc 33 and an axially facing sealing surface 137 on flange 136 extending radially inward from sealing surface 103 to sealing surface 108. Actually the sealing surfaces 103, 137 and 108 are continuous and lie in the same vertical plane.

In the event a kernel of seed is lodged or stuck in the pocket 107, a slanting seed dislodging edge 131 on spur flange 132 will serve to cam the seed loose if a portion thereof extends from the pocket 107. The loosened seed will have time to drop as the pocket 107 moves from the spur flange 132 to the sealing flange 136. The seed dislodging edge intersects the circle 138 in which the pockets rotate about the axis 176 of shaft 76 at an acute angle "*a*". FIG. 4 shows the stuck seed moving into engagement with the seed dislodging edge 131.

During operation, the disc 33 serves as a side wall closure for the cavity 81 on one axial side thereof through its sealing contact with the surface 123 of the pad 121 and the sealing surfaces 103, 137 and 108 on the housing 36. It will be noted on reference to FIGS. 5 and 8, that walls 141, 142 and flange 132 form an open seed drop portion at the bottom of the housing 36 which is not pressurized and through which the seeds drop into the furrow.

During planting operation each pocket 107 moves in a circular path upwardly alongside the seed containing cavity 81 disposed in the lower rear of the housing. The pocket 107 thence moves upwardly past the seed containing part of pressurized cavity 81 into an upper chamber 181 of the cavity where any kernels of seed in excess of one have an opportunity to drop out of the pocket before the pocket moves into confronting relation with the sealing surface 123 of pad 121.

It is relatively easy to change from a corn planting disc 33 to a soybean planting disc 133, because the disc can be removed axially from the housing and shaft 76 upon removal of the releaseable fastening member in the form of nut 77. The vertically disposed shoes 32, 32' need not be removed. After the disc 33 is shifted axially to the left, as viewed in FIG. 4, sufficiently to move it off the pilot portion 143 of the shaft 76, it may be tilted axially outward at its top and lifted upwardly and outwardly.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A seed disc for an air planter having means to rotatably drive said disc, a seed cavity and a seed drop portion, said seed disc comprising:

a relatively rigid central portion adapted for connection to said drive means whereby said disc is rotated about its axis in one direction of rotation when said planter is engaged in a planting operation, said axis being substantially horizontal and transverse to the direction of travel of said planter during the planting operation, and

a radially outer portion having

walls defining a plurality of circumferentially spaced pockets in one axial side of said disc, each of said pockets having

an axially extending surface defining a shelf at the trailing edge of said pocket operable to assist in supporting a kernel of seed in said pocket as said disc is rotated in said one direction to move said pocket in an upward arc,

a gently sloping surface from the bottom to the leading edge of said pocket facilitating movement of a kernel of seed into said pocket as said pocket communicates with said seed cavity during rotation of said disc in said one direction and facilitating dropping of said kernel of seed from said pocket when said pocket moves in a downward arc through said seed drop portion, and

a small opening between the bottom of said pocket and the other axial side of said disc, said opening being sufficiently small to prevent passage therethrough of kernels being planted and

walls defining a camming groove extending circumferentially in said one direction of rotation of said disc and radially inwardly from each pocket whereby said camming groove urges seed radially outwardly toward its associated pocket as said disc is rotated through a quantity of bulk seed.

2. The seed disc of claim 1 wherein said camming grooves taper to decreasing depth in said one direction of rotation of said disc.

3. The seed disc of claim 1 wherein said pockets are circumferentially spaced from one another in a plurality of concentric circular rows of different radii.

4. The seed disc of claim 1 and further comprising axially facing annular sealing surface areas on said one side of said disc on radially opposite sides of said pockets.

5. The seed disc of claim 1 wherein said outer portion is resiliently flexible in an axial direction.

6. The seed disc of claim 5 wherein said seed disc is slightly cupped in its noninstalled condition whereby said one side is concave.

* * * * *

United States Patent [19]

Adams et al.

[11] **4,074,830**

[45] **Feb. 21, 1978**

[54] COMPRESSED AIR SEED PLANTER

[75] Inventors: **Charles E. Adams**, Mill Creek; **Harold E. Quackenbush**, La Porte; **Paul H. Harrer**, La Porte; **Le Roy Langford**, La Porte, all of Ind.; **Alvin L. Cleek**, Wauwatosa, Wis.

[73] Assignee: **Allis-Chalmers Corporation**, Milwaukee, Wis.

[21] Appl. No.: **508,672**

[22] Filed: **Sept. 23, 1974**

[51] **Int. Cl.**[2] **A01C 7/04**

[52] **U.S. Cl.** **221/266**; 111/77; 221/278

[58] **Field of Search** 221/211, 266, 278; 111/77, 78

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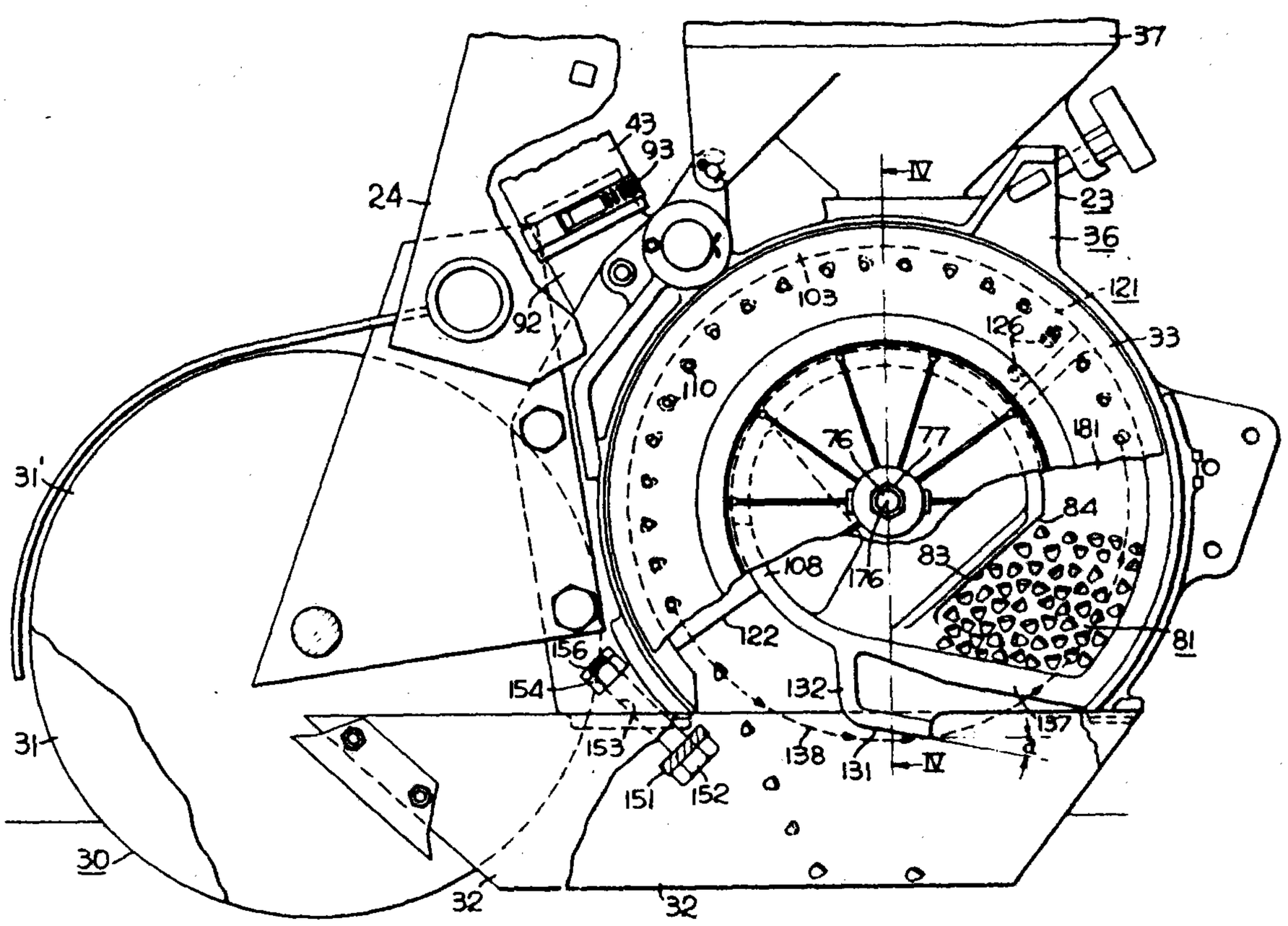
Primary Examiner—Robert B. Reeves
Assistant Examiner—Francis J. Bartuska
Attorney, Agent, or Firm—Charles L. Schwab

[57] **ABSTRACT**

A rotating disc has perforated seed pockets which pick up individual kernels of seed from a cavity of a planter housing. Bulk seed flows by gravity from a hopper to the cavity which is pressurized by a blower. As the disc rotates through the cavity, air flowing through the perforated pockets will move the seeds into the pockets and hold them there as the disc rotates to bring the seed carrying pockets into axially confronting relation with a flat sealing surface. The flat sealing surface holds the seed in the pockets as the disc rotates further to a position wherein the pockets are exposed to an open bottom area of the housing at which point the seeds are free to fall by gravity into the soil.

1 Claim, 18 Drawing Figures



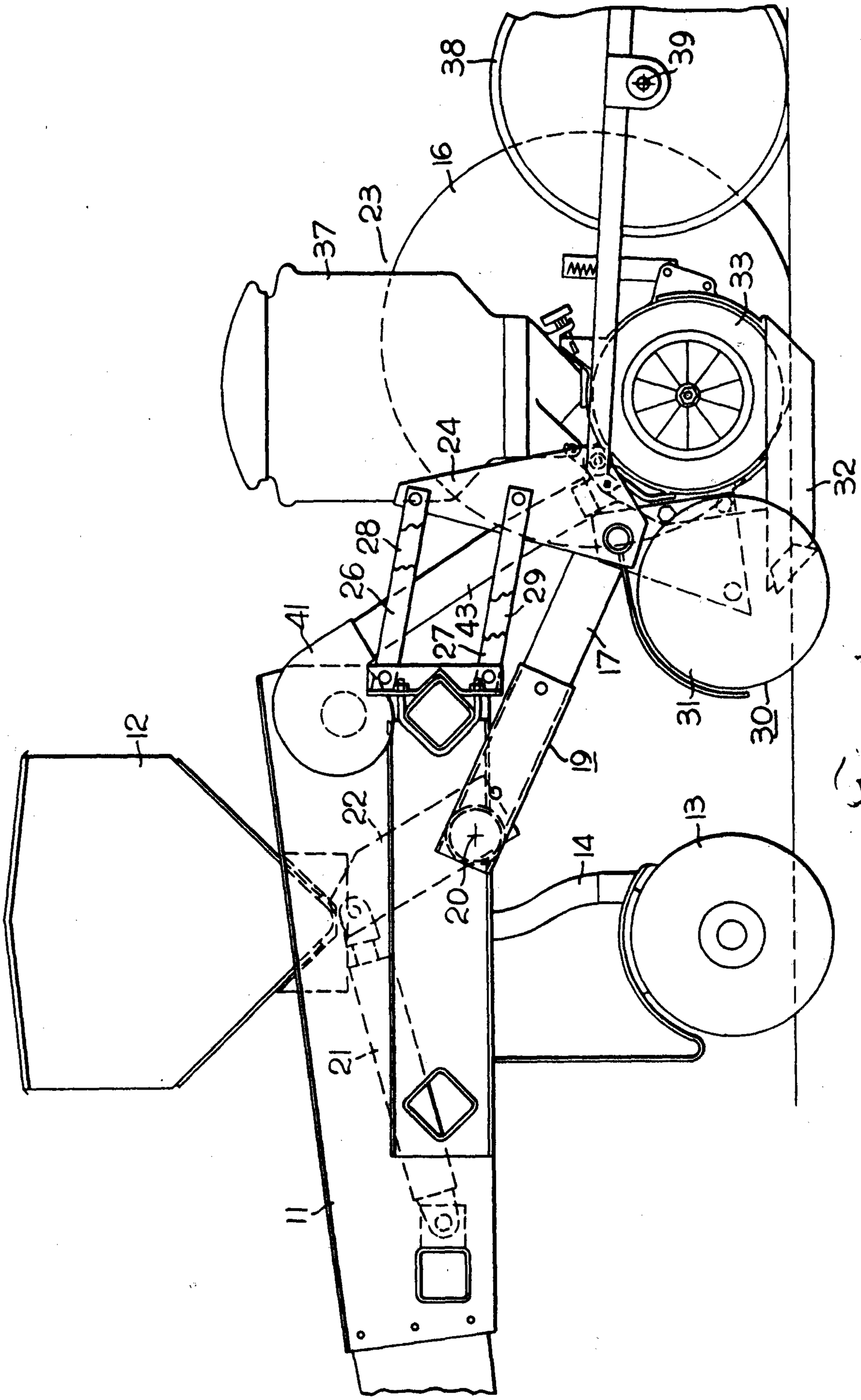

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Fig. 1

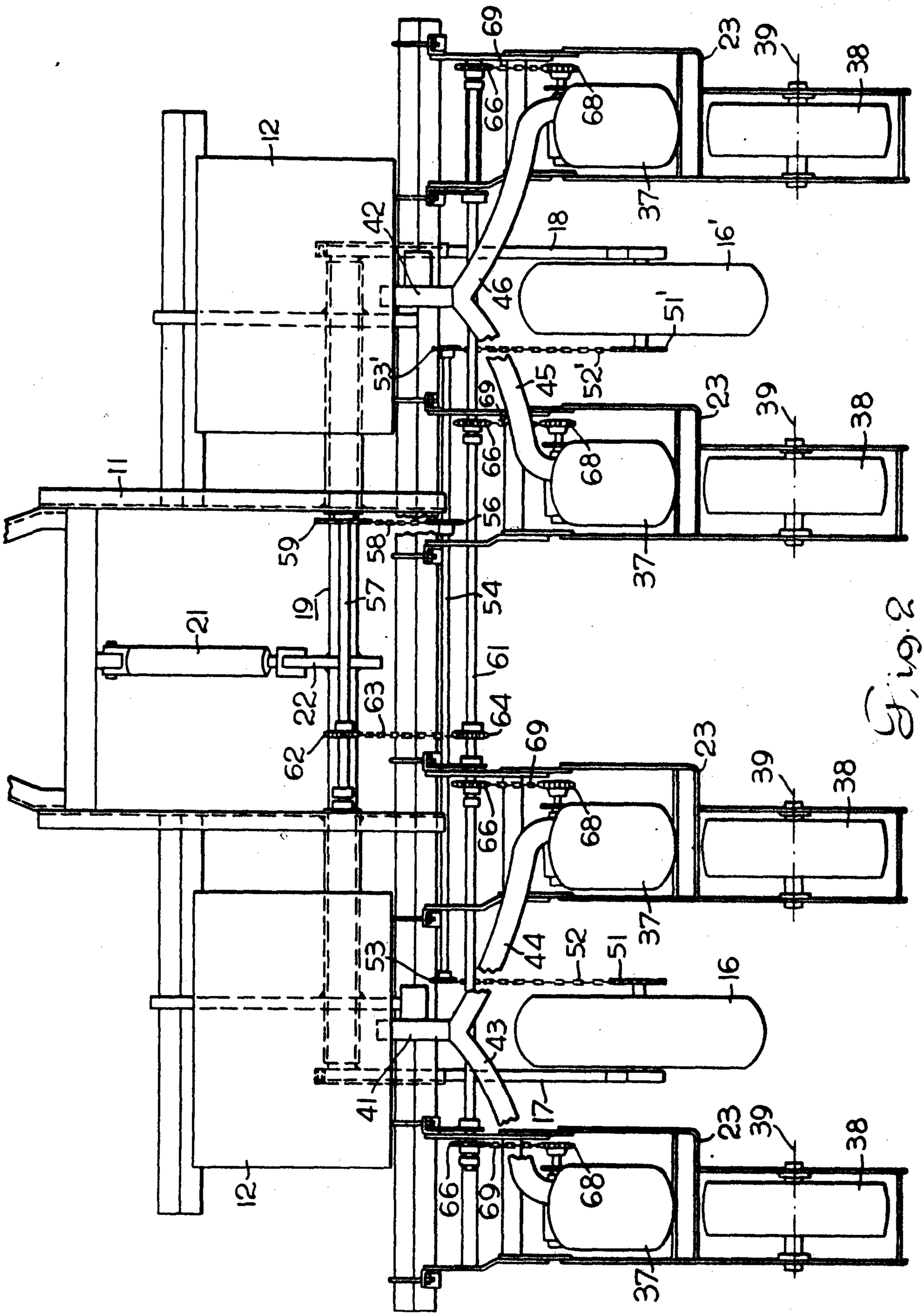
69
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Fig. 2

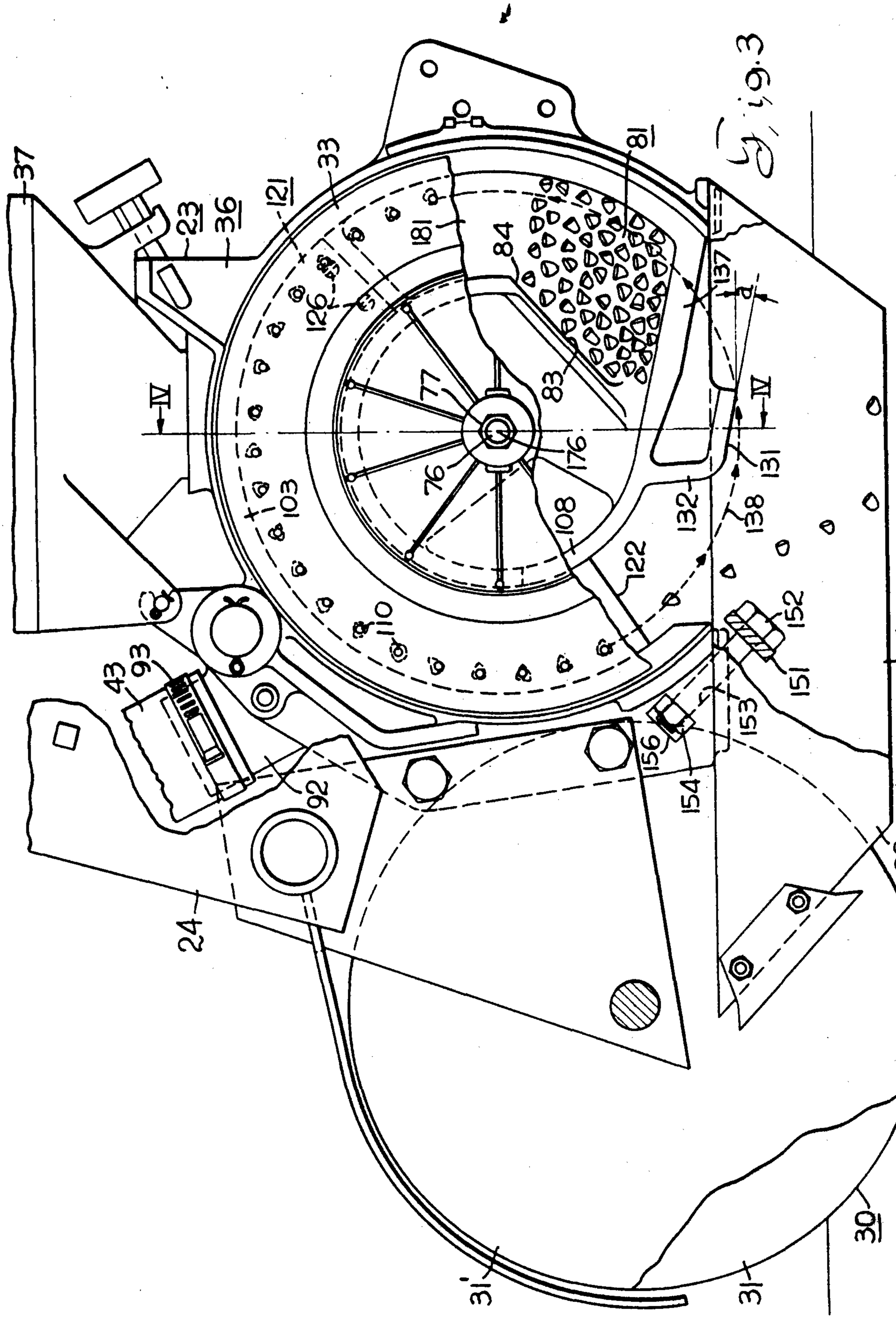
Fig. 3
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23
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d
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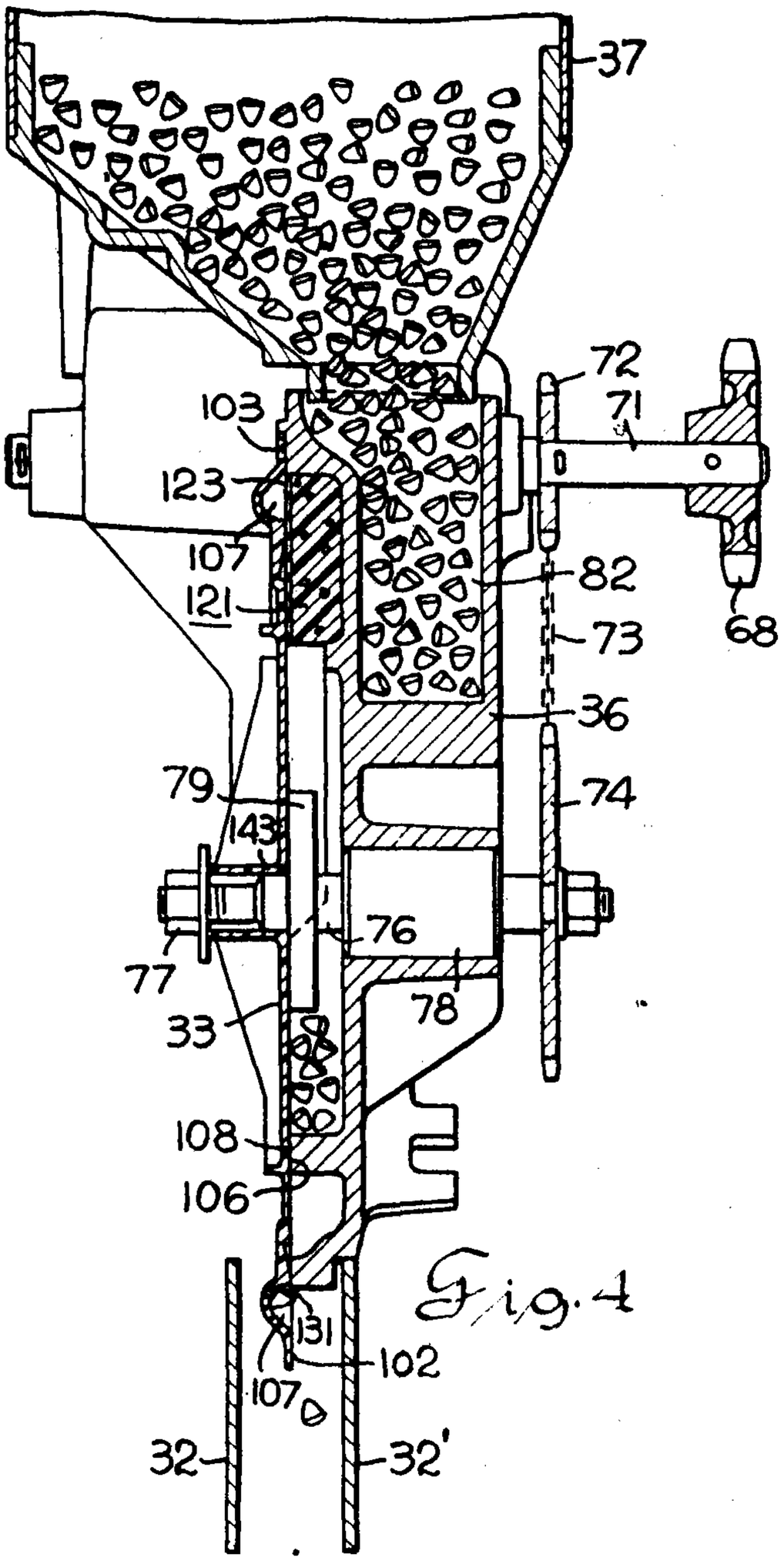
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103
123
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108
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131
102
107
32
32'

Fig. 4

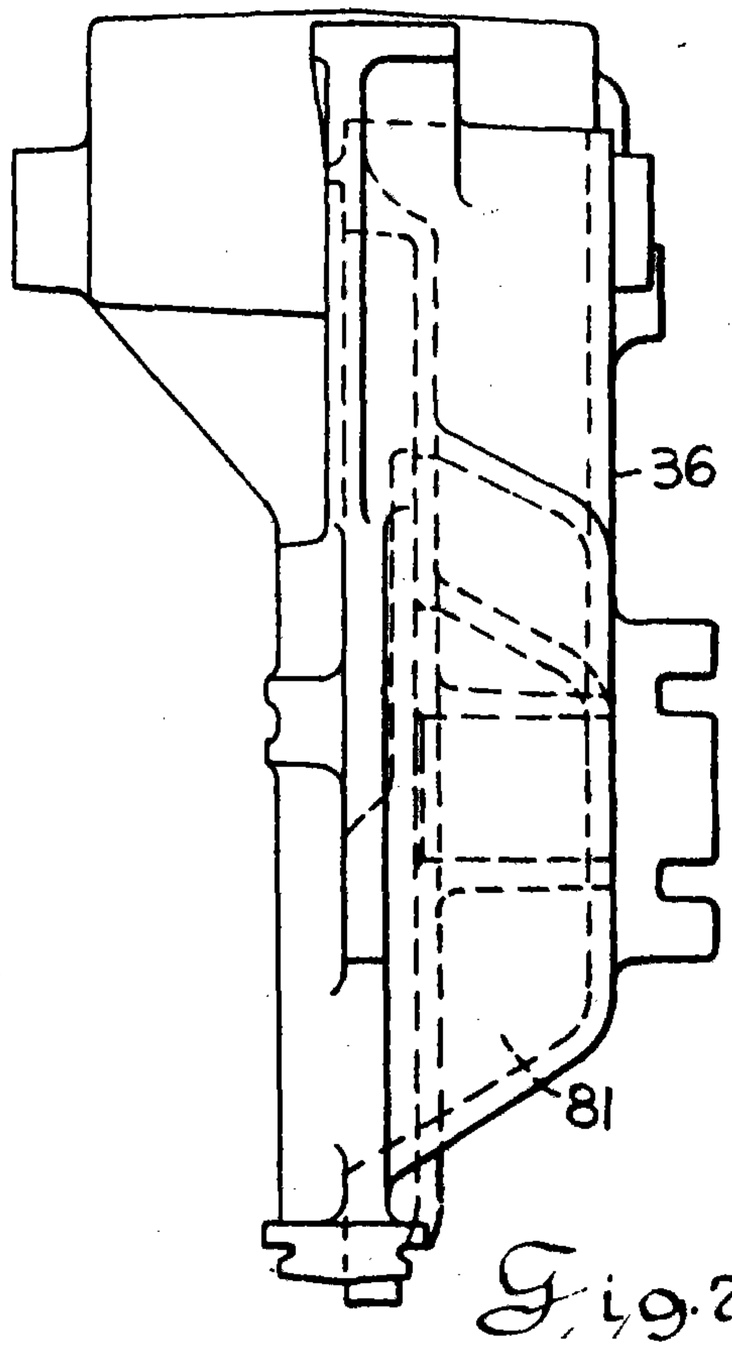
36
81

Fig. 7

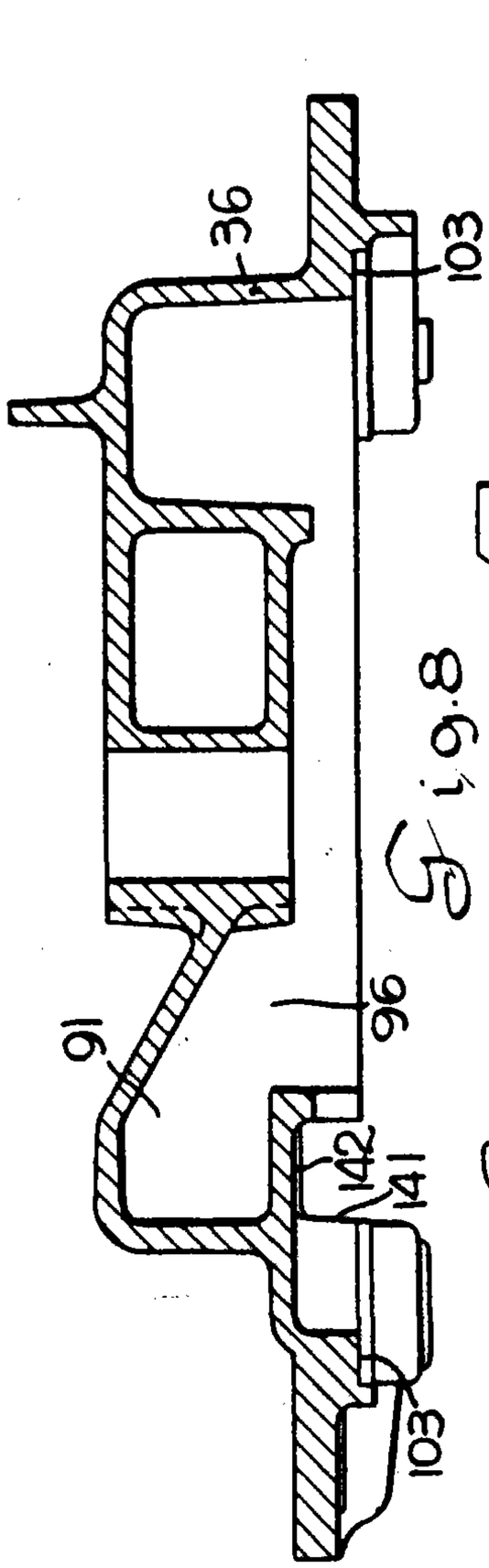

Fig. 8

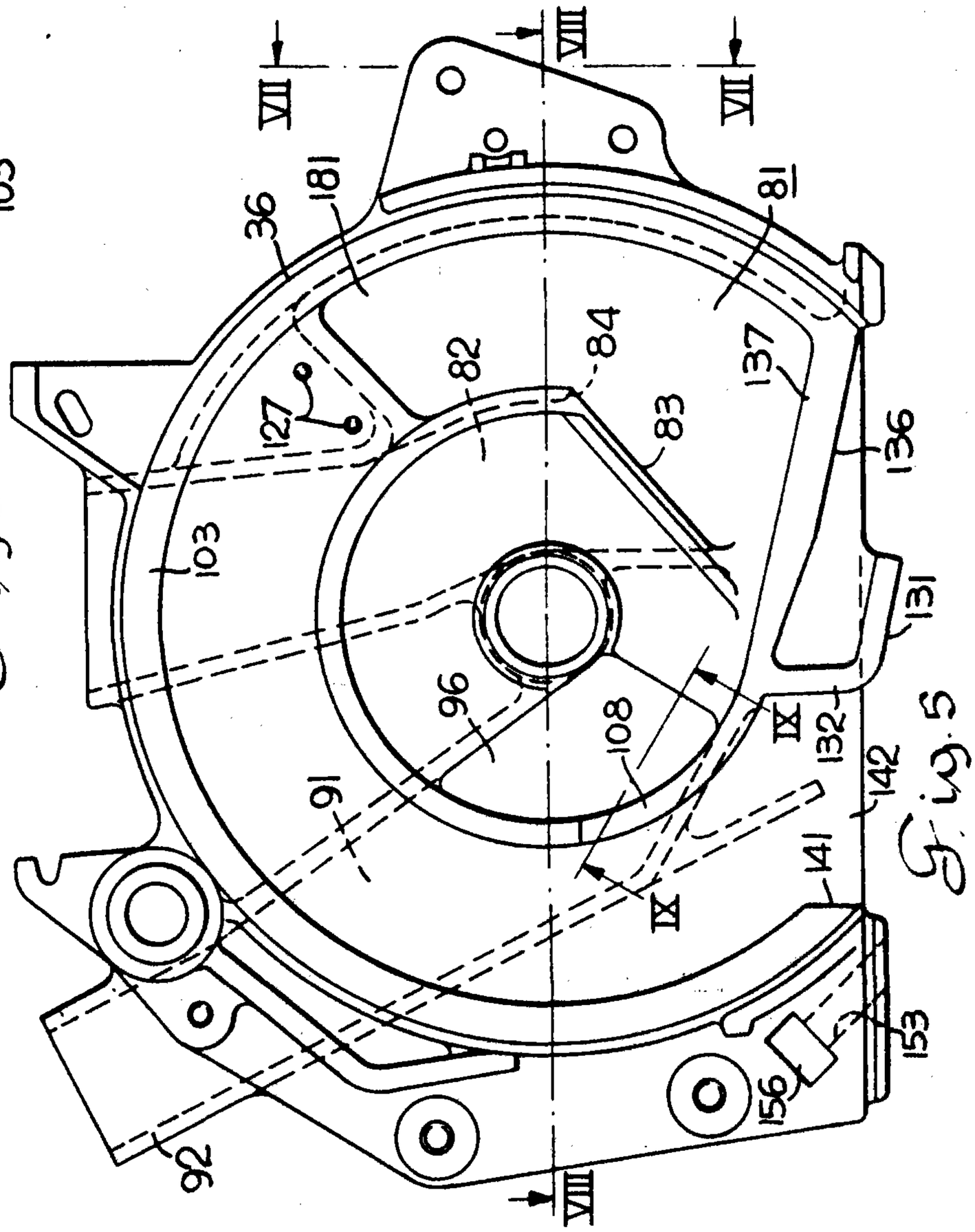

Fig. 5

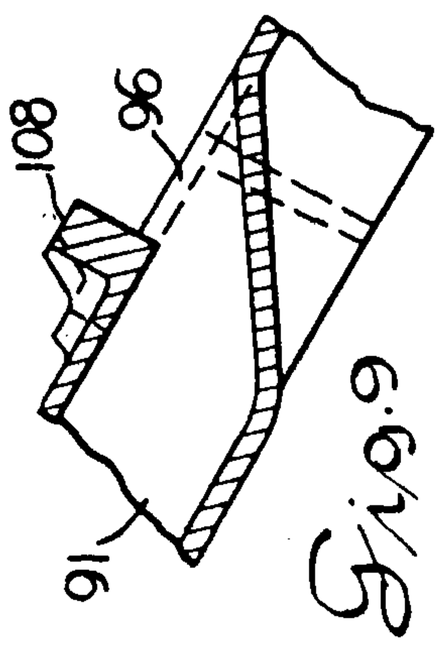

Fig. 6

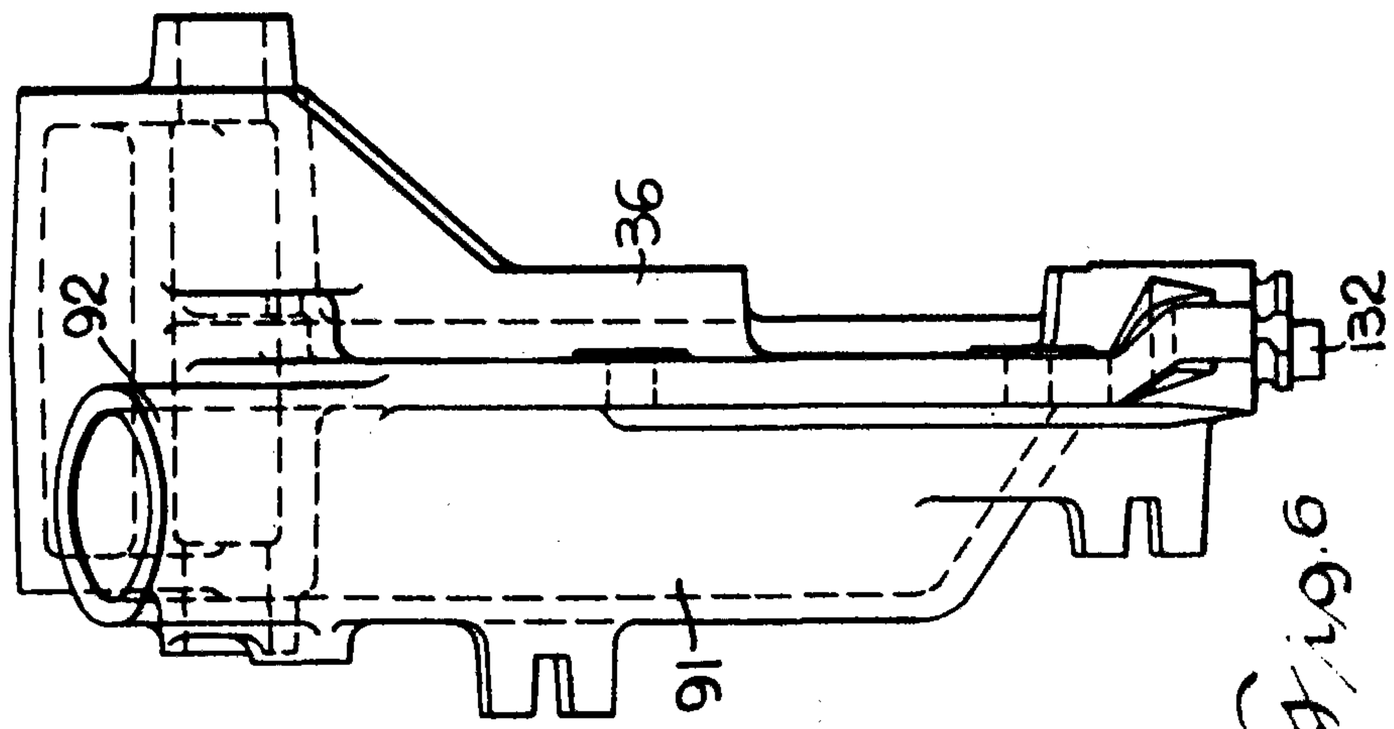

Fig. 9

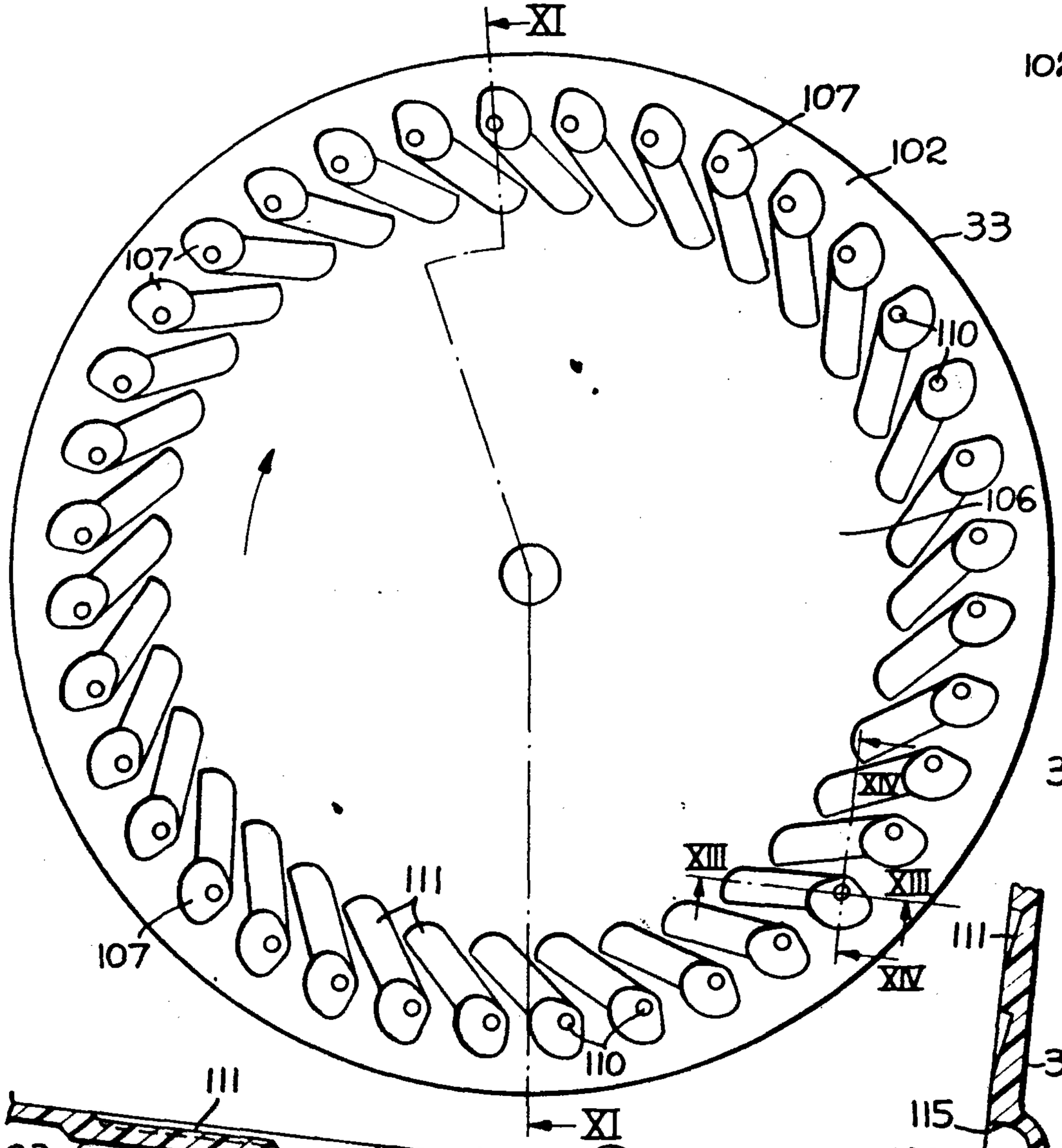

Fig.-10

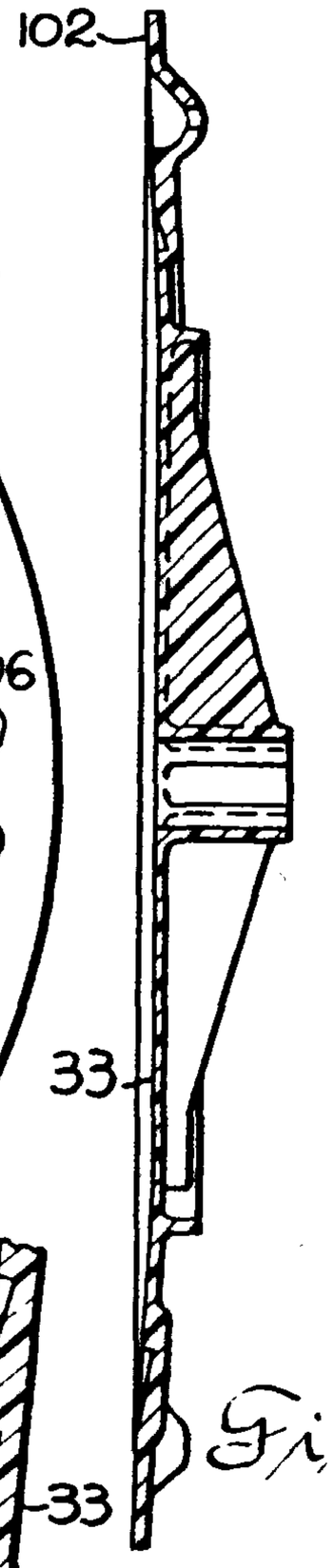

Fig.-11

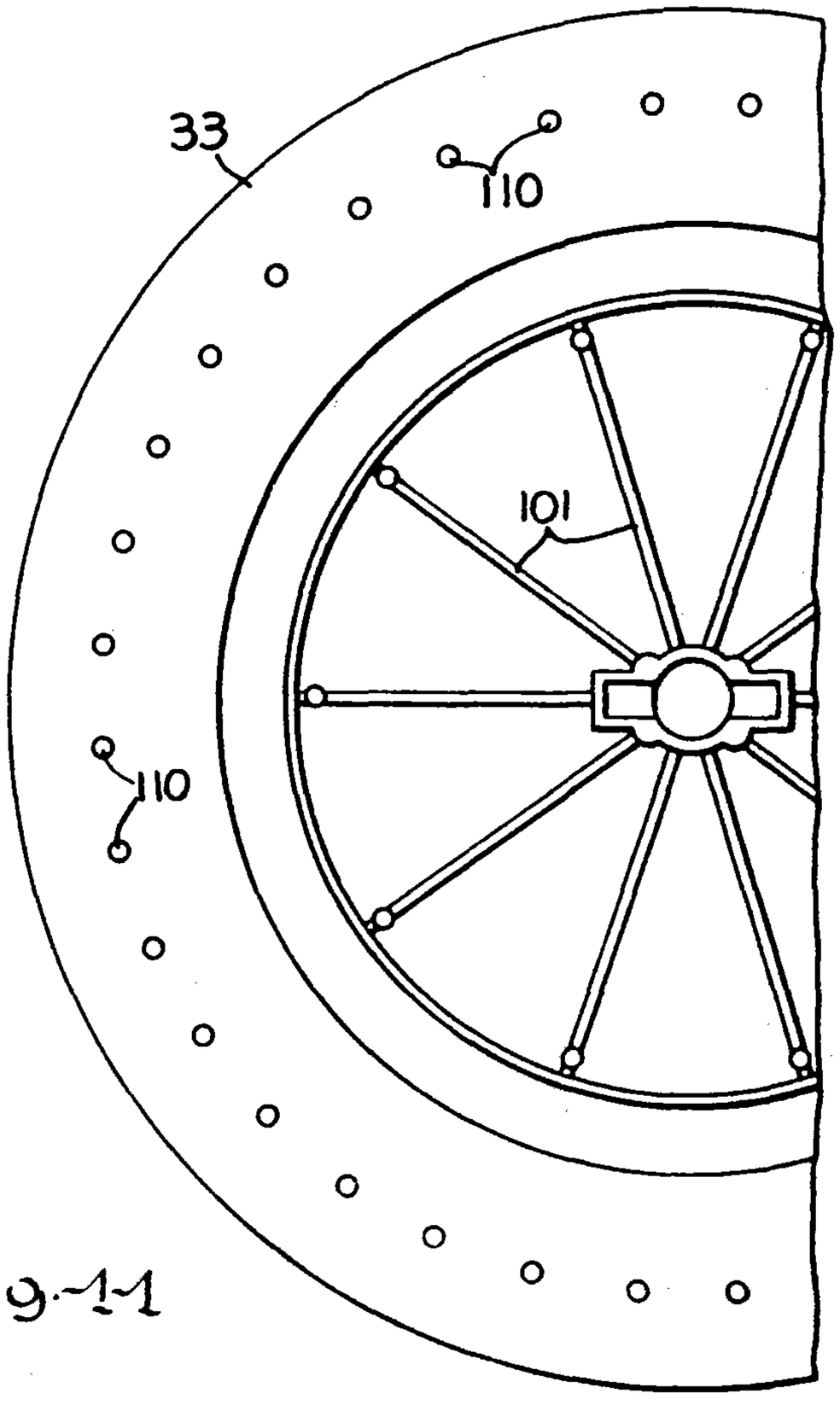

Fig.-12

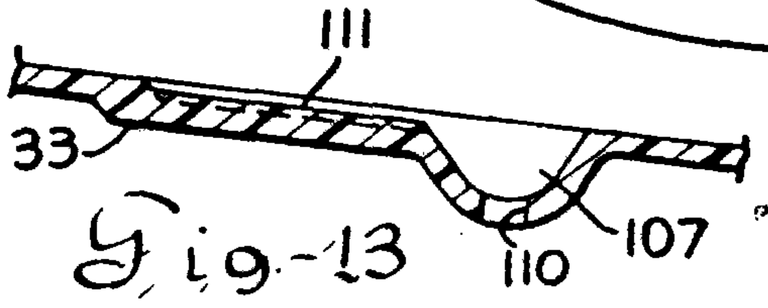

Fig.-13

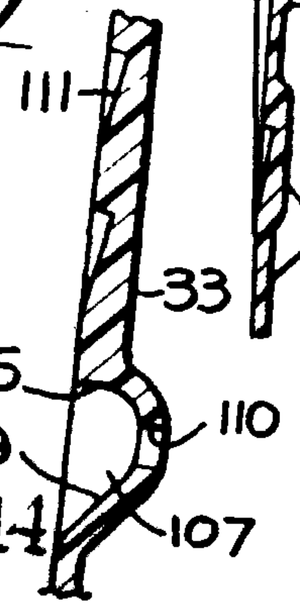

Fig.-14

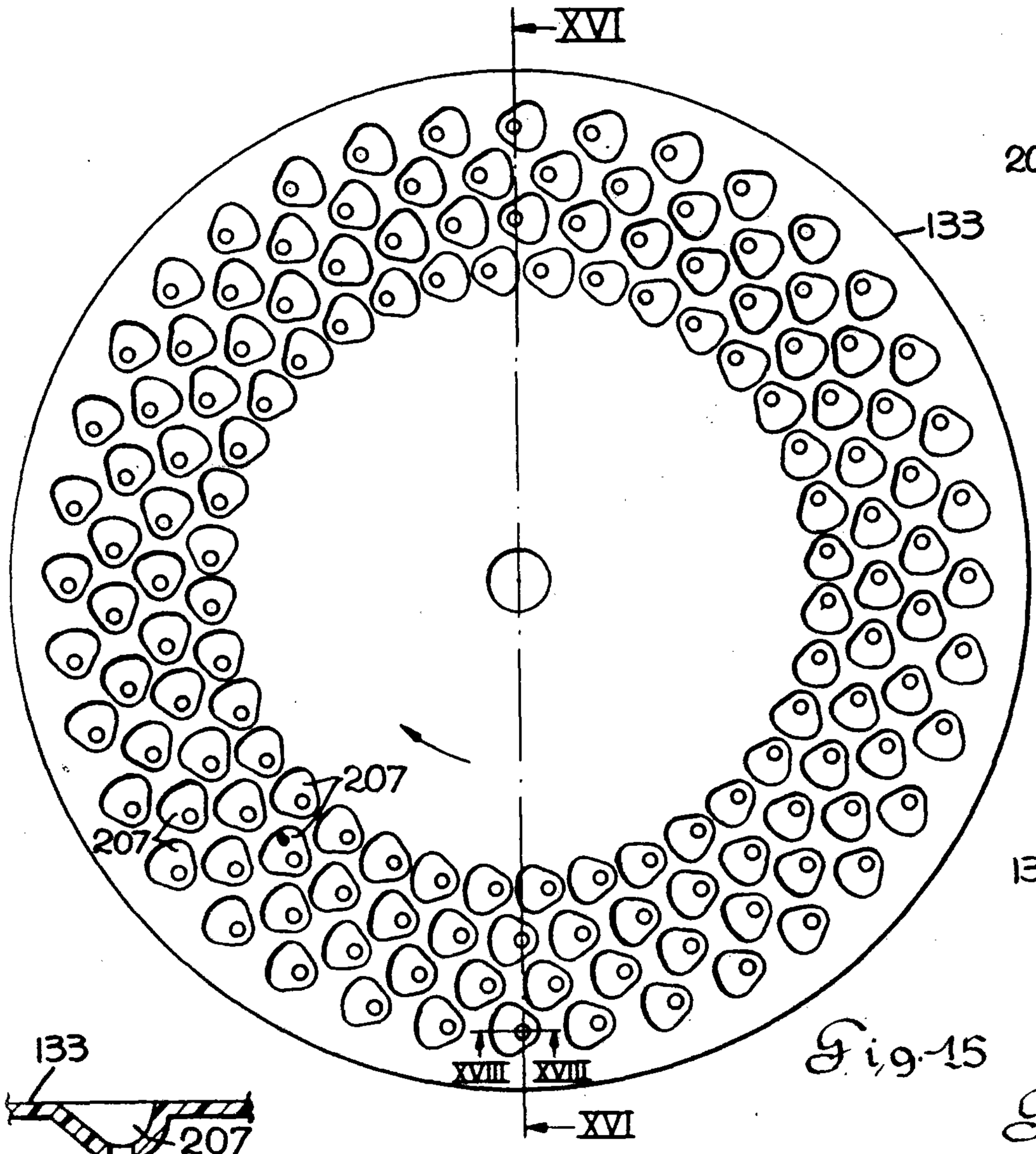

Fig.-15

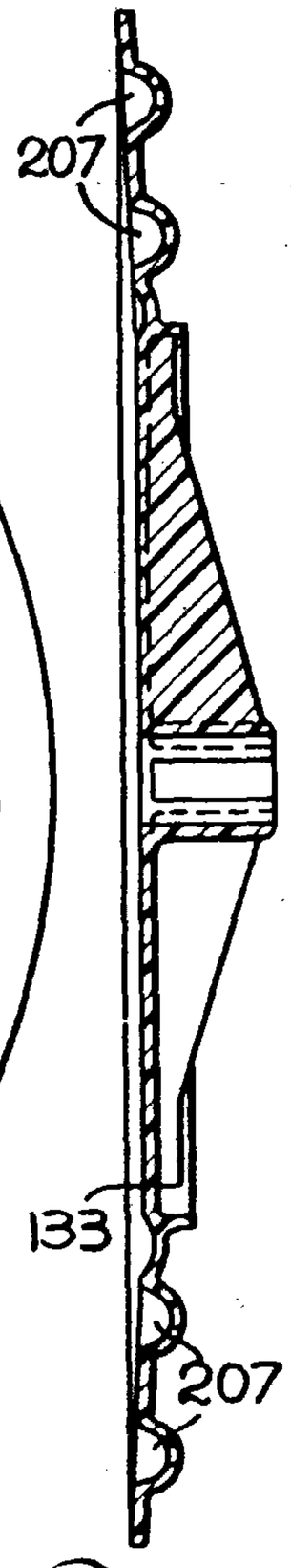

Fig.-16

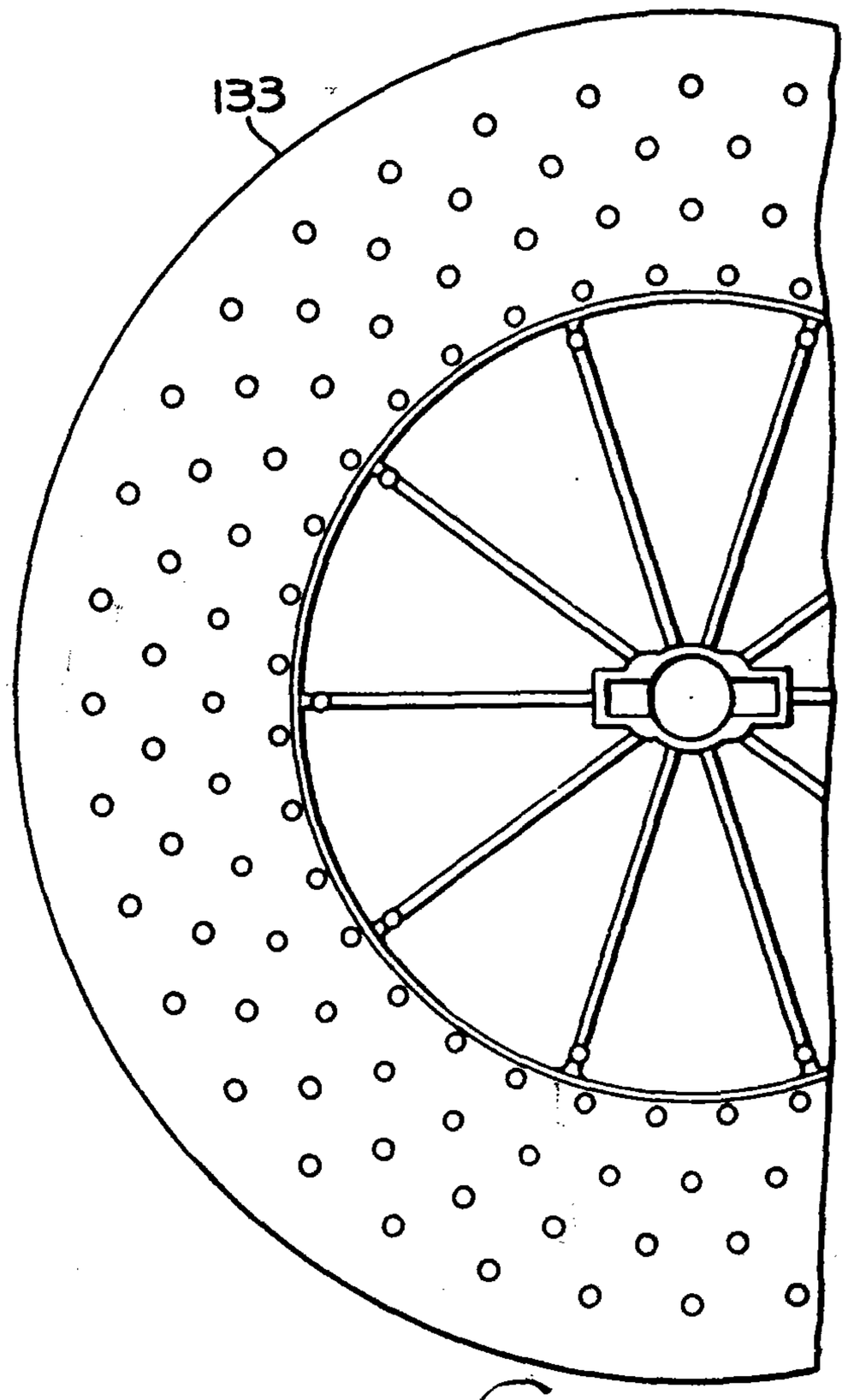

Fig.-17

Fig.-18

COMPRESSED AIR SEED PLANTER

RELATED APPLICATIONS

A seed planting disc for the air planter of this invention is shown and claimed in a copending U.S. patent application of Paul H. Harrer and LeRoy Langford for Seed Disc for an Air Planter.

BACKGROUND OF THE INVENTION

The use of air pressure or vacuum to induce separation of kernels of grain from a bulk quantity has been suggested in U.S. Pat. Nos. 792,958; 1,006,984; 1,046,199; 1,331,235; 1,762,671; 2,031,713; 2,384,820; 2,479,534; 2,525,718; 2,605,017; 2,737,314; 2,960,258; 2,986,305; 2,991,909; 2,995,274; 3,100,462; 3,133,676; 3,142,274; 3,156,201; 3,240,175; 3,322,080; 3,380,626; 3,387,746; 3,412,908; 3,434,437; 3,542,242; 3,608,787; 3,637,108; 3,680,373; 3,698,332; 3,721,842; 3,762,603 and 3,788,518 and British patent 802,899.

BRIEF SUMMARY OF THE INVENTION

Flowing air is used to trap the seeds in perforated pockets in a vertically disposed disc as the disc rotates by a housing cavity containing seed. After being picked up in the pockets, the seeds are kept in the pockets by a resilient pad with a flat surface engaging the disc as the latter rotates the seed carrying pockets out of the cavity. The seed carrying pockets then pass to an open area at the bottom of the housing where they fall directly into the soil without the aid of air pressure or mechanical devices. Seeds flow by gravity into the housing cavity and the cavity is pressurized by a suitable air blower. As the disc rotates the pockets pass upwardly beside the cavity and are exposed to the seeds therein. The air passing from the cavity by way of the perforated pockets induces the seeds to be drawn into the pockets and the seeds are held in the pockets by the pressure differential between the cavity and the atmosphere.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is illustrated in a series of drawings wherein:

FIG. 1 is a side view of a planter incorporating the present invention;

FIG. 2 is a top view of the planter shown in FIG. 1;

FIG. 3 is an enlarged side view of one planter unit of the planter shown in FIG. 1;

FIG. 4 is a section view taken along line IV—IV in FIG. 3;

FIG. 5 is a side view of the housing part of the planter unit of the present invention;

FIG. 6 is a front view of the housing shown in FIG. 5;

FIG. 7 is a rear view of the housing shown in FIG. 5;

FIG. 8 is a section view taken along the lines VIII—VIII in FIG. 5;

FIG. 9 is a section view taken along the lines IX—IX in FIG. 5;

FIG. 10 is a side view of a corn planting disc usable in the present invention;

FIG. 11 is a section view taken along the lines XI—XI in FIG. 10;

FIG. 12 is a side view of the corn planting disc from the opposite side as FIG. 10;

FIG. 13 is a section view taken along the lines XIII—XIII in FIG. 10;

FIG. 14 is a section view taken along the lines XIV—XIV in FIG. 10;

FIG. 15 is a side view of a soybean planting disc usable in the present invention;

FIG. 16 is a section view taken along the lines XVI—XVI in FIG. 15;

FIG. 17 is a side view of the soybean planting disc shown as seen from the opposite side from FIG. 15; and

FIG. 18 is a section view taken along the lines XVIII—XVIII in FIG. 15.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring to FIGS. 1, 2 and 3, the planter includes a main frame 11 on which a fertilizer hopper 12 is disposed which deposits fertilizer behind the furrow opener 13 by way of a tube 14. The furrow openers 13 are shown in FIG. 2 and form no part of the present invention. Wheels 16, 16' are rotatably mounted on ends of legs 17, 18 of a lift frame 19 which is pivotably positioned about an axis 20 by a hydraulic ram 21 interconnected between the frame 11 and an arm 22 of the lift frame 19. The wheels 16 not only support the planter, but also, on expansion of ram 21, raise planting units 23 out of their planting position in which is illustrated. A planting unit subframe 24 is connected to main frame 11 by substantially parallel links 26, 27, 28, 29. A suitable disc-type furrow opener structure 30 is provided for the planting unit 23 and includes a pair of disc 31, 31' and a pair of transversely spaced runners or shoes 32, 32'. The shoes have their longitudinally central portions disposed on opposite sides of a seed planting disc 33 and converge at their front ends which carry scrapers for the inner, confronting sides of disc 31, 31'. The subframe 24 carries a housing 36 and a seed hopper 37. A press wheel 38 is mounted in trailing relation to the subframe 24 on a transverse axis 39 and serves to close the seed planting furrow to cover the seed. A pair of blowers 41, 42 mounted on frame 11 supply air to the housing 36 by way of suitable conduits 43, 44, 45, 46.

As shown in FIGS. 2 and 4, the seed planting discs 33 are ground driven by means of a power train which includes sprockets 51, 51' on wheels 16, 16' connected by endless drive chains 52, 52' to sprockets 53, 53' secured for rotation to a shaft 54. A sprocket 56 on the shaft 54 drives a parallel shaft 57 by means of an endless drive chain 58 in power transmitting relation to sprockets 56 and a sprocket 59 on the shaft 57. A third shaft 61 is parallel to shafts 54, 57 and is driven by shaft 57 by means of a sprocket 62 secured for rotation with shaft 57, a sprocket 64 connected for rotation with shaft 61 and a chain 63 operatively interconnecting the sprockets 62, 64. A sprocket 66 is provided on shaft 61 for each of the planter units 23 and each sprocket 66 is connected to a sprocket 68 on the associated planter unit 23 by a drive chain 69.

The sprocket 68 is nonrotatably connected to a shaft 71 to which a sprocket 72 is also nonrotatably connected. The sprocket 72 drives the disc 33 by means of a chain 73 and a sprocket 74, the latter being secured for rotation with a shaft 76 to which the disc 33 is secured by releasable fastening means in the form of a nut 77. The shaft 76 is mounted in the housing 36 by a suitable bearing 78 and includes an enlarged radial flange 79 in axially abutting relation to the disc 33.

As shown in FIGS. 3, 4, 5, 7 and 8, the housing 36 includes a cavity 81 into which seeds from the bulk seed hopper 37 flow by gravity by way of a downwardly

extending seed passage 82 which is formed by walls in the housing 36. The upper lip 84 of a bottom opening 83 in passage 82 tends to regulate the height to which the grain will flow into the cavity 81. Pressurized air is delivered by blower 41 by way of the conduit 43 to the upper end 92 of an air delivery passageway 91 has a tubular configuration suitable for fastening to the conduit 43 by a band-type fastening member 93. As shown in FIGS. 5, 6, 8 and 9, the air delivery passageway 91 extends downwardly terminating in an opening 96 at the forward side of the cavity in which seed is deposited through the passage 82 from the seed hopper 37.

Referring again to FIG. 3, the side land shoes 32, 32' are interconnected by a bridging brace 151 welded at its transversely opposite ends to the confronting sides of the plates 32, 32' and the assembly thus formed is held in place on the housing 36 by releasable fastening means in the form of a bolt 152 extending through opening 153 in the housing 36 and a nut 154 disposed in a rectangular shaped window 156 in the housing 36 and in threaded engagement with the bolt 152.

Referring to FIGS. 10, 11, 12, 13 and 14, the construction of a corn planting disc 33 is illustrated. The disc 33 is constructed of a relatively stiff flexible plastic material with radial ribs 101 to provide rigidity and strength for the central part of the disc. The radially outer part of the disc is somewhat more flexible to permit deflection of the disc from its slightly cupped shape as shown in FIG. 11 to a flatened installed condition as shown in FIG. 4 wherein the radially outer portion of the flat surface 102 confronting the housing 36 is in sealing engagement with a flat axially facing sealing surface 103. When installed, as shown in FIG. 4, the disc acts like a belleville washer to provide an axial force to insure sealing engagement with the housing. A plurality of circumferentially spaced seed pockets 107 are formed in the plate 33 on the side thereof in confronting relation with the cavity 81. An annular sealing area 106 is provided by surface 102 radially inwardly from the seed pockets 107. This sealing area 106 cooperates with a complementary sealing surface 108 formed on the housing in the area adjacent where the seed drops from the disc.

As shown in FIGS. 13 and 14, the seed pockets 107 each include a trailing edge 115 which is nearly perpendicular to the disc 33 and a leading edge which presents a gradually sloping surface 109. Each of the pockets is perforated through provision of an axial opening 110. For corn seed, it has been found desirable to provide seed loading assistance ramps 111 which extend axially in the direction of rotation and radially inwardly from the pockets 107. The seed loading assistance ramps 111 are tapered to increasing depth when moving from leading to trailing sides thereof. As shown in FIG. 10, the disc rotates in a clockwise direction and the seed loading assistance ramps 111 are in leading relation to the pockets 107 thereby tending to cam the grains into the pockets 107 as the disc moves upwardly through the grain deposited in cavity 81.

Referring to FIGS. 15, 16, 17 and 18, a seed planting disc 133 for soybeans is illustrated. It will be noted that the four circumferential rows of pockets 207 are somewhat similar in shape to those for the corn planting plates illustrated in FIGS. 10 through 13, except they do not have the seed loading assistance ramps 111. The alignment and spacing of the pockets 207 in soybean disc 133 is such that the seeds drop into the soil in spaced relation to one another in the direction of travel.

OPERATION

Referring to FIGS. 3 and 4, as the seed planting disc 33 rotates, the pockets pass upwardly by the seed cavity 81, at about the 4 o'clock position as viewed in FIG. 3, where a kernel of corn is induced to move into each pocket by air flowing from the pressurized cavity 81 to atmosphere by way of the opening 110 in each pocket 107. The trailing edge 115 of the pocket 107 being nearly horizontal, provides a shelf to support the seed kernel as the pocket moves upwardly.

As the disc continues its rotation, each pocket will move adjacent a flexible pad 121, at about the 1 o'clock position, which serves to retain the single kernel of seed in the pocket until the trailing edge 122 of the pad 121 is passed, at about the 8 o'clock position, at which point the seed drops into the furrow opened by disc 31, 31' and held open by vertically disposed shoes 32, 32' of furrow opener structure 30. The arcuate pad 121 is made of suitable flexible plastic material of uniform thickness with a flat surface 123 confronting the pockets 107 which is provided by a layer of tough plastic having good wearing characteristics. As shown in FIG. 3, the pad 121 is fastened to the housing by a pair of screws 126 threadedly engaging drilled and tapped openings 127 (shown in FIG. 5). As shown in FIG. 4 the resilient pad 121 has been compressed to a reduced thickness. The pad serves to seal the cavity 81 by its engagement with the disc 33 between the housing sealing surfaces 103 and 108. The bottom of the cavity 81 is closed by sealing engagement between the disc 33 and an axially facing sealing surface 137 on flange 136 extending radially inward from sealing surface 103 to sealing surface 108. Actually the sealing surfaces 103, 137 and 108 are continuous and lie in the same vertical plane.

In the event a kernel of seed is lodged or stuck in the pocket 107, a slanting seed dislodging edge 131 on spur flange 132 will serve to cam the seed loose if a portion thereof extends from the pocket 107. The loosened seed will have time to drop as the pocket 107 moves from the spur flange 132 to the sealing flange 136. The seed dislodging edge intersects the circle 138 in which the pockets rotate about the axis 176 of shaft 76 at an acute angle "α." FIG. 4 shows the stuck seed moving into engagement with the seed dislodging edge 131.

During operation, the disc 33 closes the cavity 81 on one axial side thereof through its sealing contact with the surface 123 of the pad 121 and the sealing surfaces 103, 137 and 108 on the housing 36. It will be noted on reference to FIGS. 5 and 8, that walls 141, 142 and flange 132 form an open seed drop portion at the bottom of the housing 36 which is not pressurized and through which the seeds drop into the furrow.

During planting operation each pocket 107 moves upward alongside the seed containing cavity 81 disposed in the lower rear of the housing. The pocket 107 thence moves upwardly past the seed containing part of cavity 81 into a vacated upper chamber 181 of the cavity where any kernels of seed in excess of one have an opportunity to drop out of the pocket before the pocket moves into confronting relation with the sealing surface 123 of pad 121.

It is relatively easy to change from a corn planting disc 33 to a soybean planting disc 133, because the disc can be removed axially from the housing and shaft 76 upon removal of the releaseable fastening member in the form of nut 77. The vertically disposed shoes 32, 32' need not be removed. After the disc 33 is shifted axially

to the left, as viewed in FIG. 4, sufficiently to move it off the pilot portion 143 of the shaft 76, it may be tilted axially outward at its top and lifted upwardly and outwardly.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An air planter unit comprising:

a housing having

a seed receiving cavity,

a first flat axial facing arcuate sealing surface,

a second flat axially facing sealing surface extending from one circumferential end of said first sealing surface radially inwardly, said sealing surfaces at least partially circumscribing said cavity,

a seed passageway connected at one end to said cavity and adapted at its other end for connection to a seed hopper,

an air passageway connected at one end to said cavity and adapted at its other end for connection to a source of pressurized air; and

an open seed drop portion at its lower end,

a vertically disposed seed planting disc rotatably mounted on said planter unit on a horizontal transverse axis in substantially concentric relation to said first sealing surface and having

a substantially flat annular sealing surface on one axial side of said disc in sealing engagement with said sealing surfaces on said housing whereby said disc is disposed in enclosing relation to said cavity,

a plurality of circumferentially spaced seed receiving pockets formed in said one axial side, said pockets being disposed on the radially inner side of said first sealing surface on said housing and said second sealing surface on said housing extending radially inwardly to a point at the radially inner side of said pockets, and

wall means defining a small axial opening through the bottom of each of said pockets permitting escape of air from said cavity, said pockets and openings being proportioned to hold seed in said pockets under influence of pressurized air in said cavity, said pockets being out of communication with said cavity as the rotating disc brings them to said seed drop portion of said housing whereby said seed in each pocket is free to fall to the soil by gravity as said disc is rotated to bring the pockets into said drop portion, and

a resilient sealing pad in sealing engagement with said disc disposed between the radially inner end of said second sealing surface and said first sealing surface near the other circumferential end of the latter.

* * * * *

United States Patent [19]

Shaw

[11] **Patent Number: 4,703,868**

[45] **Date of Patent: Nov. 3, 1987**

[54] **APPARATUS FOR METERING AND DISPENSING SEEDS**

[75] Inventor: **Lawrance N. Shaw, Gainesville, Fla.**

[73] Assignee: **University of Florida, Gainesville, Fla.**

[21] Appl. No.: **812,020**

[22] Filed: **Dec. 23, 1985**

[51] **Int. Cl.**[4] **A01C 7/04**

[52] **U.S. Cl.** **221/211**; 221/278; 111/7; 406/68; 222/216; 222/225; 222/630

[58] **Field of Search** 221/211, 278; 111/6-7, 111/34, 77; 406/67-68; 222/368, 630, 216, 225, 221; 414/223, 225; 198/392, 443, 803.16, 803.5, 471.1

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Primary Examiner—Charles A. Marmor
Attorney, Agent, or Firm—Dennis P. Clarke

[57] **ABSTRACT**

Apparatus for metering and dispensing seeds from a liquid or gel suspension of seeds includes a rotor having a plurality of orifices disposed within concave-shaped recesses about the peripheral surface of the rotor, each recess communicating with a bore of the rotor by a passageway. The rotor is supported within a recess in a housing by a stationary pintle having circumferentially extending grooves which are aligned with the radial passageways in the rotor, the grooves being connected to a pressure source and to a suction source so as to enable a suction to be applied to orifices located at a first region of the housing and a pressure to be applied to orifices located at a second region of the housing. The orifices located at the first region are exposed to the seed suspension, and the suction causes a seed from the suspension to be drawn to and held on the peripheral surface. The orifices located at the second region are adjacent to a transfer fluid passageway through the housing which communicates with the peripheral surface of the rotor at the second region, and the pressure causes the seeds carried by the rotor to be ejected into the transfer fluid flow. The apparatus enables sprouted seeds to be handled without damage and affords a uniform distribution of seeds in the transfer fluid, thereby promoting uniform planting of seeds.

18 Claims, 8 Drawing Figures

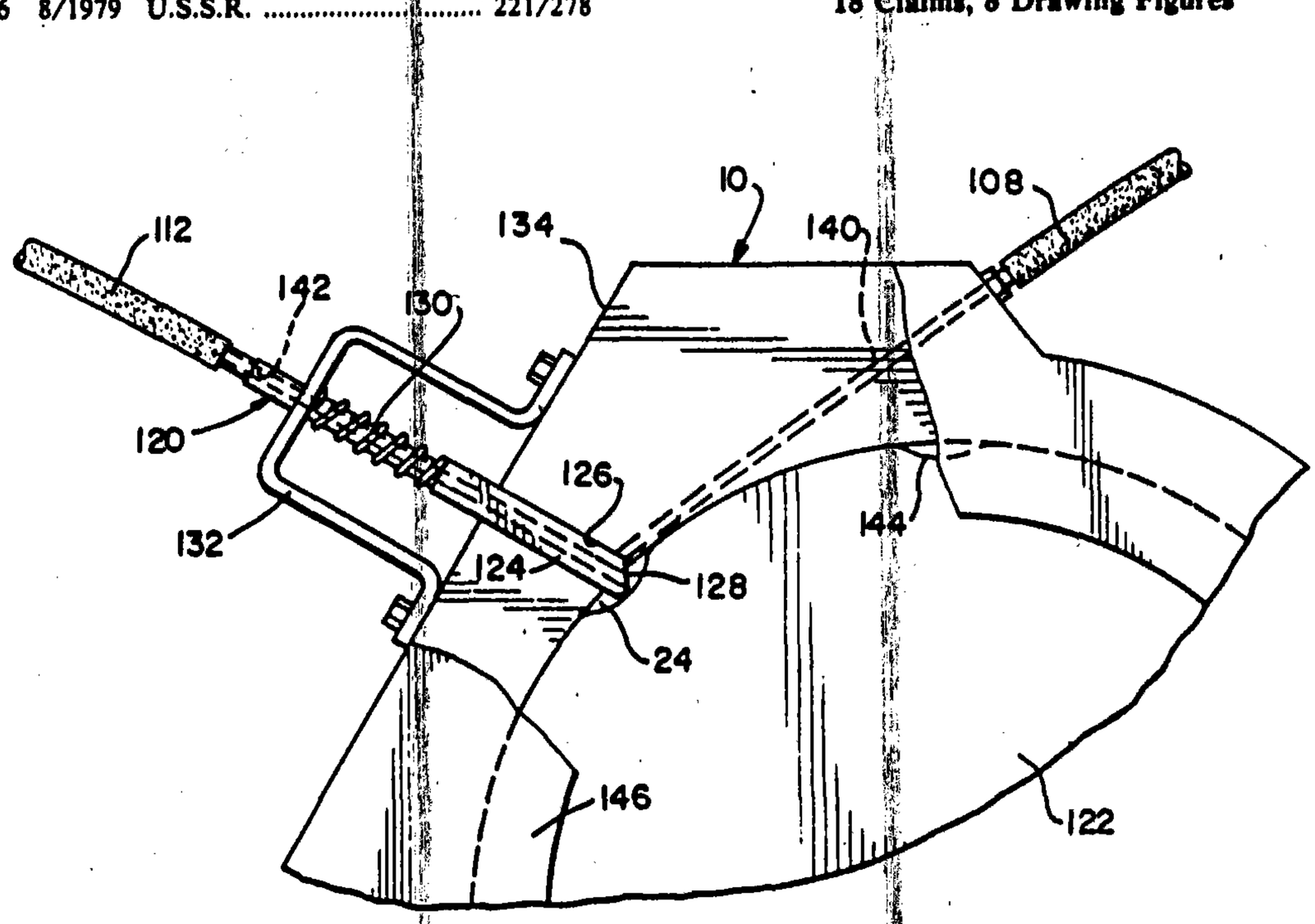

FIG 1

TRANSFER FLUID
110
SUCTION
90
PRESSURE
88
89
86
38
34
18
70
62
72
36
38
10
12
14
108
24
32
30
28
26
16
40
44
52
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124
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58
60

FIG 2A

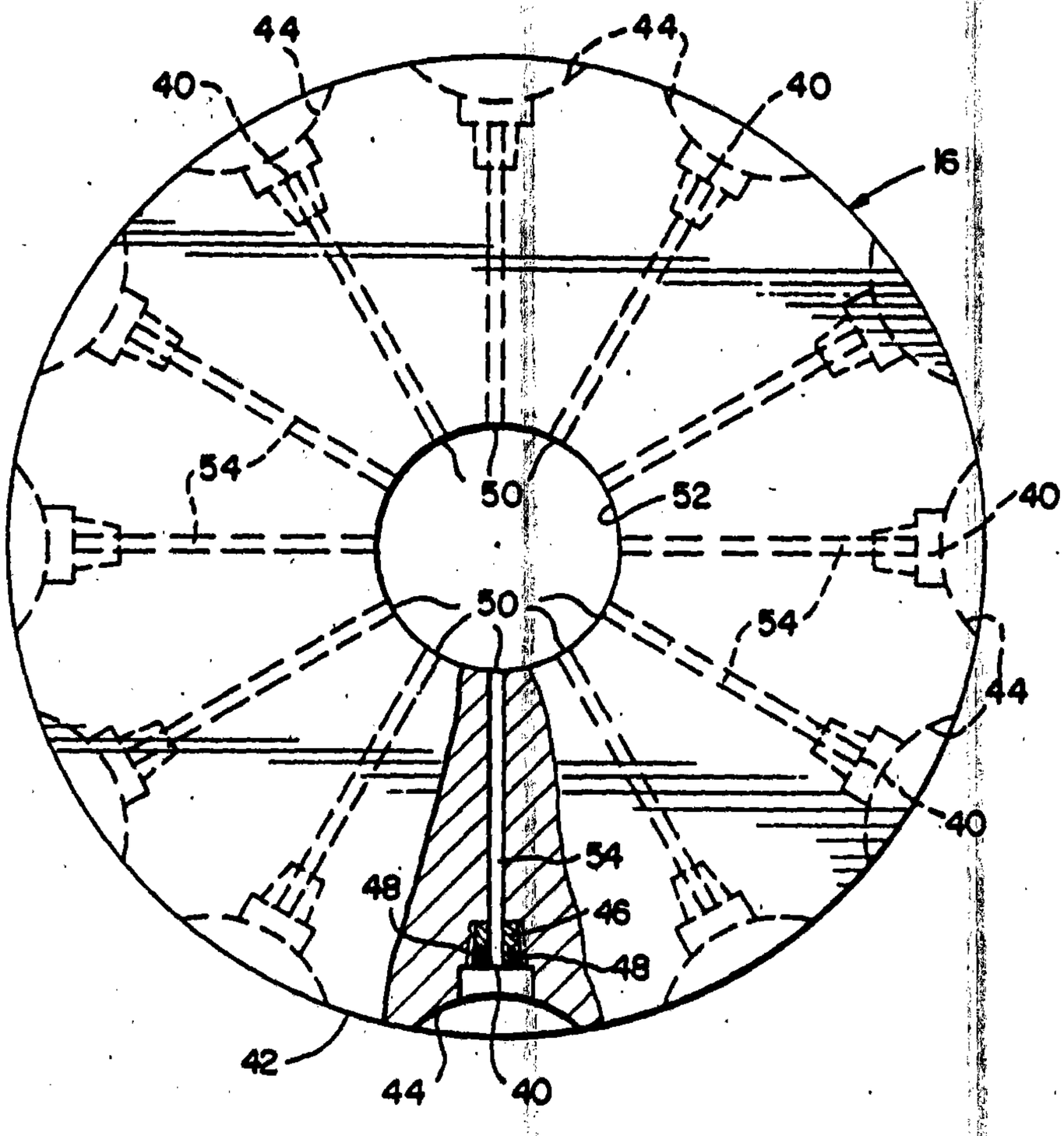
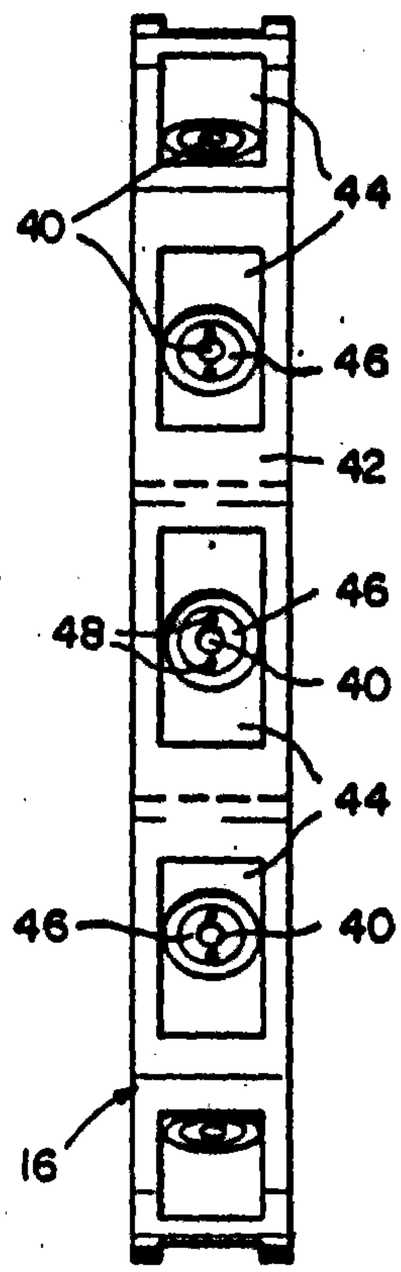


FIG 2B



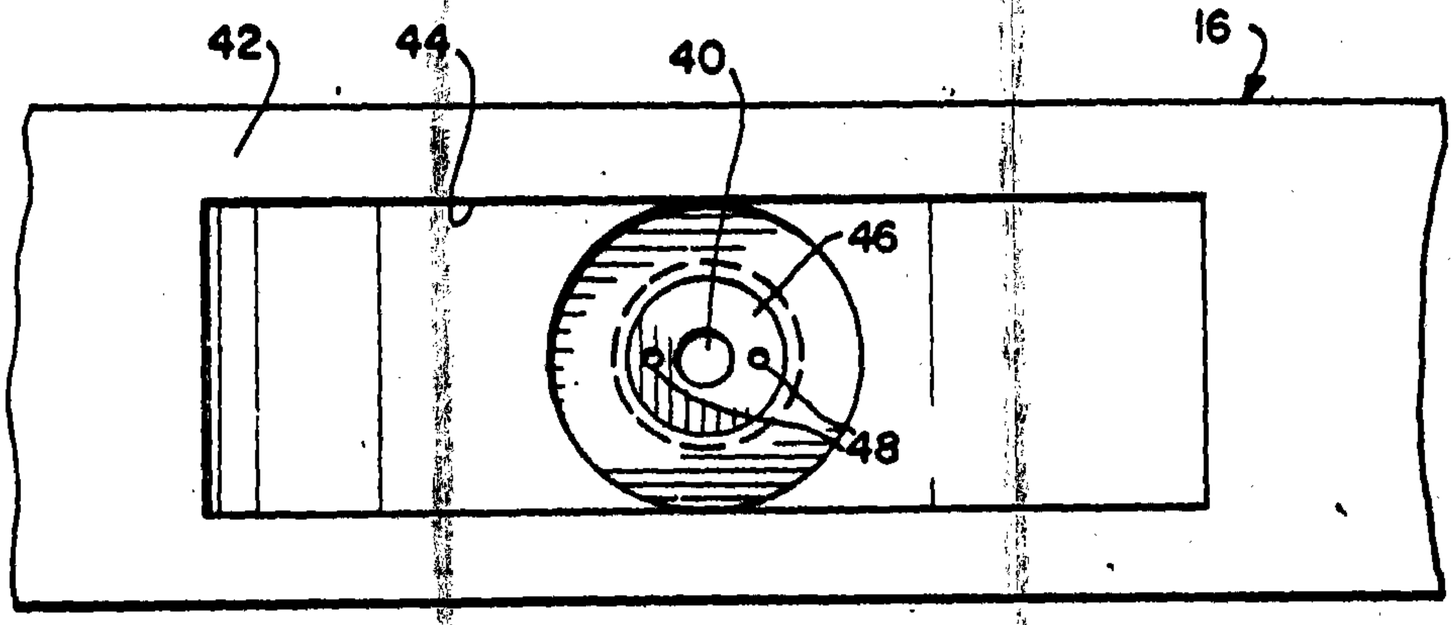
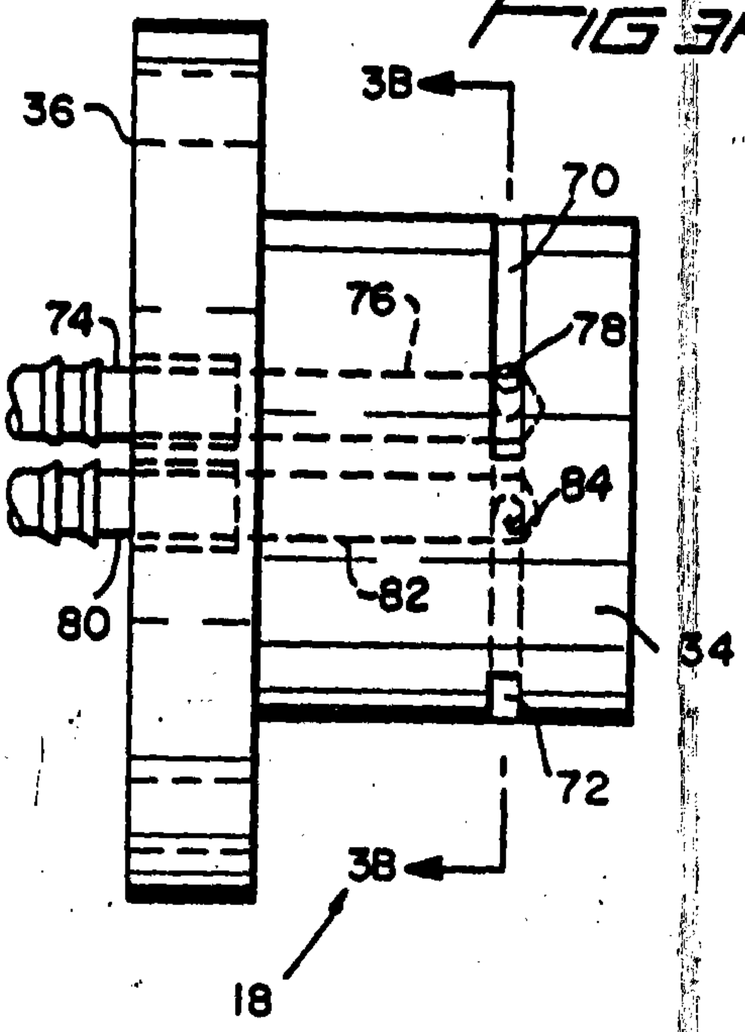


FIG 2C

FIG 3A



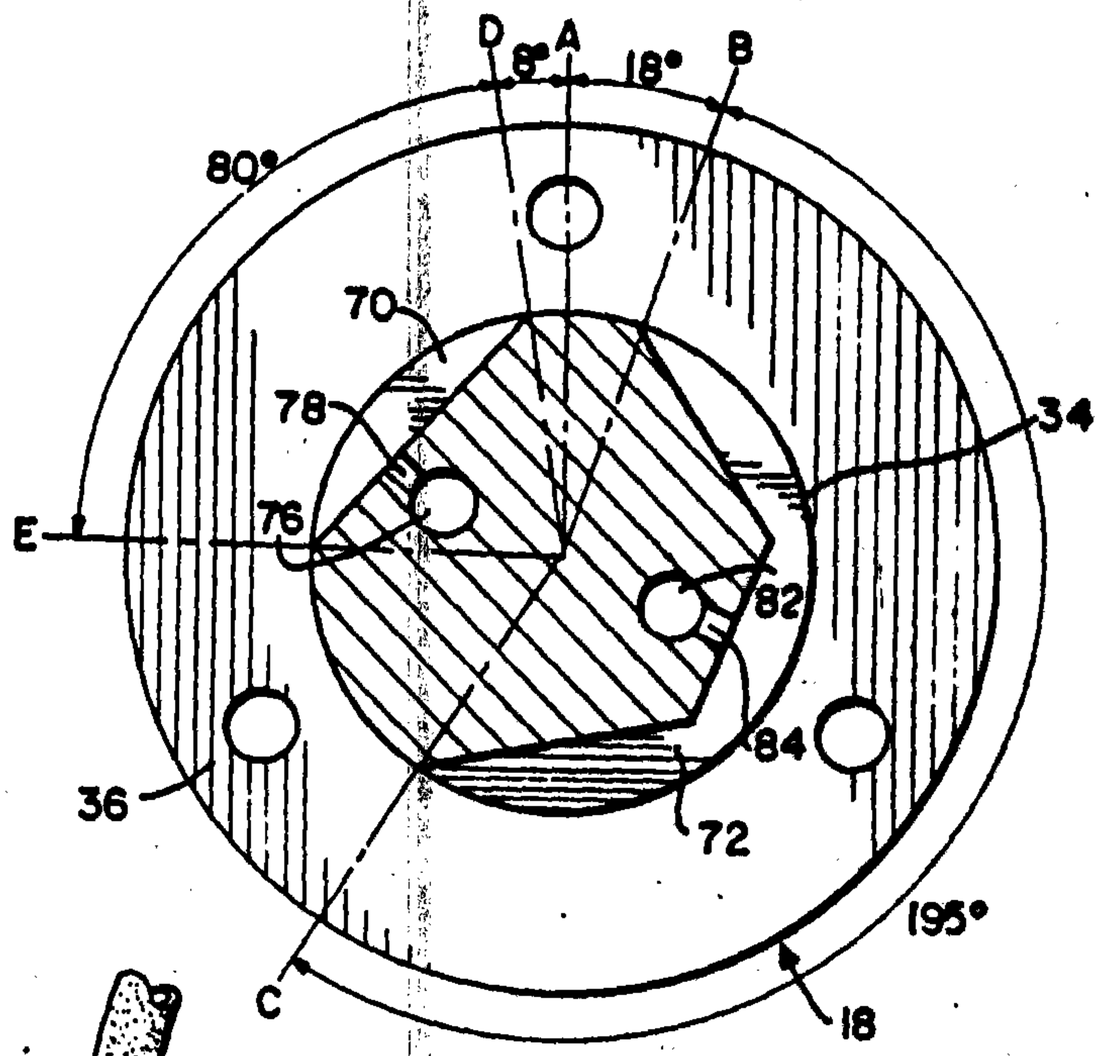


FIG 3B

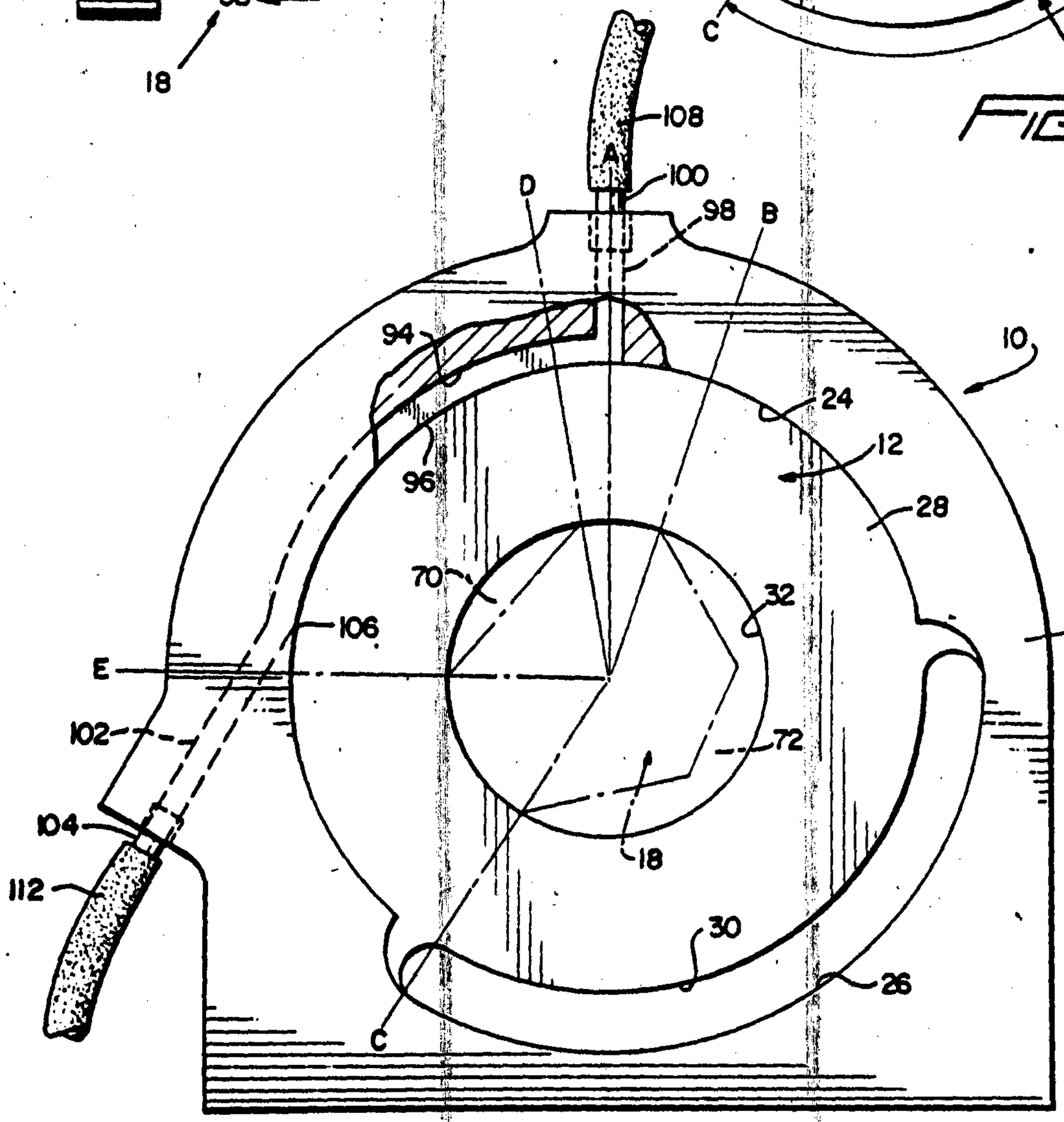


FIG 4

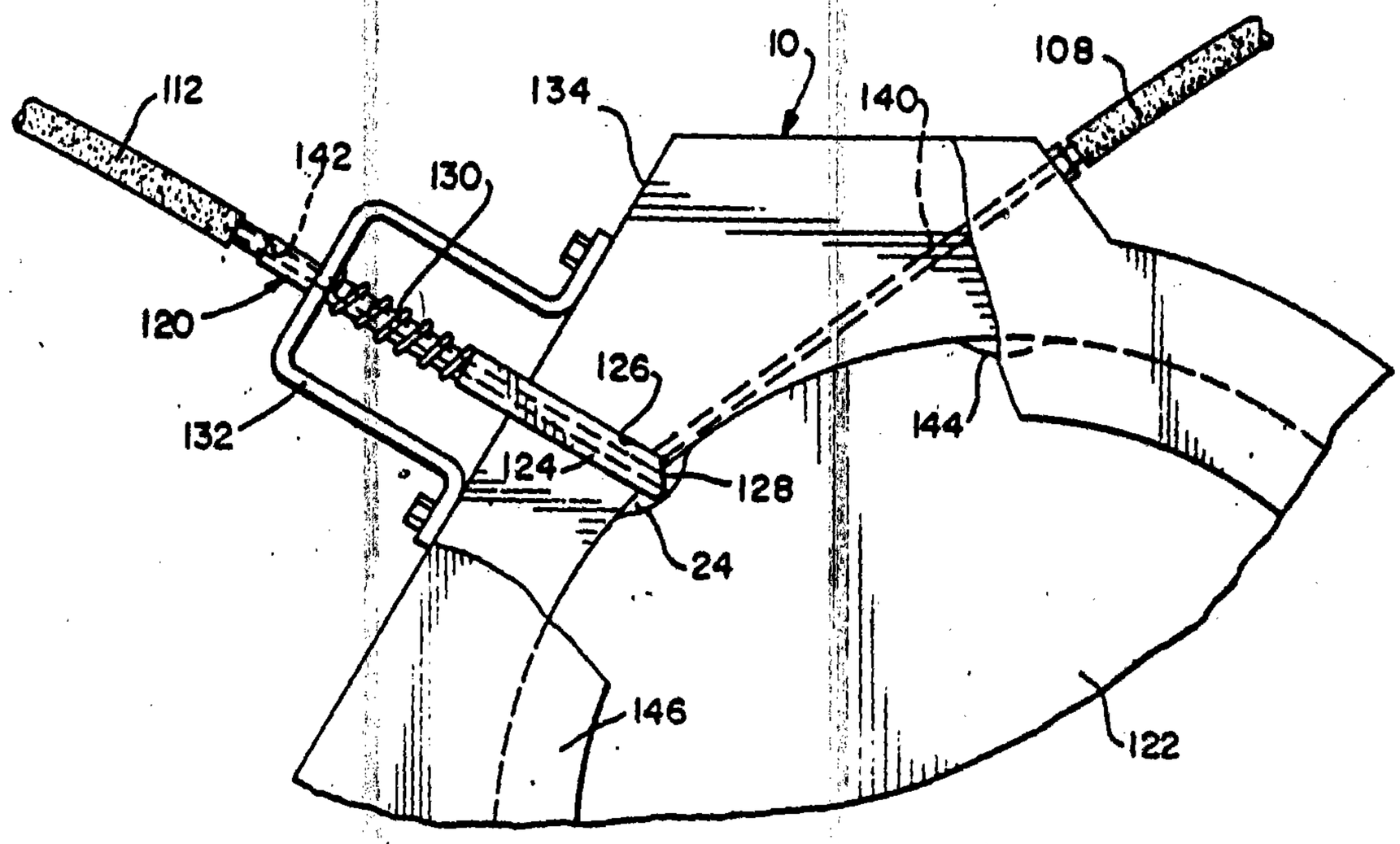


FIG 5

APPARATUS FOR METERING AND DISPENSING SEEDS

BACKGROUND OF THE INVENTION

The present invention relates generally to agricultural apparatus, and more particularly to apparatus for singling out individual seeds from a liquid or gelatinous suspension of seeds and for reintroducing the selected seeds uniformly spaced into a stream of a carrier fluid.

There are significant advantages to planting crops with pregerminated or sprouted seeds. In addition to reduced crop emergence time, this practice enables the germination of seeds in a more ideal environment than that frequently found in the soil and the planting of only viable seeds, which increases crop uniformity and improves crop quality and yield. Moreover, germination may be initiated before the time the seeds can ordinarily be planted. This enables the crop growing season to be shortened, which reduces field crop risks and allows earlier marketing for better prices.

Pregerminated seeds tend to be more fragile than seeds which have not sprouted, and sprouted seeds must be handled more carefully to minimize damage to them. Accordingly, many sprouted seeds are put into the ground manually or using a hand-feed planting machine. The handling and planting of sprouted seeds may be facilitated by dispersing the seeds in a fluid, such as a gelatinous material, which protects the seed radicals and serves as a carrier for dispersing the seeds into the soil. Since it is desirable to plant seeds regularly spaced in rows or in uniform volumes as for clump planting of seeds, attempts have been made to mix the seeds uniformly in the gelatinous carrier vehicle and to disperse the mixture regularly in drilled rows or in uniform volumes using a planting machine. Such techniques have not been satisfactory for providing a uniform spacing of seeds in a row or for providing uniform numbers of clumped seeds. This has been due in part to the difficulty in achieving a uniform distribution of the seeds in the gelatinous carrier vehicle.

It is desirable to provide apparatus in which such disadvantages are avoided and which enables the dispersion of seeds into a carrier or transfer fluid in a controlled manner, and it is to this end that the present invention is directed.

SUMMARY OF THE INVENTION

The invention affords seed metering and dispensing apparatus which is capable of gently picking or singling out individual seeds from a suspension of seeds in a fluid such as a gel or a liquid, and which is capable of reintroducing the selected seeds in a controlled manner into a separate continuous stream of a carrier or a transfer fluid. Apparatus in accordance with the invention has a rather simple construction and enables the dispensing of seeds into the transfer fluid to be easily metered and controlled. The apparatus handles the seeds gently, thereby minimizing damage to them, and may be used with pregerminated or non-germinated seeds. Furthermore, the apparatus is readily adaptable for use with seeds of different sizes, and may employ a gel, water, or some other fluid as a carrier vehicle.

Briefly stated, in accordance with one aspect, the invention may comprise a housing which is adapted to be disposed within a fluid suspension of seeds, the housing having a surface defining a recess within the housing and having a passageway through the housing which is in communication with the recess. Means is included for providing a transfer fluid flow through the passageway in the housing. A disk having a plurality of orifices disposed about its peripheral circumferential surface is rotatably supported within the recess. Each orifice is connected to a passageway within the disk, and means is included for rotating the disk within the recess. The recess is formed such that the peripheral surface of the disk is exposed to the seed suspension at a first region and such that the housing surface which defines the recess closely conforms to the peripheral surface of the disk at a second region. Means is further included for applying a suction to orifices located at the first region so as to cause a seed from the suspension to be drawn to and held on the peripheral surface of the rotating disk at each such orifice; and means is included for applying a pressure to the orifices located at the second region in order to eject the seeds from the peripheral surface into the transfer fluid flow.

In another aspect, the apparatus may comprise a rotor adopted to be disposed within a fluid suspension of seeds, the rotor having a plurality of orifices spaced about its periphery, and means for rotating the rotor. Means is included for applying a suction to orifices at a first region within the seed suspension to cause a seed to be drawn to and held on the peripheral surface of the rotor at each orifice. A hollow follower member is biased into engagement with the peripheral surface of the rotor at a second region. Means is included for providing a transfer fluid flow which contacts the periphery of the rotor at the second region and which flows outwardly from the rotor through the hollow follower member; and means is included for applying a pressure to the orifices at the second region in order to eject seeds into the transfer fluid flow.

In a preferred form, the suction and pressure applying means may comprise a pintle which rotatably supports the disk or rotor and which has formed in its surface circumferentially extending first and second grooves which are connected by passageways in the pintle to a pressure source and to a suction source, respectively. The grooves in the pintle communicate with the orifices by means of radial passageways which connect each orifice to a port in the bore of the disk or rotor that receives the pintle, and serve to alternatively apply a suction or a pressure to each orifice during a certain portion of the rotation. The follower member acts as a sliding seal at the surface of the disk or rotor and serves to minimize the amount of transfer fluid carried by the disk or rotor into the seed suspension. The follower also assists in scooping the seeds into the transfer fluid flow from the surface of the disk or rotor, thereby ensuring transfer of the seeds to the transfer fluid and promoting a more uniform distribution of seeds in the transfer fluid.

Other more specific aspects will become apparent from the description which follows.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded perspective view of seed metering and dispensing apparatus in accordance with the invention;

FIGS. 2A-C are, respectively, a plan view, partially broken away, of a rotor of the apparatus of FIG. 1, an end view of the rotor, and an enlarged plan view of an orifice in the peripheral surface of the rotor;

FIGS. 3A–B are, respectively, a side view of a pintle of the apparatus of FIG. 1 and a cross-sectional view taken approximately along the line 3B—3B of FIG. 3A;

FIG. 4 is a plan view, partially broken away, of the housing of the apparatus; and

FIG. 5 is a plan view of a portion of an alternative embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention is especially suited for use with agricultural planting machines for controlling the dispersion of seeds in a transfer fluid which carries the seeds to the soil, and will be described in that environment. As will be appreciated, however, this is illustrative of only one utility of the invention.

FIG. 1 is an exploded perspective view of a first embodiment of apparatus in accordance with the invention. As shown in the Figure, and as will be described in more detail hereinafter, the apparatus may comprise a generally planer housing 10 having a recess 12 therein which is open to one side 14 of the housing, a rotor 16 disposed within the recess on a stationary hub or pintle 18 and a drive mechanism 20 for rotating the rotor. The housing is adapted to be disposed in a substantially vertical plane at least partially submerged in a fluid suspension of seeds in a container 22 of an automatic planting machine such as a seed drill or the like. As the rotor rotates within the housing, it picks up seeds from the fluid suspension and deposits the seeds into a stream of a transfer fluid flowing through the housing. The planting machine (not illustrated) may include conventional devices for opening the soil and means for dispensing the transfer fluid containing the seeds into the ground.

In more detail, as shown in FIGS. 1 and 4, recess 12 may have a first generally cylindrical upper portion 24 which presents a circular opening having a first radius in the sidewall 14 of the housing and may have a second lower portion 26 which is also circular but has a somewhat greater radius. The upper portion of the recess may extend from the sidewall surface 14 approximately three-fourths of the way through the housing to a rear wall 28 of the housing. The rear wall may have an arcuate slot 30 cut therethrough, as shown, so that the lower portion of the recess extends completely through the housing. As will be explained hereinafter, the lower portion 26 of the recess and slot 30 enable the fluid suspension of seeds to flow through the housing adjacent to the peripheral circumferential surface of the rotor and constitute a pick-up region of the apparatus where the seeds may be picked up by the rotor and carried to a transfer region adjacent to the upper portion of the recess where they may be transfered to a stream of transfer fluid flowing through the housing. As indicated in FIG. 4, portion 26 of the recess and slot 30 may comprise approximately one-third, e.g., 120° of arc, of the circumference of the opening in the sidewall, and the upper portion 24 of the recess may comprise the remaining two-thirds of the opening.

Rear wall 28 of the housing may have a circular opening 32 therethrough which is centered with respect to the upper portion 24 of the recess to enable a cylindrical portion 34 of the pintle to be received within the housing. As shown in FIGS. 1 and 3A–B, the pintle may have a rear flange 36 to enable the pintle to be secured to the rear wall 28 of the housing, as by bolts 38 threaded into the rear wall. Upon the pintle being secured to the rear wall, its cylindrical portion 34 projects into the recess and serves as a stationary hub for rotatably supporting rotor 16 within the recess.

As shown in FIGS. 1 and 2A–C, rotor 16 may comprise a disk having a plurality of orifices 40 regularly spaced about the periphery of its circumferential surface 42. Each orifice may be located within a generally concave-shaped recess 44 formed in the peripheral surface of the rotor, and is preferably constituted by an opening extending through a member 46 which is threaded into the rotor. Member 46 may comprise, for example, a standard ¼ inch NPT threaded plug, as of brass, having a hole bored therethrough. The plug is preferably removable and, as best shown in FIG. 2C, its upper surface may be formed with a pair of offset blind holes 48 for receiving the prongs of a U-shaped tool (not illustrated) for threading the plug into and out of the rotor. The use of a removable plug is desirable since it enables the size of the orifice to be changed conveniently to accommodate different size seeds, as will be explained shortly. As also shown in FIGS. 1 and 2A, each orifice 40 may communicate with a corresponding opening or port 50 formed in a centrally located bore 52 of the rotor by means of a radially extending passageway 54, for a purpose which will also be explained shortly.

Bore 52 of the rotor is sized to have a diameter which is slightly greater (by a few thousandths of an inch, for example) than the diameter of cylindrical portion 34 of the pintle so that the rotor may rotate freely on the pintle and so that the surface of the bore conforms closely to the surface of the pintle. The rotor may have a thickness substantially equal to the depth of the recess portion 24 in the housing so that its outer surface 56 lies in substantially the same plane as the sidewall surface 14 of the housing. The rotor may further have a radius substantially equal to the radius of recess portion 24 so that its peripheral surface 42 closely conforms to the cylindrical surface of the recess portion 24 with a small clearance sufficient to enable the rotor to rotate freely. An end cap 58 mounted on the end of the pintle, as by bolts 60 threaded into corresponding openings 62 in the pintle, may confine the rotor axially on the pintle.

As shown in FIGS. 1 and 3A–B, cylindrical portion 34 of the pintle may be formed with a pair of circumferentially extending sectional grooves 70 and 72. These grooves are positioned in the pintle so as to be in alignment with openings 50 in the bore of the rotor when the rotor is mounted on the pintle. As shown, groove 70 may communicate with a port 74 on the rear flange 36 of the pintle by means of an axially extending passageway 76 and a radially extending passageway 78 which connects the groove and passageway 76. Similarly, groove 72 may communicate with another port 80 on the rear flange by means of an axial passageway 82 and a radial passageway 84. As shown in FIG. 1, port 74 may be connected by means of a line 86 to a positive pressure source 88, and port 80 may be connected via a line 89 to a negative pressure or suction source 90. The pressure and suction sources may comprise a single peristaltic pump, for example. The arrangement of passageways and grooves in the pintle enables a suction to be applied to those of the orifices 40 having their corresponding ports 50 in the rotor bore 52 aligned with groove 72 of the pintle, and enables a pressure to be applied to the orifices whose ports 50 are aligned with groove 70. Thus, as the rotor rotates on the pintle, a suction is applied to an orifice during a first part of the

rotation of the rotor and a pressure is applied to the orifice during another part of the rotation.

As shown in FIG. 3B, suction groove 72 may be formed to subtend an arc of approximately 195° which extends between the lines B and C, and pressure groove 70 may be formed to subtend an arc of approximately 80° which extends between the lines D and E. Line B may be located approximately 18° clockwise from a vertical line A and line D may be located approximately 8° counterclockwise from the vertical line. FIG. 4 illustrates in phantom lines the preferred orientation of the pintle and grooves 70 and 72 relative to the housing, and illustrates the locations of the lines A-E relative to the housing.

As is also shown in FIG. 4, a groove 94 may be formed in a portion of the interior cylindrical surface 96 of the housing which constitutes recess portion 24. Groove 94 may be connected by means of a vertical passageway 98 to the top of the housing and to an inlet port 100 and may be connected by means of another passageway 102 to an outlet port 104 at the left side of the housing. As shown, groove 94 is open to and communicates with recess portion 24 between the vertical line A and a point 106 at which it intersects with passageway 102. Inlet port 100 may be connected via a line 108 to a transfer fluid source 110 (see FIG. 1), and outlet port 104 may be connected by a line 112 to a device (not illustrated) on the planting machine which deposits seeds into the ground. Groove 94 and passageways 98 and 102 enable a stream of a transfer or carrier fluid to flow from source 110 through the housing. As shown by the positions of the lines B, C, D, and E in FIG. 4, suction groove 72 of the pintle enables suction to be applied to orifices 40 in the rotor which are adjacent to slot 30 and recess 26, and enables pressure to be applied to the orifices which are adjacent to groove 94 in the housing. As previously indicated, the region adjacent to slot 30 is a pick-up zone where seeds are drawn to and held on the periphery of the rotor. The region adjacent to groove 94 is a transfer zone where the seeds are transferred to the transfer or carrier fluid flowing through the housing.

In operation, the apparatus may be submerged at least partially in a gel or liquid containing seeds in suspension. A suitable gel for the seed suspension is Viterra-2 manufactured by Union Carbide. This gel has a consistency similar to that of applesauce. The transfer fluid may be a similar gel or may be another liquid. Other liquids which may be used include water. The rotor is rotated counterclockwise by drive arrangement 20, which may comprise a sprocket gear 120 attached to the surface of the rotor by means of bolts 122 and spacer bushings 124. The sprocket gear may have a central opening 125 with a diameter greater than the diameter of end cap 58, and may be coupled by a chain 126 and another sprocket gear 128 to a drive device 130 which is preferably formed to enable the rotational speed of the rotor to be varied. Drive device 130 may comprise, for example, a motor, a gear box which is driven by a gauge wheel or the like (not illustrated) of the planting machine which engages the ground so that the rotation of the rotor may be synchronized to the speed of the planting machine. As the rotor rotates through the pick-up zone corresponding to recess portion 26 and slot 30, the suction causes seeds to be attracted to and held on the rotor periphery at each orifice. As noted above, the larger diameter of recess portion 26 exposes the peripheral surface of the rotor to the seeds suspension, and slot 30 through the housing enables a flow of the seed suspension past the rotor surface to be maintained, which facilitates capture of the seeds by the orifices. The orifices in the rotor are sized according to the type of seed being planted and such that a single seed will be held on the rotor at each orifice. The orifice diameter may vary between 0.125 inch and 0.0135 inch, for example, depending upon the size of the seeds being planted. The use of replacable plugs 46 for the orifices as previously described facilitates changing of the orifice size to accommodate different size seeds.

Referring to FIG. 4, with the rotor rotating counterclockwise, suction is applied to an orifice as it enters the pick-up zone at line C. Suction is maintained throughout the pick-up zone and until the orifice reaches the line B just prior to where the transfer fluid enters the housing via passageway 98. The concave recesses 44 in which each orifice is disposed enable the seeds to be carried by the rotor without damage past the cylindrical surface 96 of recess portion 24, and maintaining suction until an orifice approaches closely to the transfer region helps to minimize any damage to the seeds which could be caused by the seeds scraping on the surface of the recess. When the orifice reaches the position indicated by line D, at which it is beyond passageway 98 and adjacent to the transfer fluid stream flowing through groove 94, the positive pressure applied to the orifice via pressure groove 70 of the pintle causes the seed in concave recess 44 to be ejected into the transfer fluid stream. The stream carries the seeds out of the housing via line 112 to a seed drill or the like for placing the seeds into the ground. The positive pressure is maintained until the orifice reaches line E, which is beyond the point where the transfer fluid is in contact with the peripheral surface, to ensure that the seed does not drop back into the concave recess but is carried out of the housing in the transfer fluid. This also minimizes somewhat the amount of transfer fluid which is carried by the rotor back to the seed suspension, which may be desirable.

The invention can gently pick or single out individual seeds from the suspension, thereby making it especially suited for handling very fragile or sprouted seeds, and can dispense the seeds uniformly and regularly spaced into the transfer fluid, thereby enabling uniform placement of the seeds into the ground. The spacing of the seeds in the transfer fluid may be varied by changing the relative velocities of the rotor and the transfer fluid, as by varying the rotor speed, for example. For the embodiment illustrated in the figures, which employs a rotor having twelve orifices spaced about its periphery, it has been found that a seed dispensing rate of the order of one seed per second, which corresponds to a disk rotation of about eight seconds per revolution, works well. If the velocity of the orifices through the seed suspension is too high, some orifices may not pick up seeds and, accordingly, the spacing of the seeds in the transfer fluid would not be uniform. For the embodiment illustrated, it has been found that the maximum rotational speed at which uniform distribution of the seeds in the transfer fluid occurs corresponds to a seed delivery rate of the order of 0.75 seconds per seed. In order to increase the capacity and delivery rate, the number of orifices about the periphery of the rotor may be increased to twenty-four, for example, or two rows of orifices side-by-side may be provided on the rotor. Also, two or more rotors placed side-by-side could be

employed, which would enable planting of seeds in parallel rows.

FIG. 5 illustrates a modified form of the invention. The modifications relate principally to the incorporation into the housing of a slipper seal 120 which bears against the peripheral surface of the rotor 122 and acts like a cam follower. As shown, the slipper seal may comprise an elongated hollow member, one portion 124 of which has a rectangular or square cross section and is slidingly disposed within a correspondingly shaped groove 126 in the housing sidewall. The end 128 of the slipper seal adjacent to the rotor may be angled, as shown, and may be biased into engagement with the rotor by means of a spring 130 which acts between portion 124 and a bracket 132 which is mounted on the exterior surface 134 of the housing.

FIG. 5 also illustrates a somewhat different transfer fluid path through the housing than that employed by the first embodiment. As shown, the transfer fluid path 140 may comprise a generally straight path which intersects recess 24 adjacent to groove 126 for the slipper seal. Transfer fluid enters the housing via line 108, travels through path 140, to the recess and the surface of the rotor, and then exits the housing through the hollow bore 142 of the slipper seal and flows through line 112. If desired, the grooves in the pintle may be formed so that pressure is not applied to the orifices in the rotor until they approach the slipper seal. Although this transfer fluid arrangement has been found to be satisfactory, an arrangement similar to that illustrated in FIG. 4 employing a groove which communicates with the periphery of the rotor over a portion thereof may be employed instead of the illustrated arrangement. In addition, rotor 122 may be formed, as shown in FIG. 5, with concave recess 144 in its periphery which extend through the thickness of the rotor and are open at the sides thereof, and an annular plate 146 applied to the sidewall of the housing may be employed to confine the seeds within the recesses in the rotor. The plate also serves to prevent the transfer fluid from flowing outwardly to the side of the rotor rather than through bore 142 in the slipper seal.

In operation, as the rotor is rotated counterclockwise within the housing, end 128 of the slipper seal bears against the rotor periphery. This provides a sliding seal between the rotor periphery and the housing which prevents transfer fluid from being carried on the rotor periphery beyond the slipper seal and into the seed suspension reservoir. This enables a transfer fluid, such as water, which is different from the fluid in which the seeds are suspended to be employed without fear of the transfer fluid being carried by the rotor periphery to the seed suspension reservoir. As a concave recess 144 of the rotor moves adjacent to the slipper seal, spring 130 causes end 128 of the slipper seal to follow the contour of the recess. Transfer fluid flows into recess 144 from passageway 140 and out of the housing through bore 142 of the slipper seal and line 112, carrying with it the seed from the recess. In addition to providing a seal, end 128 of the slipper seal acts somewhat like a scoop to assist in removing the seed from recess 144 and helps insure that the seed is injected into the transfer fluid flow. This has been found to contribute to the more uniform spacing of the seeds in the transfer fluid leaving the housing.

The embodiment of FIG. 5 may be oriented vertically in the seed suspension reservoir, as described for the first embodiment, or may be disposed horizontally completely submerged in the reservoir. The embodiment of FIG. 5 has been tested using sprouted tomato seeds and agitation of the seed suspension, and found to afford single seed selection approximately 79% of the time with approximately 3.5% skips. This results in the distribution of seeds in the transfer fluid being quite uniform, and, accordingly, enables the seeds to be placed uniformly into the ground.

The invention may be constructed from a number of different materials. In a preferred form, the housing is aluminum, the pintle is brass, and the rotor is of acetal plastic. If desired, the housing and the pintle could be formed of plastic as well.

While preferred embodiments of the invention have been shown and described, it will be apparent to those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the invention, the scope of which is defined in the appended claims.

What is claimed is:

1. Apparatus for metering and dispensing seeds from a fluid suspension of seeds, comprising a housing adapted to be disposed within the fluid suspension, the housing having a surface defining a housing recess within the housing and having a passageway therethrough, the passageway communicating with the surface; means for providing a flow of a transfer fluid through the passageway; a disk rotatably supported within the housing recess, the disk having a plurality of orifices disposed about a circumferential peripheral surface thereof, each orifice being disposed within a corresponding shallow recess in the peripheral surface and communicating with a corresponding passageway in the disk, and the housing recess being formed such that the peripheral surface of the disk is exposed to the seed suspension at a first region and such that the housing surface closely conforms to the peripheral surface of the disk at a second region, the transfer fluid passageway communicating with the peripheral surface within said seond region; means for rotating the disk; means for applying a suction to orifices located at the first region so as to cause a seed from said suspension to be drawn to and held on the peripheral surface of the disk at such orifices; means for applying a pressure to orifices located within said second region in order to eject seeds located at such orifices into the transfer fluid flow; an elongated follower member slidably disposed within a groove in the housing which communicates with said fluid transfer passageway; and means for biasing the follower member into engagement with the peripheral surface of the disk, the follower member being formed to enter said shallow recesses in the peripheral surface so that it follows a contour of the peripheral surface and acts between the disk and the housing as a sliding seal for preventing transfer fluid from being carried on the peripheral surface of the disk to the seed suspension.

2. The apparatus of claim 1, wherein said transfer fluid passageway comprises a circumferentially extending groove formed in the housing surface within said second region.

3. The apparatus of claim 2, wherein said groove has a length of the order of one-fourth the circumference of the disk.

4. The apparatus of claim 1, wherein the second region at which said housing surface conforms closely to the peripheral surface extends approximately two-thirds of the circumference of the disk, and said first region extends approximately one-third of the circumference.

5. The apparatus of claim 4, wherein the housing has a circumferentially extending slotted opening therethrough at said first region to enable the flow of said fluid suspension of seeds past the peripheral surface of the disk.

6. The apparatus of claim 1 further comprising a pintle for rotatably supporting the disk, the pintle passing through a bore in the disk and the passageways in the disk communicating with the bore by ports, and wherein the suction applying means and the pressure applying means respectively comprise first and second circumferentially extending grooves located in the pintle so as to be in alignment with said ports, the first groove being in communication with a first passageway in the pintle which is in communication with a suction source, and the second groove being in communication with a second passageway in the pintle which is in communication with a pressure source.

7. The apparatus of claim 6, wherein said first groove is formed to apply suction to orifices located in both said first region and in a first portion of said second region, and said second groove is formed to apply pressure to orifices located in a second portion of said second region at which said transfer fluid passageway communicates with the peripheral surface of the disk.

8. The apparatus of claim 7, wherein said first pintle groove subtends an arc approximately equal to one-half the circumference of the disk, and said second pintle groove subtends another arc approximately equal to one-fourth of the circumference.

9. The apparatus of claim 1, wherein the elongated member is hollow and constitutes part of the transfer fluid passageway through the housing.

10. The apparatus of claim 1, further comprising means for varying the relative velocities of the transfer fluid flow and the peripheral surface of the disk to vary the distribution of seeds in the transfer fluid.

11. Apparatus for metering and dispensing seeds comprising a rotor adapted to be disposed within a fl;uid suspension of seeds, the rotor having a plurality of orifices spaced about a circumferentially extending peripheral surface thereof, each orifice being disposed in a concave shaped recess in the peripheral surface; means for rotating the rotor; means for applying a suction to orifices at a first portion of the rotor which is within the seed suspension to cause a seed to be drawn to and held on the peripheral surface at such orifices; a hollow follower member having an end biased into engagement with the peripheral surface at a second portion of the rotor, the end being formed to scoop seeds from the concave recesses; means for providing a flow of a transfer fluid at said second portion which contacts the peripheral surface of the rotor and flows outwardly from the rotor through the hollow follower member; and means for applying a pressure to orifices at said second portion to eject seeds at such orifices into the transfer fluid flow.

12. The apparatus of claim 1 further comprising a housing having a surface defining a housing recess, the rotor being rotatably disposed within the housing recess, and the housing recess being formed such that the housing surface conforms closely to a second part of the peripheral surface of the rotor and such that a first part of the peripheral surface is exposed to afford access to the seed suspension, the follower member being slidably disposed within a slot in the housing which communicates with said housing surface and is adjacent to the second portion of the rotor, and wherein said housing has a passageway therein which communicates with the housing recess and with the follower member for said transfer fluid flow.

13. The apparatus of claim 12, wherein said passageway comprises a circumferentially extending groove in the housing surface adjacent to the second portion of the rotor.

14. The apparatus of claim 12, wherein the follower member constitutes a sliding seal which acts between the peripheral surface of the rotor and the housing surface.

15. The apparatus of claim 12, wherein the rotor has a central bore which receives a pintle for rotatably supporting the rotor within the housing, each orifice communicating with the bore by a radial passageway in the rotor connected to the orifice and to a port in the bore, and wherein said suction applying means and said pressure applying means comprise, respectively, first and second circumferentially extending grooves in the pintle aligned with the ports, the first groove being in communication via passageways in the pintle with a suction source and the second groove being in communication via other passageways in the pintle with a pressure source.

16. The apparatus of claim 15, wherein the first groove is formed so as to apply a suction to orifices which are exposed to the seed suspension, and the second groove is formed to apply a pressure to orifices which are adjacent to the follower member.

17. The apparatus of claim 11, wherein the apparatus is adapted to be used with an automatic planting machine, and wherein said rotating means includes means for synchronizing the rotation of the rotor with respect to the speed of the planting machine over the ground.

18. The apparatus of claim 11 wherein the rotating means includes means for controlling the speed of rotation of the rotor relative to the velocity of the transfer fluid flow so as to control the dispensing of seeds into said transfer fluid.

* * * * *

United States Patent [19]

Ribouleau

[11] **Patent Number: 4,949,869**

[45] **Date of Patent: Aug. 21, 1990**

[54] **DISTRIBUTOR FOR A MONOSEED SOWING MACHINE**

[75] Inventor: **Michel Ribouleau, Paris, France**

[73] Assignee: **Ateliers Ribouleau, Largeasse, France**

[21] Appl. No.: **342,028**

[22] Filed: **Apr. 24, 1989**

[30] **Foreign Application Priority Data**

Apr. 22, 1988 [FR] France 88 05398

[51] **Int. Cl.**[5] **A01C 7/04**

[52] **U.S. Cl.** **221/211; 111/77**

[58] **Field of Search** 221/211; 111/77, 78

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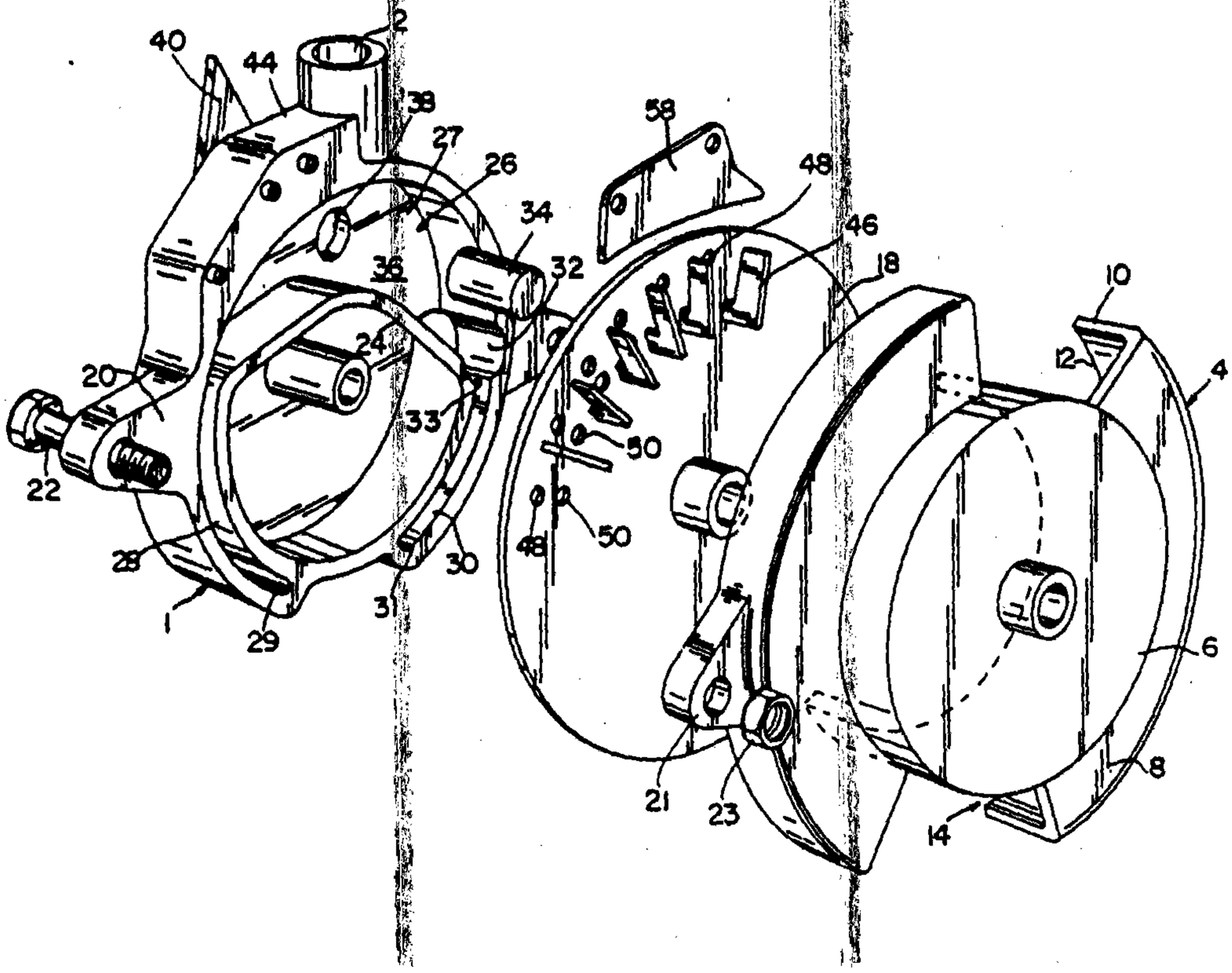
Primary Examiner—F. J. Bartuska
Attorney, Agent, or Firm—Sherman and Shalloway

[57] **ABSTRACT**

The distributor comprises a generally cylindrical case which is formed by a housing (1) and a cover (4) between which is rotatively mounted a distributor disk (18) provided with circumferentially spaced-apart orifices (48, 50). Inside the housing, a partition (24) defines a depression passageway (26) in communication with an suction duct (2). The passageway (26) includes a wide upper part (27) in the shape of a crescent which is extended at both ends by a narrow branch (28, 30). Formed in the upper part of the descending branch (30), relative to the direction of rotation of the disk (18), is a cavity (32, 33) for receiving a removable element (34) for isolating this branch from the source of depression. The inner wall of the passageway is provided with an air intake (39) whose opening is adjustable.

11 Claims, 4 Drawing Sheets



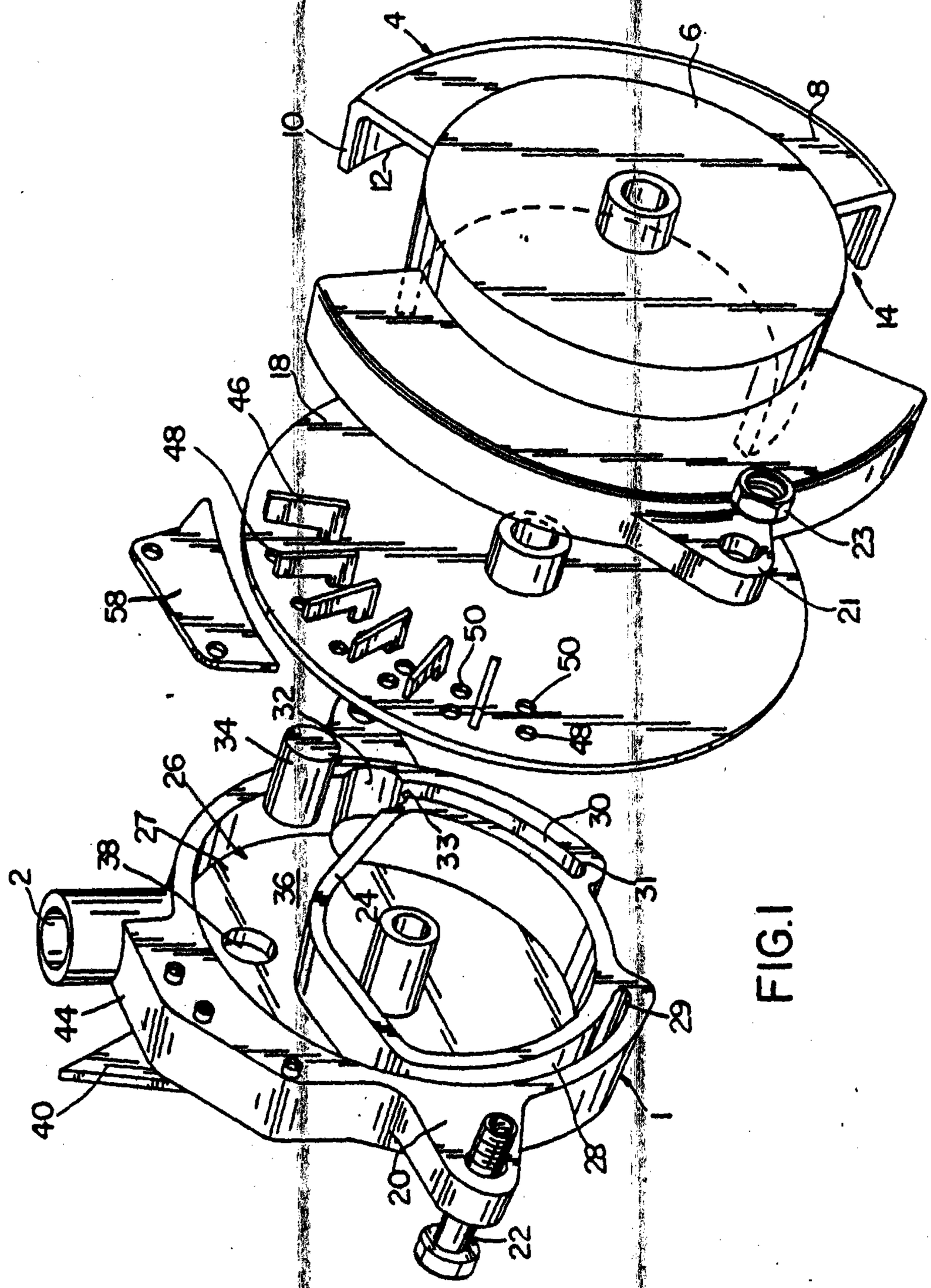

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FIG.1

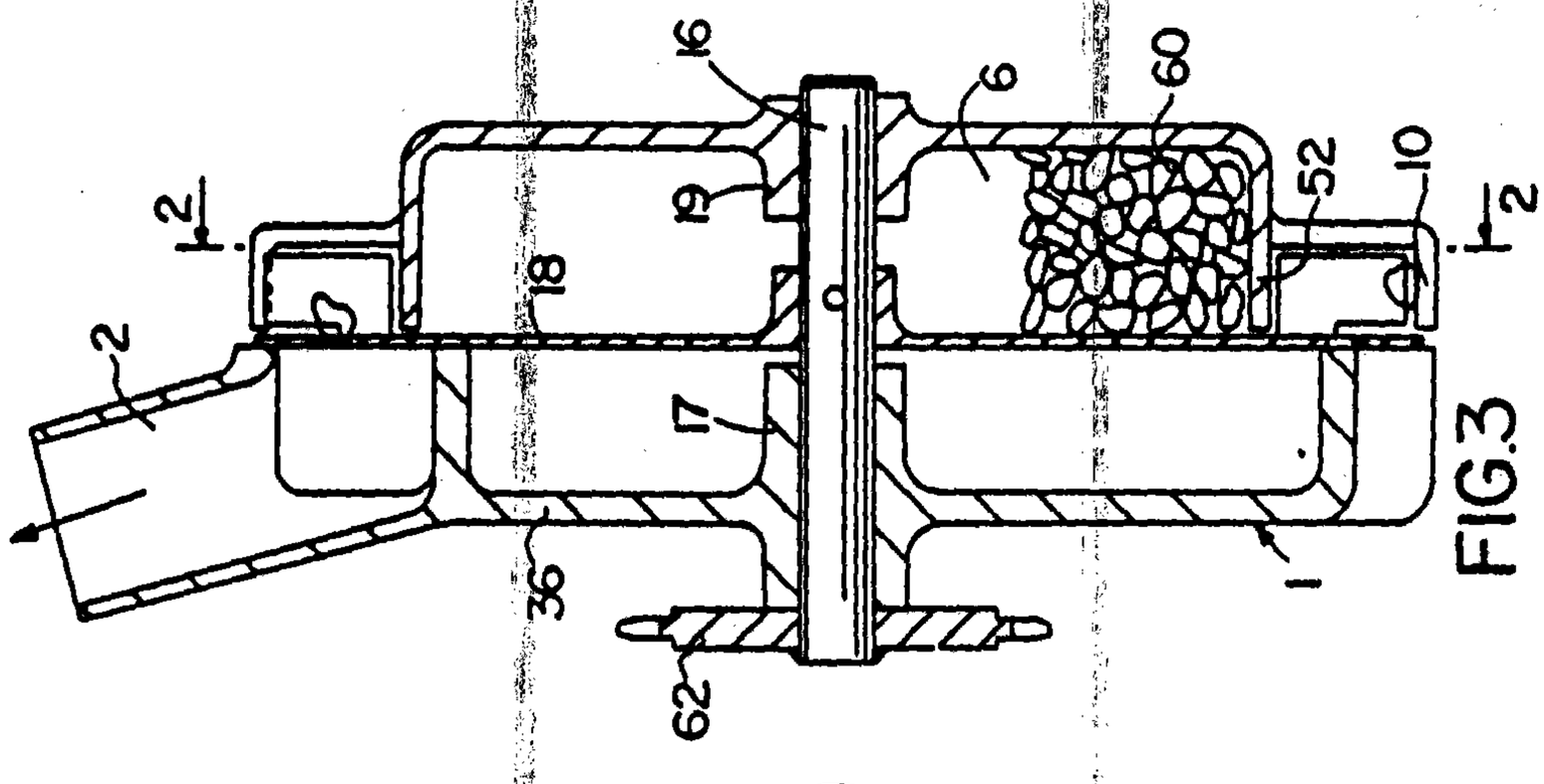
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FIG.3

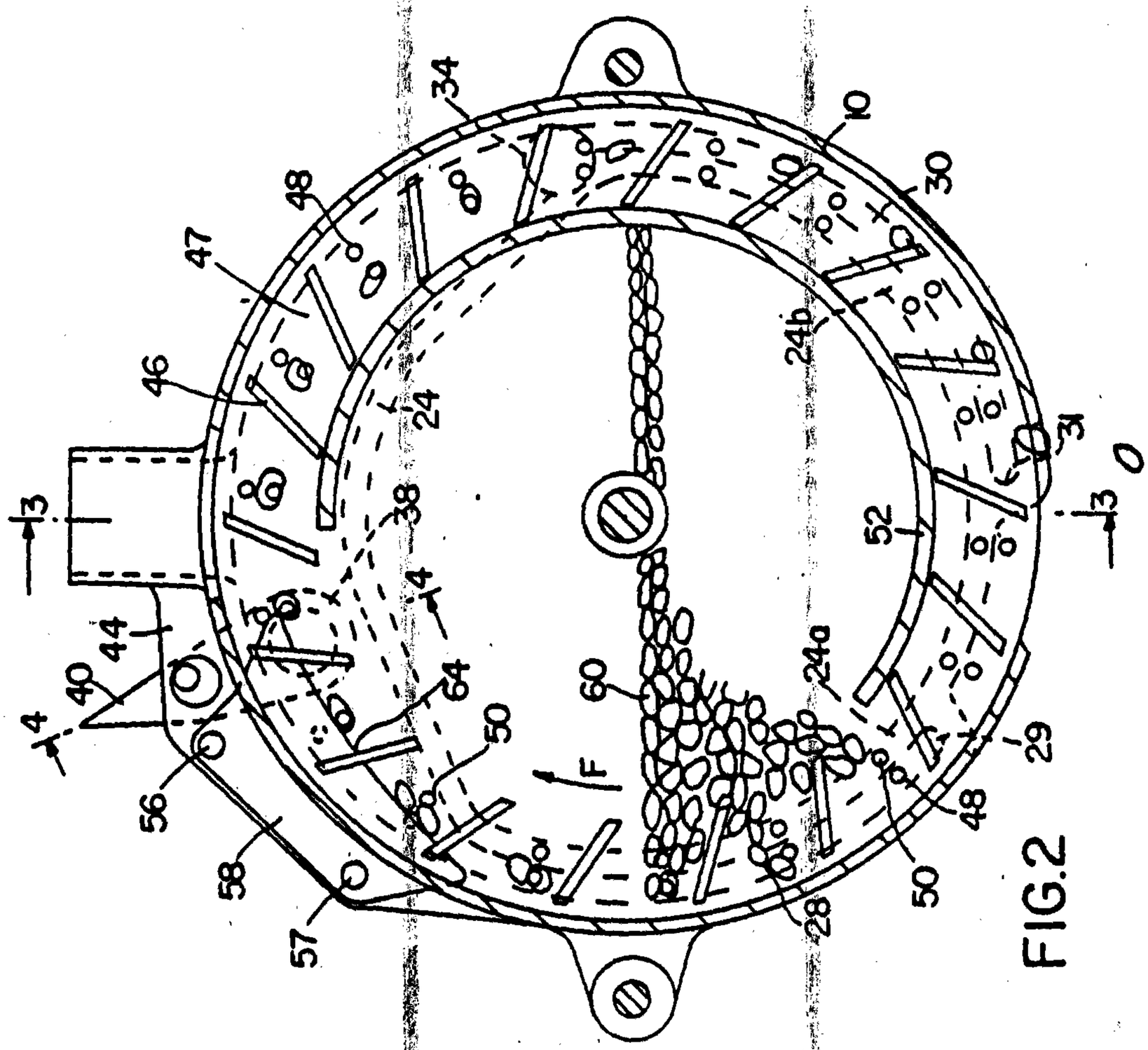
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FIG.2

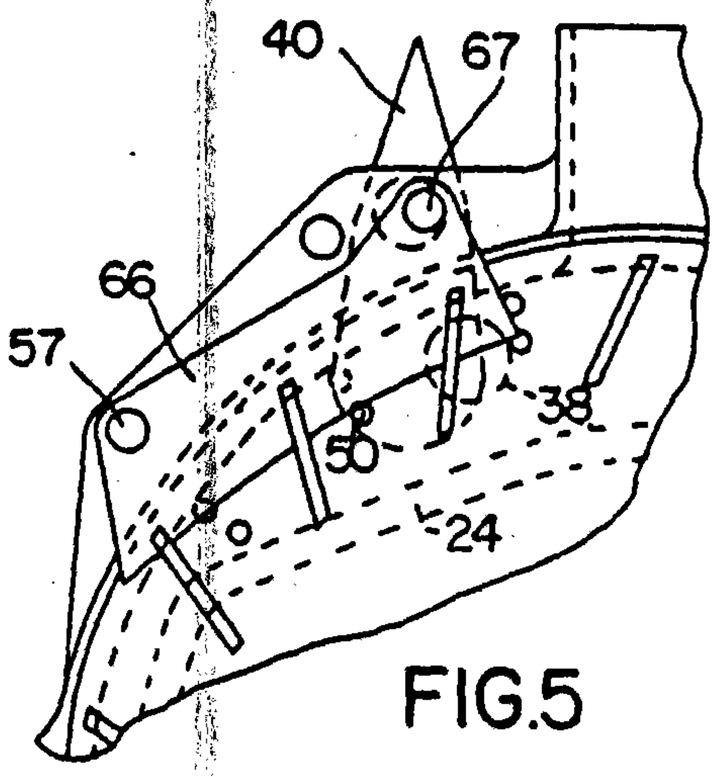

FIG.5

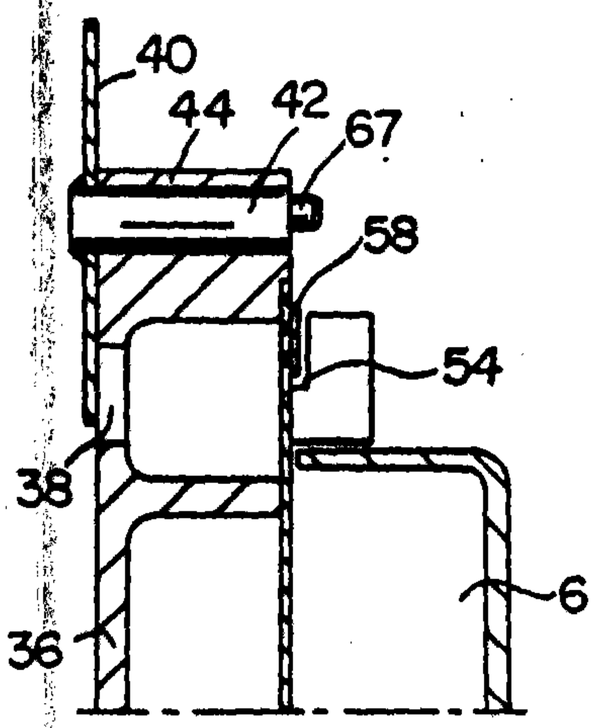

FIG.4

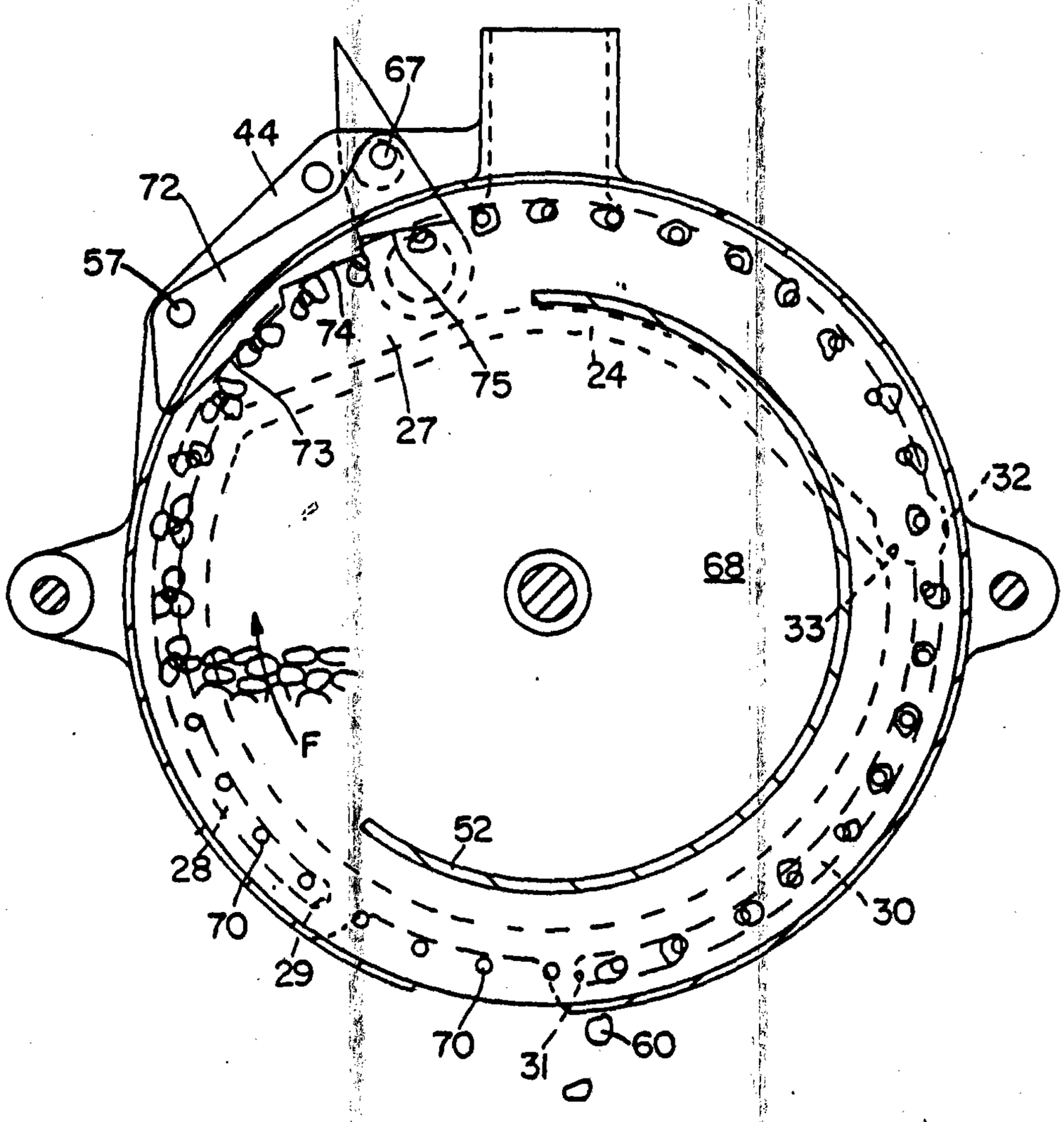

FIG.6

DISTRIBUTOR FOR A MONOSEED SOWING MACHINE

Monoseed sowing machines are increasingly appreciated by farmers owing to the regularity and precision of the sowing.

These sowing machines are usually provided with a distributor comprising a generally cylindrical case in which is rotatably mounted, on a horizontal axis a distributor disk which is provided with circumferentially spaced-apart orifices and separates a seed container from a suction device so that its orifices are subjected to a depression which retains the seeds taken from the container during at least a part of their angular displacement, means for eliminating double seeds and, in the lower part of the case, a seed discharge opening. Each of these seeds is in this way strictly separated from the others and disposed alone in the furrow to be provided with seeds.

Some distributors, such as that described in the documents FR-A-2 135,702 and FR-A-2 2,174,341 comprise a disk provided with fins which facilitate the feeding of the orifices with seeds, and the conduction and the precise release of the seeds, which permits a very simple automatic selection of the seeds while requiring only a low depression. However, the disk can only have a limited number of fins, i.e., cavities each containing a seed, and only an increase in the speed of rotation of the disk permits increasing the density of the sowing, so sowings of high density are impossible.

Other distributors (FR-A-1 585,445) comprise a disk devoid of fins which may consequently be provided with a large number of orifices and which is consequently well adapted to a high sowing density. Unfortunately, these distributors require a considerable depression otherwise the seeds are not carried along so that they are poorly adapted to heavy seeds and large seeds.

The farmer who usually must effect a plurality of types of sowing is therefore confronted with a difficult choice or is obliged to have a plurality of sowing machines.

An object of the present invention is to overcome this drawback by providing a distributor for a monoseed sowing machine which is easily adaptable to all types of sowing.

The invention indeed provides a distributor of the aforementioned type in which the suction device comprises inside the case a depression passageway having substantially the shape of a crescent whose ends are extended toward each other by two narrow and curved peripheral branches and which includes at the beginning of one of these branches a cavity for housing a closure element capable of isolating this branch from the source of depression.

According to another feature of the invention, the cavity for the closure element is provided in the upper part of the descending branch of the depression passageway, relative to the direction of rotation of the distributor disk.

Preferably, an outer air intake is provided in the bottom of the case in the vicinity of a suction duct and is associated with a pivotal lever for adjusting its opening.

The shaft of this lever may also control a selector which is in this way adapted to the nature of the seeds.

As the removable closure element combines its effects with that of the lever adjusting the outer air intake and optionally that of the selector, it permits varying the depression and thus using the distributor with a disk having fins or with a simple disk, depending on the nature of the sowing to be effected.

The following description of embodiments given by way of non-limitative examples and shown in the accompanying drawings, will bring out the advantages and features of the invention. In the drawings:

FIG. 1 is an exploded perspective view of a distributor for a monoseed sowing machine according to the invention, provided with a finned disk.

FIG. 2 is a sectional view taken on line 2—2 of FIG. 3, of the distributor of FIG. 1 when assembled.

FIG. 3 is a sectional view taken on line 3—3 of FIG. 2.

FIG. 4 is a sectional view taken on line 4—4 of FIG. 2.

FIG. 5 is a partial view similar to FIG. 2 showing a variant of the means for eliminating double seeds.

FIG. 6 is a view similar to FIG. 2 of the distributor provided with a simple disk.

A distributor for a monoseed sowing machine comprises, as shown more particularly in FIG. 1, a generally cylindrical case which is constituted by a housing 1 provided in its upper part with a duct 2 communicating with a suction element, or with another suitable source of depression, and by a cover 4 which constitutes a seed container 6 surrounded by a flange 8 provided on its periphery with a flange 10 extending toward the housing 1. The flange 8 is interrupted in its upper part at 12 to provide the communication of its inner volume with the outer atmosphere and in its lower part at 14 to form a seed discharge opening. The housing 1 and the cover 4 are mounted on the same shaft 16 by cylindrical bearing surfaces, respectively 17 and 19, which enable the shaft to rotate with respect thereto (FIG. 3).

The shaft 16 is connected to a distributor disk 18 which is in sealed contact with the wall of the housing 1 and against which the cover 4 is maintained by any suitable means. For example, in the illustrated embodiment, the housing 1 and the cover 4 each include two lateral lugs respectively 20 and 21 through which two screws 22 extend and which are clamped against each other by nuts 23.

Inside the housing 1, a partition 24 defines with the wall of this housing a depression passageway 26 which communicates with the suction duct 2. As the partition 24 has in its upper part substantially the shape of an inverted V, the depression passageway 26 comprises in the vicinity of the suction duct 2 a wide upper part 27 substantially in the shape of a crescent. Each of the ends of this crescent is extended by a narrow peripheral branch 28 and 30 respectively, these two branches extending toward each other but not joining each other. Indeed, the ends of the branches 28 and 30 are closed in the lower part of the housing 1 in the region of the seed discharge opening of the cover 4. Their ends 29, 31 are, in the illustrated embodiment, slightly off-set relative to this opening 14 so that the end 29 of the branch 28 is higher than the end 31 of the branch 30. In fact, the end 31 of the descending branch relative to the direction of rotation of the distributor disk 18, indicated by the arrow F in FIG. 2, is normally the lowest point of the distributor.

In the upper part of the branch 30, i.e. the descending branch, the wall of the housing 1 and the confronting surface of the partition 24 each comprise a curved recess, respectively 32 and 33 which together define a cavity for housing a closure element which is consti-

tuted in the illustrated embodiment by a cylindrical plug 34 but which may be formed by a flap, a slide or any other suitable element. This plug 34 has an axial length which is equal to the depth of the housing 1 so that, when it is in position in the cavity 32, 33, it completely closes the entrance of the branch 30 of the depression passageway and isolates this entrance from the suction duct 2. The plug 34 is however removable and may be easily withdrawn when the branch 30 must be subjected to a depression.

The bottom 36 of the housing 1 is also provided, in the vicinity of the suciton duct 2, with an air intake 38 which is associated with a pivotal lever 40 behind the bottom 36 on a shaft 42 which extends through an outer boss 44 of the wall of the housing 1 (FIG. 4).

In the embodiment represented in FIGS. 1 to 4, the distributor disk 18 is provided with a series of fins 46 all of which extend toward the cover 4 and are evenly spaced apart on its circumference and include two circumferential rows of orifices 48, 50, one orifice of each of the rows being contained in the cavity 47 defined by two neighbouring fins 46. The diameter of the orifices 48, 50 and their radial position are such that the orifices 48 of the radially outer row are located in confronting relation to the narrow branch 28 or 30 of the depression passageway, while the orifices 50 of the inner row are placed in confronting relation to the cylindrical portion *24a*, *24b* of the partition 24 which defines these narrow branches 28 and 30. In the upper part of the case, the two rows of orifices 48, 50 open onto the wide part 27 of the depression passageway, as shown more particularly in FIG. 2.

On the side of the disk opposed to the depression passageway, the cavities 47 defined by the adjacent fins 46 are radially outwardly closed by the flange 10 of the flange 8 and inwardly by a cylindrical extension 52 of the wall of the seed container which extends in confronting relation to the descending part of the depression passageway in a litle more than one half of a circumference, i.e. up to a point located beyond the seed discharge opening 14.

On the other side of the distributor, i.e. in the vicinity of the rising part of the depression passageway, the cavities are in communication with the container 6. Moreover, the boss 44 carries, by means of two shafts 56 and 57, a deflector element 58 along which slides the surface of the distributor disk 18 opposed to the depression passageway. The element 58 is preferably in the form of a plate whose lower edge is rectilinear and whose profile is such that it partly overlaps and then completely overlaps, the orifices 48 of the outer row as the width of the depression passageway 26 increases.

The distributor constructed in this way ensures with precision, by means of a low depression, sowings whose density is not very high. Indeed, when the seeds 60 have been placed in the central container 6 and the shaft 16 is driven in rotation, for example by a chain sprocket wheel 62, the seeds enter the cavities 47 located in the lower part of the housing, beyond the wall 52, and are carried along by the depression prevailing in the passageway 26 and more particularly in the ascending branch 28. Consequently, seeds are applied, generally in groups of two or three, against each of the orifices 48 corresponding to this ascending branch and are carried along in the direction toward the wide part 27 of the passageway 26. Upon entry in this widened part, each group of seeds encounters the deflector 58 which urges it in the direction toward the orifices 50 of the inner row so that only one of the seeds remains and the other seeds fall back into the central container 6. A seed is in this way applied by the depression against each of the orifices 50 and carried along by the distributor disk 18 to the region of the plug 34. At this point, the action of the depression is interrupted and a seed drops by the effect of gravity into the cavity 47 which contains it where it is retained by the fin 46 and by the flange 10 of the cover until it reaches the discharge opening 14 which enables it to fall into the furrow to be provided with seeds.

Throughout this operation, the lever 40 was maintained in the position illustrated in FIG. 2 where it completely closes the air intake 38 and ensures inside the depression passageway 26 a maximum depression and permits the distribution of relatively heavy seeds, such as seeds of corn or the like, or was shifted in such manner as to clear a more or less large part of this air intake and consequently reduce the magnitude of the depresson inside the passageway 26 for facilitating the distribution of light seeds, such as beetroot seeds.

As light seeds are often also small seeds, it may be advantageous to shift the deflector so as to more rapidly bring the rectilinear edge 64 of the deflector closer to the orifices 50 when the air intake 38 is opened. There is therefore preferably employed in this case, as a deflector, a plate 66 which is fixed, on one hand, on the fixed shaft 57, and, on the other hand, on a movable shaft 67 which is eccentric relative to the axis 42 of pivoting of the lever 40, as shown in FIGS. 4 and 5. In this way, a pivoting of the end of the lever 40 toward the left as viewed in FIG. 5, simultaneously results in an increase in the opening of the air intake 38 and a lowering of the upper end of the plate 66 so that the latter moves toward the orifices 50 which it may even partly close. It will be understood that a pivoting of the lever 40 in the opposite direction for closing the air intake on the contrary raises the upper end of the plate 60 and enables the largest seeds to be retained in an effective manner by a higher depression which is exerted through the orifices 50.

The distributor may therefore be adapted, by a simple adjustment of the position of the lever 40, to different types of seeds and ensure their planting one by one in an extremely reliable and regular manner.

This distributor may also comprise, instead of the distributor disk 18, a distributor disk 68 devoid of fins (FIG. 6) and having only one circumferential row of orifices 70. In this case, the orifices 70 are so arranged as to correspond to the depression passageway 26 and more particularly to the inner volume of the narrow branches 28 and 30. Furthermore, the plug 34 is withdrawn so that the whole of the passageway 26 is subjected to the depression and only the orifices 70 located in the space left free between the ends 29 and 31 of the narrow branches 28 and 30 are not subjected to this depression.

At the entrance of the divergent part 27 of the depression passageway 26, the boss 44 carries, by way of a deflector, a plate 72 whose lower edge is stepped and consequently forms a succession of ramps 73, 74, 75 inclined relative to the circumference formed by the orifices 70. The plate 72 is preferably mounted on the fixed shaft 57 and on the movable shaft 67 so that it is movalbe relative to the row of orifices 70 as a function of the position of the lever 40, i.e. of the opening of the air intake 38. Thus, as in the foregoing embodiment, the position of the plate 72 may vary at the same time as the

magnitude of the depression prevailing in the passageway 26.

However, this depression must always be large and it must exist throughout the extent of the passageway 26. Indeed, when the disk 68 is rotated, the seeds 60 are taken from the container 6 by the suction effect exerted through the orifices 70 facing the narrow branch 28. They usually gather together in groups of two or three against each of these orifices and are carried along by the latter in the direction of the plate 72, or more exactly of the ramps 73, 74, 75. In abutting in succession against these ramps, the group of seeds is displaced and only one of the seeds remains applied against the orifice 70, the others falling back into the central container. The seed 60 which remains against the orifice is shifted along the depression passageway 26 to the end 31 of the narrow branch 31, i.e. substantially up to the moment it is in confronting relation to the discharge opening 14. It then drops onto the ground.

As in the foregoing embodiment, the magnitude of the depression and the position of the deflector element, or selection plate, may be adjusted in an extremely simple manner in accordance with the nature of the seeds. Furthermore, the distributor may be easily adapted to the different types of sowing since the replacement of the disk 18 by the disk 68, or inversely, merely requires the opening of the cover 4 to permit sliding the first disk off the shaft 16, withdraw or place back the plug 34, then mounting the new disk on the shaft 16 before placing the cover 4 back in position. Such operations may be easily carried out by a farmer so that he merely needs to possess one sowing machine and a plurality of distributor disks to be able to carry out in an effective manner any kind of sowing while being able to employ the most appropriate depression and sowing rate.

It will be understood that the distributor may also include a disk provided with fins and a single row of orifices for a sowing of heavy seeds at low density. This disk is preferably employed with the closure element 34 in position so as to limit the depression needs.

The distributor disk could also comprise more than two rows of orifices.

I claim:

1. A distributor for a monoseed sowing machine comprising a generally cylindrical case, a horizontal shaft supported on said case, a distributor disk rotatively mounted on said shaft and provided with circumferentially spaced-apart orifices, said disk separating in said case a seed container from a suction device so that the orifices are subjected to a depression which retains the seeds taken from the container during at least a part of their angular travel about said shaft, means for eliminating double seeds and, in a lower part of the case, a seed discharge opening, said suction device comprising, inside the case, a depression passageway which has substantially the shape of a crescent and ends which are extended toward each other along the periphery of the case by two narrow branches, said passageway comprising at a beginning of one of the branches a cavity and a closure element inserted in said cavity and capable of isolating said one branch from the source of depression.

2. A distributor according to claim 1, wherein the cavity for housing the closure element is formed by a widening of the depression passageway in an upper part of the descending branch relative to the direction of the rotation of the distributor disk, and the closure element is removable.

3. A distributor according to claim 1, wherein an inner wall of the depression passageway is provided with an air intake having an opening and a pivotal lever for adjusting the size of said opening.

4. A distributor according to claim 1, wherein the widest part of the depression passageway is located in an upper part of the case and a suction duct opens onto said passageway in the vicinity of said widest part of the passageway, the two narrow branches extending toward a lower part of the case and terminating on each side of the seed discharge opening.

5. A distributor according to claim 1, comprising a deflector element mounted on the case in the region of an entrance of a wide part of the depression passageway against a side of the distributor disk opposed to the depression passageway.

6. A distributor according to claim 5, wherein the deflector element is fixed.

7. The distributor according to claim 5, which further comprises an air intake having an opening on an inner wall of the depression passageway and a pivotal lever for adjusting the size of said opening, wherein the deflector element is pivotally mounted and has one end carried by a movable shaft movable by the pivoting of the lever controlling the air intake.

8. A distributor according to claim 1, comprising a distributor disk provided with a single row of circumferentially spaced-apart orifices which put the depression passageway in communication with the seed container throughout the length of the depression passageway.

9. A distributor according to claim 1, comprising a disk provided with at least one row of circumferentially spaced-apart orifices and fins which define a succession of cavities each containing an orifice of each row of orifices, the orifices of a radially outer row being in confronting relation to the narrow branches of the depression passageway and the descending branch being isolated from the source of depression by the closure element.

10. A distributor according to claim 8, wherein the deflector element has a stepped lower edge forming a plurality of successive ramps for eliminating double seeds.

11. A distributor according to claim 9, wherein the deflector element has a rectilinear lower surface.

* * * * *

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DIA DE EXPEDICION: 12 DE JUNIO DE 1992.

SOLICITUD Nº:

FECHA DE PRESENTACION :

HORA:

DENOMINACION :

INVENTOR(ES) :

NACIONALIDAD:

TITULAR:

NACIONALIDAD:

DOMICILIO DEL TITULAR:

PRIORIDAD:

MEJORAS A METODO Y APARATO PARA LA COLOCACION PRECISA DE UN DISCO DE SEMILLA EN UN DOSIFICADOR DE SEMILLA.

Inventores: Sres. James Carlson Martin y Jay Harold Olson de nacionalidad norteamericana con domicilios en 1809 - East 31st Street, Davenport, Iowa 52807 y 1716 29th Street, Rock Island Illinois 61201, Estados Unidos de Norteamérica.

Propietario: DEERE & COMPANY, de nacionalidad norteamericana con domicilio en John Deere Road, Moline, Illinois 61265, Estados Unidos de Norteamérica.

EXTRACTO DE LA INVENCION:

En un dosificador o medidor de semilla en el cual un disco de semilla está montado giratoriamente dentro de una caja, un método y un aparato se proporcionan para colocar el disco de semilla dentro de la caja de manera que la parte periférica del

disco de semilla está localizada según se deseé, a una distancia relativamente uniforme de una parte periférica del centro de la caja. Una flecha que tiene una parte externa roscada, está montada giratoriamente entre la caja y un cubo que tiene una abertura roscada, en el mismo está colocado sobre y vaciado en relación a la parte externa listada de la flecha para comenzar a avanzar la abertura roscada sobre la flecha. El disco de semillas es entonces montado sobre el cubo, después de lo cual la rentención del cubo en relación a la flecha se continúa en una dirección para avanzar, el cubo a lo largo de la flecha hacia la caja hasta que una separación de tamaño deseado existe entre la parte periférica del disco de semilla y la parte periférica de la caja. El cubo es entonces sujetado en forma desprendible sobre la flecha mediante la insersión de un perno a través de una abertura en la flecha y a través de un paro opuesto de una pluralidad de ranuras espaciadas alrededor del cubo.

ANTECEDENTES DE LA INVENCION

1. Campo del Invento.

La presente invención se refiere a dosificadores o medidores de semilla en los cuales está montado giratoriamente un disco de semillas dentro de la caja de dosificador, y más particularmente los métodos y aparatos para colocar giratoriamente un disco de semillas montado en forma rotatoria en una ubicación deseada dentro de la caja de un medidor de semilla.

2. Historia del Arte Anterior.

Se conoce en el campo del equipo y maquinaria agricola, el proporcionar un dosificador de semilla lo cual es proporcionar una dispensa a semillas individuales dentro de un surco en el terreno a una taza controlada en conjunción con un aparato asociado para crear el surco y entonces mover la tierra suelta de regreso de adentro del surco después de que las semillas han sido depositadas ahí. Hay varios tipos diferentes de dosificadores de semilla incluyendo del tipo mecánico en el cual las semillas individuales son obtenidas de un amase de semillas y descargadas del dosificador para depositarse dentro del surco por medio de dispositivos mecánicos. Aún otros tipos dosificadores desemilla son los de tipo de aire en los cuales la presión diferencial se emplea típicamente en conjunción con un disco de semilla giratorio o dispositivo similar, para tomar semillas del amase de semillas y entonces descargarlas del dosificador hacia adentro del surco. Los dosificadores de semillas de aire pueden ser del tipo de flujo de aire positivo en el cual las semillas son tomadas por el disco de semillas y mantenidas ahí mediante aire soplado. Los dosificadores de aire de semilla también pueden ser del tipo de vacío en los cuales se emplea una presión reducida al disco de semilla en una manera que permite al disco el tomar y llevar semillas individuales el mismo con la ayuda de la presión reducida.

Un ejemplo de un dosificador de semilla por vacío se proporciona en la solicitud co-pendiente No. 546,834 or[illegible]

Lundie y otros, presentada el 31 de octubre de 1983 y comunmente asignada con la presente solicitud. La solicitud de Lundie y otros describe un dosificador de semillas por vacío en el cual está montado un disco de semilla giratorio dentro del interior hueco de una caja como para tener una masa de semilla dispuesta en un lado del mismo y una fuente de presión reducida acoplada a una cámara de vacío en el lado opuesto del disco. La presión reducida se comunica con una pluralidad de celdas de semilla rebajadas en el lado del disco de cara al avance de semillas a través de aberturas que se extienden a través del espesor del disco desde los fondos de las semillas. La presión reducida ayuda a las celdas a tomar las semillas individuales de la masa y a transportarlas a una área de descargas de semillas sellada de la presión reducida para proporcionar el desprendimiento de las semillas llevadas en las celdas de semilla. Las semillas desprendidas cáen a través de un tubo de descarga hacia dentro de un surco en el terreno formado por una unidad abridora montada en conjunción con dosificador de semillas.

En el dosificador de semillas por vacío descrito en Lundie y otros, la aplicación de la masa de semillas sobre un lado del disco de semillas giratorio se forma por semillas que cáen desde una tolva montada arriba del dosificador de semillas dentro de una cámara de semillas formada en el lado del disco de semillas por la forma del interior hueco de la caja del dosificador. La parte de periferia externa del disco de semillas

está colocada en forma adyacente y cercana a una parte periférica externa del interior hueco de una caja dosificadora para evitar que las semillas en la cámara de semillas escapen al exterior del dosificador de semillas.

Una solicitud co-pendiente, Serie No. 546,829 de Olson, presentada el 31 de octubre de 1983 de los Estados Unidos de Norteamérica y comunmente cedida con la pendiente solicitud, describe un arreglo de el dosificador de semillas por vacío, de la solicitud de Lundie y otros en el cual un espacio relativamente pequeño se forma entre la parte periférica externa del disco de semillas y la parte periférica adyacente del interior de hueco de la caja sobre lado del disco de semillas en donde la masa de semillas reside. El espacio define una separación entre el disco de semillas y la caja el cual es lo suficientemente grande para permitir la expulsión de la basura desde el interior de la caja de dosificador mientras que al mismo tiempo evita el escape de las semillas mismas incluyendo en particular semillas de tamaño relativamente pequeño. La basura en la cual es eliminada mediante su paso a través de tal separación incluye polvo, suciedad y partículas no deseadas de tamaño relativamente pequeño tal como partículas de semillas rotas o similares. Como se describe en la solicitud de Olson, la parte periférica externa en el disco de semillas puede estar provista con una sucesión de aletas colocadas sobre los lados opuestos de los rebajes entre los mismos para agitar y alentar

la expulsión de basura que pudiera acumularse en la interferencia entre el disco de semillas y las partes adyacentes del interior de la caja.

En el arreglo descrito en la solicitud de Olson, se desea no solamente el que la separación entre el disco de semillas y el interior de la caja sea de un tamaño nominal deseado sino que también tal separación sea de un tamaño relativamente uniforme alrededor de la parte periférica externa completa del disco de semillas. Una separación la cual es muy grande puede resultar en expulsión de las semillas mismas, particularmente aquellas semillas de tamaño más pequeño, además de la basura. En forma inversa una separación que es muy pequeña puede no permitir la expulsión adecuada de la basura. Una separación no uniforme tiene a proporcionar una expulsión no uniforme de la basura y de la expulsión no deseada de semillas en lugares en donde la separación se ha hecho indebidamente.

En los dosificadores de semilla por vacío particular y descritos en las solicitudes de Lundie y otros y de Olson, el disco de semillas está montado para girar dentro del interior hueco de la caja dosificadora mediante una flecha montada giratoriamente dentro de la caja y que tiene un cubo de montaje de disco de semilla colocados sobre el extremo exterior del mismo, para montar el disco de semilla para girar con la flecha. Un ejemplo del cubo de montaje de disco de semilla se proporciona por la solicitud co-pendiente serie No. 546,831, presentada el 31 de octubre de 1983 a nombre de Webber y comunmente cedida con

la presente solicitud. Durante la fabricación de tales dosificadores de semilla el cubo de montaje de disco de semilla,está típicamente montado sobre el extremo exterior de la flecha tal como por medio de un perno de fiador, después de lo cual el extremo opuesto de la flecha se presiona dentro de el casco externo de un cojinete dentro de la caja para lograr un ajuste de interferencia entre los mismos. La presión de la flecha dentro de el casco de cojinete se lleva a cabo usando equipo que ha sido programado para proporcionar una separación deseada entre el disco de semilla y la caja. Desafortunadamente, este proceso hace difícil de formar tal separación dentro de las tolerancias estrechas deseadas. Adicionalmente, una vez que la flecha es presionada dentro del casquillo de cojinete , puede ser muy difícil el reubicar la flecha para proporcionar la separaciónde disco-caja deseada, particularmente cuando el equipo de instalación de flecha no está disponible. Tal problema puede surgir, por ejemplo, en el campo en donde el agricultor descubre que la separación entre el disco de semillas y la caja es muy grande o muy pequeño. Otro problema en el cual comunmente existe,es la falta de perpendicularidad. Como un resultado de la desalineación de la flecha por la presión dentro del casquillo de cojinete o posiblemente debido a dos factores, el eje central de la flecha y por tanto del disco de semilla mismo puede no ser precisamente particular al plano de la parte periférica del interior de la caja que está de entrecara con la parte periférica externa del disco de semilla.

Esto puede resultar en una separación uniforme con sus desventajas inherentes como se anotó previamente.

Por tanto sería ventajoso proporcionar un método y aparato mejorados para montar giratoriamente un disco de semillas dentro del interior hueco de una caja de un dosificador de semillas.

Sería adicionalmente ventajoso el proporcionar un método y aparato mejorados para montar giratoriamente un disco de semillas dentro del interior hueco de una caja de un dosificador de semillas en una manera que proporcione tanto una separación de tamaño deseado entre los mismos y una separación la cual es relativamente uniforme en tamaño alrededor de la parte periférica externa completa del disco de semillas.

BREVE DESCRIPCION DE LA INVENCION

Estos y otros objetos se logran de acuerdo con la invención mediante los métodos de montaje de disco y los aparatos en los cuales un cubo de montaje de disco de semilla debe ser sujetado a una flecha en cualesquiera de una pluralidad de ubicaciónes diferentes a lo largo de una parte de la longitud de la flecha siguiendo la instalación de la flecha en la caja dosificador. Adicionalmente el ajuste entre el cubo y la flecha se proporciona con una tolerancia o juego suficiente para compensar por una falta de perpendicularidad que puede existir entre el disco de semillas y la caja.

La flecha se instala primero en la caja de dosificador de semilla tal como mediante presionando un extremo de la misma dentro de la posición en un casquillo de cojinete den

de la caja. Después,el cubo es por colocar inicialmente so
bre el extremo opuesto de la flecha y el disco de semillas
es entonces montado sobre el cubo. El cubo y el disco de semi
lla incluído son entonces avanzados,a lo largo de la flecha
hacia el interior de la caja hasta que una separación del tama
ño deseado entre la parte periférica externa del disco de semi
llas y la parte periférica externa adyacente del interior de
la caja se logra. El cubo es entonces sujeto a la flecha de ma
nera que la separación deseada se mantiene después. El disco
de semillas se remueve del cubo si es necesario para permitir
la sujeción del cubo a la flecha después de lo cual el disco
es de nuevo montado sobre el cubo. Una cantidad predeterminada
de tolerancia o juego se proporciona en el ajuste del cubo
sobre la flecha de manera que el eje de rotación del cubo y el
disco de semillas puede formar ángulos relativamente pequeños
con el eje central de la flecha. Esta cantidad pequeña de jue
go permite al eje de rotación del disco de semillas,el cambiar
ligeramente como sea necesario para mantener la separación en-
tre el disco de semillas y la caja relativamente uniforme.

La nueva modalidad preferida de un método y apara-
to de acuerdo con la invención como una parte externa de la
flecha opuesta al interior de la caja se rosca como es una
abertura dentro de una parte central del cubo. Después de la
instalación de la flecha en la caja y con el disco de semillas
removido del cubo, la abertura cntral en el cubo es roscada
sobre la parte externa roscada de la flecha para colocar inicial
mente el cubo sobre la flecha. El disco de semillas es entonces

montado sobre el cubo, después de lo cual el cubo y el disco de semilla incluído se giran en relación a la flecha en nueva dirección para avanzar el cubo a lo largo de la longitud de la flecha hacia el interior de la caja. Cuando se logra una separación de tamaño deseado entre el disco de semilla y la caja, el cubo se sujeta sobre la flecha de manera que la separación es en adelante mantenida. La sujeción del cubo a la flecha se logra al remover el disco de semillas hacia el cubo después de lo cual se inserta un perno a través de una abertura en la flecha y a través de un paro opuesto de pluralidad de ranuras en el cubo que se extienden alrededor de la abertura roscada. El perno es mantenido en forma liberable en su lugar por medio de una parte colgada del mismo que tiene una extremo curveado externo el cual asienta en forma elástica dentro de una diferente de la pluralidad de ranuras en el cubo. Con el cubo sujetado en forma desprendible así en su lugar sobre la flecha como para proporcionar una separación de tamaño deseado entre el dosificador de semilla y la caja, el disco de semilla es nuevamente montado sobre el cubo. La abertura roscada en el cubo es ligeramente más grande que la parte externa roscada de la flecha. Esto proporciona una pequeña cantidad de tolerancia o juego entre la abertura roscada del cubo y la flecha, pero haciendo posible que el eje de rotación del cubo y del disco de semillas pivoteé ligeramente y forme ángulos pequeños con el eje central de la caja. Esta pequeña cantidad de juego hace que el disco de semillas gire en una manera que proporciona una separación uniforme entre la parte periferica externa del disco

de semillas y la parte periférica adyacente de la caja.

BREVE DESCRIPCION DEL DIBUJO

Los objetos anteriores y otros, características y ventajas en la invención serán evidentes de una descripción más particular siguiente de una modalidad preferida de la invención, como se ilustra en los dibujos anexos, en los cuales:

La figura 1 es una vista en perspectiva de un dosificador de semillas teniendo un aparato para la colocación precisa del disco de semillas allí de acuerdo con la invención, el dosificador de semilla estando mostrado en una posición abierta junto con el disco de semilla;

La figura 2 es una vista en planta de un dosificador de semillas de la figura 1 con el dosificador en la posición abierta y mostrando el lado de reversa del disco de semillas;

La figura 3 es una vista seccional de un dosificador de semillas en una posición cerrada.

La figura 4 es una vista en perspectiva trasera e izquierda del dosificador de semillas de la figura 1 con el dosificador en la posición cerrada.

La figura 5 es una vista en sección de una parte del dosificador de semillas de la figura 1 ilustrando la separación pequeña entre la parte periférica externa del disco de semillas y la parte periférica externa adyacente de la caja dosificadora de semillas.

La figura 6 es una vista en perspectiva de una parte del borde externo del disco de semillas ilustrando una serie de cavidades espaciadas-separadas y de las costillas intervenientes formadas ahí.

La figura 7 es un diagrama de bloque de los pasos sucesivos y el método para la colocación precisa de un disco de semillas en un dosificador de semillas de acuerdo con la invención.

La figura 8 es un bloque de diagrama de pasos detallados sucesivos de un ejemplo detallado del método de la figura 7 para colocar en forma precisa el disco de semillas en el dosificador de semillas de las figuras 1-6.

La figura 9 es una vista en perspectiva y despiezada de una parte del dosificador de semillas de la figuras 1-6 incluyendo una flecha como un cubo y un perno los cuales están incluídos en el aparato utilizado en el método de la figura 8.

La figura 10 es una vista frontal del cubo de la figura 9.

La figura 11 es una vista lateral del cubo de la figura 9; y

La figura 12 es una vista frontal agrandada del perno de la figura 9.

DESCRIPCION DETALLADA

Las figuras 1-6 ilustran un dosificador de semillas por vacío 10 útil para describir los métodos y aparatos de acuerdo a la presente invención. El dosificador de semillas por vacío 10 es similar a aquél mostrado y descrito en la solicitud co-pendiente

de los Estados Unidos de Norteamérica previamente mencionada serie No. 546,834 de Lundie y otros que se incorpora aquí por referencia. Por tanto aquellas partes del dosificador de semilla por vacío 10 no directamente relacionados a la presente invención se describirán solamente en forma breve más adelante.

El dosificador de semillas por vacío 10 tiene una caja generalmente cilíndrica 12 puesta de una primera media concha 14 y una segunda media concha que hace juego y opuesta 16. La segunda media concha 16 está acoplada a la primera media concha 14 por una bisagra 18 permitiendo a la segunda media concha 16 el cerrarse sobre la primera media concha 14 para cerrar la caja 12. Una grapa 20 montada sobre la primera media concha 14 sobre un lado de la misma opuesta a la bisagra 18 está sujeta a la segunda media concha 16 para retener la caja 12 en una posición cerrada.

El cubo 22 está montado giratoriamente dentro de la primera media concha 14 de la caja 12 en el centro de la primera media concha 14. Como se vé en las figuras 3 y 4 un par de orejas 24 y 26 están colocadas sobre el exterior de la primera media concha 14 en el respaldo de la caja 12. Las orejas 24 y 26 están enganchadas por un arreglo de impulsión mostrado en la figura 3 para impulsar giratoriamente el cubo 22.

El dosificador de semilla 10 incluye un disco de semillas 28 el cual tiene una abertura alargada 30 en el centro de la misma. El disco de semillas 28 está montado para girar sobre el cubo 22 mediante el paso de una manija 32 la cual está

está montada sobre el cubo 22 a través de la abertura alargada 30 para asentar el disco de semillas 28 sobre el cubo 22. La manija 32 es entonces girada a una posición para fijar el disco de semillas 28 sobre el cubo 22. Este arreglo para montar el disco de semillas 28 sobre el cubo 22 el cual está también mostrado en la figura 9 es similar a un arreglo descrito en detalle en la solicitud co-pendiente previamente mencionada Serie No. 546,831 de Webber, cuya solicitud se incorpora aquí por referencia.

El disco de semillas 28 tiene una pluralidad de aberturas 34 arregladas allí en un arreglo adyacente conferencial y dentro de un borde externo circular 36 desde el disco de semillas 28. Cada una de las aberturas 34 se extiende a través del grosor del disco de semillas 28 entre un primer lado 38 del disco de semillas 28 y el fondo de una de una pluralidad de celdas de semilla 40 formadas en un segundo lado opuesto 42 del disco de semillas 28.

Con el disco de semilla 28 montado sobre el cubo 22 y la segunda media concha 16 fijada sobre la primera media concha 14, el disco de semillas 28 divide el interior hueco de la caja cilíndrica 12 en una cámara de semillas 44 entre el disco de semillas 28 y la primera media concha 14 y una cámara de vacío 46 entre el disco de semillas 28 y la segunda media concha 16. Una fuente de vacío está acoplada por una lumbrera de vacío 47 en la segunda media concha 16 para crear una presión reducida dentro de la cámara de vacío 46 adyacente al primer

lado 38 del disco de semillas 28. La presión reducida se comunica con las celdas de semillas 40 formadas en el segundo lado 42 el disco de semillas 28 a través de las aberturas 34.

Como se muestra en la figura 1 la primera media concha 14 de la caja cilíndrica 12 está montada en la base de una tolva de semilla 48 para contener semillas que van a ser dosificadas por el dosificador de semillas por vacío 10. Las semillas de la tolva de semillas 48 fluyen hacia adentro de la cámara de semillas 44 dentro de la primera media concha 14 en donde forman una masa de semillas en contra del segundo lado 42 del disco de semillas 28. Cuando el cubo 22 es impulsado giratoriamente como para girar el disco de semillas 28 las celdas de semillas 40 agitan, aceleran y entonces capturan semillas individuales en las mismas cuando estas se mueven a través de la masa de semillas dentro de la cámara de semilla 44. Cuando cada celda de semilla 40 se eleva fuera de la masa de semillas, la semilla contenida ahí se mantiene en su lugar por la presión reducida dentro de la cámara de vacío 46 que se comunica con la semilla a través de la abertura 34. La presión reducida retiene a la semilla en su lugar en la celda de semilla 40 hasta que la celda de semilla 40 pasa a través de un cepillo divisor 50. El cepillo divisor 50 se extiende a través del interior de la primera media concha 14 y define un área de descarga de semilla 52 la cual está separada de la cámara de semillas 44 y la masa de semilla contenida ahí por el cepillo divisor 50 y una pared divisora 54 desde la cual el cepillo 50 está montado. Cuando la celda de semilla 40

entra en el área de descarga de semillas 52, los efectos de la presión reducida de dentro de la cámara de vacío 46 se cortan. Esto se debe a la forma de un sello de vacío 56 que está montado sobre el interior de la segunda media concha 16 el cual se extiende para hacer contacto con la primer lado 38 del disco de semillas 28. Una parte 57 del sello de vacío 56 se extiende hacia adentro desde la región adyacente a la circunferencia de la segunda media concha 16 para aislar el área de descarga de semillas 52 de la presión reducida. Cuando la presión reducida es cortada cada celda de semilla 40, la semilla contenida ahí cáe fuera de la celda de semilla 40 bajo la influencia de la gravedad. Las semillas cáen a través de un tubo de descarga de semilla 58 en el fondo de la primera media concha 14 al terreno que está abajo.

Refiriéndonos a la figura 3 las semillas de la tolva de semilla 48 mostradas en la figura 1 forman la masa de semillas dentro de la parte inferior de la cámara de semillas 44. Las semillas de la masa de semillas residen sobre una superficie interna 60 de un borde externo generalmente circular 62 de la caja generalmente cilíndrica 12. La semilla también quedan en contra del segundo lado 42 del disco de semillas 28 así como una pared interna opuesta 64 dentro de la primera media concha 14. Cuando es usado el dosificador de semillas 10, las astillas de semilla, las semillas rotas, la suciedad y otros desperdicios comienzan a formar excedente de la cámara de semillas 44. La mayor parte de tal desperdicio es jalado a través de las aberturas 34 en el disco de semilla 28 por la presión reducida en la cámara de vacío 46. Mucho de el

desperdicio restante se sienta sobre la superficie interna 60 en el segundo lado 42 del disco de semilla 28.

El desperdicio que se sienta dentro de la cámara de semillas 44 se elimina por un arreglo el cual está descrito en mayor detalle en la solicitud norteamericana co-pendiente Serie No. 546,829 de Olson, previamente mencionada, cuya solicitud se incorpora aquí por referencia,cuyo arreglo incluye un miembro de sellamiento de semilla y de limpia 66 montado sobre una superficie plana de configuración circular que comprende una parte periférica externa 68 de la primera media concha 14 de la caja 12. Como se vé en las figuras 1 y 2 los miembros de sellamiento de semilla y limpieza 66 son de una configuración alargada como para ponerse alrededor de una parte substancial de la circunferencia del molde externo 62 de la caja 12. El miembro de sellamiento de semilla y de limpia 66 está interrumpido solamente por el tubo de descarga de semilla 58 en el fondo del área de descarga de semilla 52.

Miembros de acinamiento de semilla y de limpia 66 tiene una superficie 70 que se extiende a lo largo de la longitud del miembro 66 a un lado de la parte periférica externa 72 del disco de semillas 28 en la región del borde externo circular 36 como para formar una pequeña separación 74 con el mismo. La forma de sección transversal de miembro de acinamiento de semilla y limpia 66 es ahusada de manera que de la superficie externa 70 de el mismo se inclina gradualmente hacia afuera de la parte periférica externa 72 del disco de semillas 28 con una distancia que se incrementa

desde un eje de rotación 76 alrededor del cual gira el disco de semillas 28.

El tamaño de la separación 74 a un lado del borde interno 78 del miembro de sellamiento de semilla y limpia 66 deberá ser lo suficientemente pequeño para estar debajo de la gama limitada del tamaño de un tipo particular de semilla siendo usado dentro del clasificador de semilla 10. Al mismo tiempo el tamaño de la separación 74 debe ser lo suficientemente grande para permitir el paso libremente de la mayor parte de las astillas de semilla, semillas rotas, suciedad y otros desperdicios a través de la misma. Por tanto, la separación 74 facilita la limpieza del interior de la cama de las semillas 44 mientras que al mismo tiempo sella a las semillas allí. Esto se ilustra en la figura 5 la cual muestra tanto semillas completas 80 como partículas de desperdicio 82 que pueden comprender astillas de semillas, semillas rotas o suciedad.

Como se muestra en la figura 6 el borde externo 36 del disco de semillas 28 está provisto con una serie de cavidades espaciadas-separadas 84 allí. Cada par adyacente de las cavidades 84 define una costilla 86 entre las mismas. Las costillas 86 las cuales están localizadas en un lado de las separaciones 74 y que tiene la superficies superiores que se inclinan hacia abajo desde el lado 42 del disco de semillas 28 a un nivel igual aquel de las cavidades 84 - a cabo una sección de raspado al raspar cualesquier acumulaciones de desperdicio que puedan ocurrir dentro de la separación 74. Las

costillas 86 también agitan los desperdicios que entran en la separación 74 para acelerar el paso de tal desperdicio a través de la separación 74. Esto se ayuda por las cavidades intervenientes 84 que reciben algo de el desperdicio agitado por las costillas 86 y lo pasan libremente y rápidamente hacia afuera de la separación 74.

La caja cilíndrica 12 tiene una ranura 88 allí que se extiende alrededor de sustancialmente la circunferencia completa del borde externo generalmente circular 62 del mismo . La ranura 88 está formada mediante bordes opuestos de las medias conchas primera y segunda 14 y 16 las cuales se mantienen en una relación ligeramente espaciada y separada por un arreglo de brida como se muestra en las figuras 1, 2 y 4. En la figura 2 la primera media concha 14 tiene una brida 90 en el borde externo de la misma opuesto a la bisagra 18 y localizada justo fuera del miembro de sellamiento de semilla y de limpieza 66. Un par adicional de bridas 92 y 94 están localizadas sobre los lados opuestos de la primera media concha 14 entre la brida 90 y la bisagra 18. La segunda media concha 16 tiene una media brida 96 en el borde externo de la misma opuesto al agujero 18 y un par opuesto de bridas intermedias 98 y 100. La separación radial de las bridas 96, 98 y 100 del centro de la media concha 16 es ligeramente mayor que las separación radial de las bridas 90, 92 y 94 desde el centro de la primera media concha

14. Cuando la segunda media concha 16, esta cerrada sobre la prime ra media concha 14, la brida 96 se extienden justo hasta el ex terior de y en contacto con la brida 90. En forma similar las bridas 98 y 100 se extienden junto y al exterior de y en contac to con las bridas 92 y 94 respectivamente. Las varias bridas 90, 92, 94, 96, 98 y 100 se combinan con la acción de la bisa- gra 18 para retener los bordes de las medias conchas 14 y 16 separados por una distancia pequeña y relativamente unifor me que forma la ranura 88.

Se verá por tanto que la ranura 88 se cierra de al rededor de substancialmente la circunferencia completa de la ca ja 12 a un la do del miembro de sellamiento de semilla y de lim pieza 66 y el borde externo 36 y el disco de semillas 28. La ranura 88 facilita la expulsión de desperdicio del interior de la caja cilíndrica 12 son virtualmente de alrededor del borde externo generalmente circular 62 de la caja 12, como se ilustra en la figura 5.

Como se muestra en la figura 2 el segundo lado 42 del disco de semillas 28 tiene un anillo separador que se extien de hacia afuera 102 formado ahí. El anillo separador 102 está centrado sobre el disco de semillas 28, para tener el centro del mismo en el eje de rotación 76. El anillo separador 102 que se extiende para ser contacto con el cubo 22 y el disco de semillas 28 está montado sobre el mismo determina la separación del disco de semillas 28 y del cubo 22, y por tanto una vez que el cubo 22 está actualmente fijo dentro de la caja 12, el anillo

separador 102 determina el tamaño nominal de la separación 74 entre el miembro de sellamiento de semilla y limpieza 66 en la parte periférica externa 68 de la caja 12 y en la parte periférica externa 72 del disco de semilla 28. El disco de semillas 28 es normalmente usable solamente con una clase particular de semillas teniendo una gama de tamaño limitada predeterminada. Por tanto el anillo separador 102 puede ser diseñado para proporcionar el tamaño deseado de la separación 74 para sellar la semilla que tiene tamaños dentro de la gama de tamaños limitada dentro de la cámara de semillas 44 mientras que al mismo tiempo se proporciona el escape del desperdicio a través de la separación 74. Cuando un tipo diferente de semilla va a usarse en el dosificador de semillas 10, el disco de semillas 28 es normalmente cambiado. El nuevo disco se proporciona con un anillo separador 102 que tiene un grosor que corresponde al tamaño de las semillas con las que el nuevo disco está diseñado para usarse. Las semillas de disco 28 diseñadas para usarse con semillas más grandes tienen los anillos separadores 102 los cuales son relativamente anchos como para colocar el segundo lado 42 del disco de semillas 28 a una distancia mayor del cubo 22 para proporcionar la separación 74 con un tamaño más grande. Cuando las semillas más pequeñas se van a dosificar, la separación 74 debe reducirse en tamaño para sellar las semillas dentro de la cámara de semillas 44 y para evitar el escape de la misma. Esto se logra mediante el proporcionar discos de semillas 28

los cuales son usados con las semillas más pequeñas con un anillo de separación más estrecho 102 el cual coloca el segundo lado 42 del disco de semillas 28 más cerca del cubo 22.

Como se notó previamente en relación a la figura 3, el disco de semillas 28 el cual está montado sobre el cubo 22 está giratoriamente impulsado mediante el enganche de las orejas 24 y 26. Las orejas 24 y 26 las cuales están enganchadas por un arreglo de impulsión giratoria 104 mostrada en la figura 3 están acompladas a un cojinete 106 montado dentro de un agujero 108 dentro de la primera media concha 14 de la caja 12 y teniendo un casquillo externo 110. El cubo 22 está acoplado al casquillo externo 110 del cojinete 106 por una flecha 112 que tiene un primer extremo 114 presionado dentro del casquillo externo 110 y un segundo extremo roscado opuesto 116 para recibir una abertura central roscada 118 del cubo 22. El segundo extremo 116 de la flecha 112 termina en un perno 120 que se extiende dentro y giratoriamente y montando elásticamente la manija 32 sobre el mismo. Como se describirá de aquí en adelante la flecha 112 combina con la abertura central roscada 118 del cubo 22 para proporcionar la colocación precisa del disco de semillas 28 en relación a la primera media concha 14 de la caja 12. Tal colocación precisa permite a la separación 74 entre la parte periférica externa 68 de la caja 12 y la periferia externa 72 del disco de semillas 28 el ser de un tamaño deseado y también el ser relativamente uniforme en tamaño alrededor del borde externo completo 62 de la caja 12. Como se notó previamente la expulsión adecuada de el

desperdicio tal como las partículas 82 con la exclusión de las semillas completas 80 depende de la separación 74 que sea de un tamaño uniforme deseado.

La figura 7 muestra los pasos sucesivos en un método de colocación preciso de un disco de semillas dentro de la caja de un dosificador de semillas de acuerdo con la invención.

El método de la figura 7 comienza con un primer paso 122 en el cual una flecha está montada para girar dentro de la caja de el dosificador de semillas. En un segundo paso siguiente 124 un cubo para montar un disco de semillas se coloca inicialmente sobre la flecha. La colocación inicial del cubo sobre la flecha se logra con el disco de semillas removido del cubo a fín de facilitar tal colocación inicial del cubo. Después de la colocación inicial del cubo sobre la flecha, el disco de semillas es montado sobre el cubo en el siguiente tercer paso 126. Con el disco de semilla montado sobre el cubo como se proporciona en el tercer paso 126, el cubo y el disco de semillas incluido se avanza a lo largo de la flecha a una posición deseada en un cuarto paso 128.

El movimiento del cubo y el disco de semillas incluído a lo largo de la flecha de acuerdo con el cuarto paso 128 del método de la figura 7 proporciona la variación en la colocación del disco de semillas en relación a la caja de dosificador de semillas. Por tanto, la separación 74 entre la parte periférica externa 72 del disco de semillas 28 y la parte periférica externa 68

de la caja 12 puede proporcionarse con un tamaño seleccionado de semilla por la posición deseada del cubo sobre la flecha.

En un quinto paso final 130 del método de la figura 7 el cubo es sujetado a la flecha en la posición deseada. La sujeción del cubo a la flecha puede ser permanente pero preferiblemente se hace en una forma desprendible para permitir al cubo el ser colocado en otras posiciones deseadas sobre la flecha tal como para cuando sea deseable cambiar el tamaño de la separación 74

En la figura 8 proporciona un ejemplo detallado del método de la figura 7 como se aplica al dosificador de semillas de vacío particular 10 de las figuras 1-6.

En el método de la figura 8 el montaje de la flecha en la caja de acuerdo con el primer paso 122 de la figura 7 se logra por un paso 132 en el cual la flecha 112 es presionada dentro del casco externo 110 del cojinete 106 en la primera media concha 14 de la caja dosificadora de semillas 12. Este es un tipo de interferencia de ajuste de fuerza que proporciona el montaje giratorio de la flecha 112 dentro de la caja 12. Como se muestra en la figura 3 el primer extremo 114 de flecha 112 es presionado dentro del casco externo 110. Esta operación puede llevarse a mano pero preferiblemente se hace a máquina lo cual proporciona un montaje más uniforme consistente de la flecha 112. El cojinete 106 con su casco externo 110 y la flecha 112 se muestra en la figura 9 así como en la figura 3.

En un siguiente paso 134 del método de la figura 8 el segundo paso 124 del método de la figura 7 se logra mediante el empezar a atornillar el cubo 22 sobre la flecha 112. Como se notó previamente la superficie exterior de la flecha 112 está roscada a lo largo de una parte de la misma en el segundo extremo 116. El cubo 22 tiene la abertura central roscada 118 en el mismo. El paso 134 se logra enganchando el cubo 22 con el segundo extremo 116 de la flecha 112 y entonces volteando el cubo 22 en la dirección apropiada para comenzar el atornillamiento del cubo 22 sobre la flecha 112. En un siguiente paso 136 del método de la figura 8 el aparato usado en el montaje del disco de semillas 28 se instala sobre el cubo 22 en preparación para el montaje de disco de semillas 28 sobre el cubo 22. En el mecanismo de montaje de disco descrito en la solicitud norteamericana co-pendiente No. 546,831 a la que previamente se ha hecho referencia de Weber, la manija es sujetada en forma giratoria y elásticamente al cubo mediante un guardian montado sobre el extremo externo de un perno que se extiende desde el cubo y un resorte en espiral que rodea el perno y colocado entre el retén en un extremo del mismo y un lomo anular dentro de una abertura central en la manija en el otro extremo de la misma. Un arreglo similar es como se muestra en las figuras 3 y 9 en donde la manija 32 está montada giratoria y elásticamente sobre el perno 120 dependiéndose desde el segundo extremo 116 de la flecha 112.

Como se muestra en la figura 3 un resorte en espiral 138 el cual rodea al perno 120 se extiende entre una superficie anular 140 dentro de la manija 32 y un retén 142 presionado sobre un extremo externo del perno 120.

Después de la colocación inicial del cubo 22 sobre la flecha 112 en el paso 134, el paso 136 se empieza mediante la instalación de la manija 32 sobre el perno 120. El perno 110 es insertado dentro de la abertura central de la manija 32, después de lo cual el resorte 138 es colocado sobre el perno 120 y el retén 142 es presionado sobre el extremo exterior del perno 120. La manija 32 como está así montada,está ya lista para montar el disco de semillas 28 sobre el cubo 22.

En un siguiente paso 137 del método de la figura 8, que corresponde al tercer paso 126 al método de la figura 7 el disco de semilla 28 es montado sobre el cubo 22. Como se muestra en la figura 9 el cubo 22 el cual es de forma generalmente de disco tiene una perilla 144 en el centro del mismo que se extiende hacia afuera desde los lados opuestos de la parte de forma de disco del cubo 22 y tiene la abertura central roscada 118. Un par de miembros alargados 146 y 148 se extienden hacia afuera desde la perilla 144 sobre los lados opuestos de la misma sobre el lado del cubo 22 opuesto a la flecha 112 y reciben los elementos alargados 150 y 152 respectivamente de la manija 32 cuando la manija 32 está alineada con los elementos alargados 146 y 148 del cubo 22. Con la manija 32 en esta posición, el

disco de semillas 28 está montado mediante la inserción de la manija 32 a través de la abertura alargada 30 en el disco de semillas 28 para que el anillo separador 102 del disco de semillas 28 sea asentado sobre la parte de forma de disco del cubo 22 sobre una ceja externa 153 con la perilla 144 y los elementos alargados opuestos 146 y 148 colocados dentro de la abertura alargada 30. Con el disco de semillas 28 así colocado la manija 32 es entonces girada en relación con el cubo 22 de manera que los elementos alargados opuestos 150 y 152 de la manija 32 vayan sobre las trampas opuestas 154 y 156 en los lados de la abertura alargada 30 contra la resistencia del resorte en espiral 138. Las rampas 154 y 156 están mostradas en las figuras 2 y 3. Eventualmente, los elementos alargados opuestos 150 y 152 de la manija 32 se sientan dentro de los rebajes en las rampas 154 y 156, y el montaje del disco de semillas 28 sobre el cubo 22 se completa con el disco de semillas 28 así montado, el eje de rotación 76 del mismo coincide con el eje central del cubo 22.

Con el disco de montaje 28 montado sobre el cubo 22 como se preveé en el paso 137, un siguiente paso 158 en el método de la figura 8 corresponde al cuarto paso 128 en el método de la figura 7 se lleva a cabo. El paso 158 se lleva a cabo mediante el continuar atornillando el cubo 22 sobre la flecha 112 hasta que el disco de semillas 28 está a una distancia deseada de la caja 12. Más específicamente, el cubo 22 y el disco de semilla 28 el cual está montado sobre el mismo se

giran alrededor de la flecha 112 en una dirección para avance del cubo 22 a lo largo de la parte roscada de la flecha 112 hasta que la separación 74 entre la parte periférica externa 62 del disco de semilla 28 y la parte periférica externa 68 de la primera media concha 14 de la caja 12 tiene un tamaño deseado. El tamaño de separación deseado puede ser determinado por cualesquier técnica apropiada incluyendo el uso de un elemento espaciador. Con tal elemento espaciador colocado en contra de las superficies externa 70 de el miembro de sellamiento de semilla y de limpieza 66, el cubo 22 y el disco de semillas 28 son girados alrededor de la flecha 112 hasta que el disco de semillas 28 hace contacto con el elemento espaciador, en cuyo momento el elemento separador se remueve de la separación 74.

En un siguiente paso 160 del método de la figura 8 el disco de semilla 28 se remueve del cubo 22. Esto se logra mediante la rotación de la manija 32 de manera que los elementos alargados y opuestos 150 y 152 de la misma se deslicen hacia abajo y entonces fuera de las rampas 154 y 156 sobre el disco de semilla 28 y sobre los elementos alargados 146 y 148 del cubo 22. Con la manija 32 así alineada con los elementos alargados 146 y 148 del cubo 22 el disco de semilla 28 puede simplemente ser jalado fuera del cubo 22. La remoción del disco de semillas 28 del cubo 22 en el paso 160 se necesita de llevar a cabo un siguiente paso 162 en el método de la figura 8.

En el paso 162 del método de la figura 8 el cual corresponde al paso final 130 del método de la figura 7 el cubo 22 está sujeto a la flecha 112 mediante la instalación de un perno de fijación en el cubo 22 y en la flecha 112. La instalación del perno de fijación 164 asegura en forma desprendible al cubo 22 en la posición deseada sobre la flecha 112.

El perno de fijación 164 que se muestra en las figuras 3 , 9 y 12 incluye una parte recta 166 del mismo y una parte curveada 168. La parte curveada 168 termina en otro extremo curvo 170. La instalación del perno de fijación 64 sobre el cubo 22 se logra insertando la parte recta 166 del mismo a través de un par opuesto de ranuras 172 en la perilla 144 del cubo 22 y a través de la abertura 174 en la flecha 112. La abertura 174 está mostrada en linea punteada en la figura 9. La perilla 144 está provista con cuatro de las ranuras 172. Las ranuras 172 están localizadas en forma generalmente equidistante o aproximadamente a 90° de separación alrededor de la abertura central roscada 118. La abertura 174 se extiende a través de la flecha 112 en la parte roscada de la misma a un lado del segundo extremo 116 y esta generalmente perpendicular al eje central de la flecha 112.

Después de la colocación deseada del disco de semillas 28 en el paso 158 la remoción del disco de semillas 28 del cubo 22 en el paso 160, el cubo 22 es girado sobre la flecha 112 por una cantidad ligera que sea necesaria para alinear un par

opuesto de la ranura 172 con la abertura 174 antes de la instalación del perno de fijación 164. Al insertarse la parte recta 166 del perno de fijación 164 a través de la abertura 174 y el par opuesto de la ranura 172, el extremo curvo externo 170 de el perno de fijación 164 engancha una tercera de las ranuras 172 localizada en medio entre el par opuesto de la ranura 172 a través de las cuales la parte recta 166 del perno de fijación 164 se extiende. Esto presiona la parte curva 168 del perno de fijación 164 para asentar elásticamente el extremo curvo externo 170 dentro de la tercera de las ranuras 172 para retener en forma desprendible por tanto el perno de fijación 164 en la posición instalada. Con el perno de fijación 164 se ha instalado,el cubo 22 no puede girar sobre el eje 112 y el disco de semillas 28 se mantiene en la posición deseada. Como se muestra en la figura 3 el anillo separador 102 del disco de semillas 28 que se asienta sobre la ceja 153 del cubo 22 proporciona una pequeña cantidad de espacio entre el cubo 22 y la parte adyacente del disco de semillas 28 en la región de la abertura alargada 30. Este espacio acomoda esas partes del perno de fijación 164 que sobresalen de la perilla 144.

En un paso final 176 del metodo de la figura 8 el disco de semillas 28 está de nuevo montado sobre el cubo 22. Esto se logra en esencialmente la misma manera como se describió previamente en conexión con el paso 137.

Se apreciará del método de la figura 8 descrito en conjunción con el aparato de las figuras 1-6 y de las figuras 9-

12 que la colocación precisa del disco de semillas 28 dentro del dosificador de semillas 10 se proporciona. La superficie externa roscada de la flecha 112 en combinación con la abertura central roscada 118 del cubo 22 y del perno de fijación 164 permite al cubo 22 el colocarse en cualesquiera de una pluralidad de posi - ciónes seleccionadas a lo largo de la longitud de la flecha 112. La flecha 112 puede por tanto ser montada dentro del casquillo externo 110 del cojinete 106 sin importar la colocación precisa de la flecha 112. El perno de fijación 164 proporciona la sujeción desprendible del cubo 22 sobre la flecha 112 cuando se ha logrado una posición deseada. En caso de que fuera necesario o deseable el volver a colocar el disco de semilla 28 dentro de la caja 12, es solamente necesario el remover el perno de fijación 164 siguiendo la remoción del disco de semillas 28 del cubo 22, después de lo cual el cubo 22 puede ser girado sobre la flecha 112 a una nueva posición deseada, con el disco de semillas 28 remontado sobre el mismo. Cuando el disco de semillas 28 se remueve nuevamente, el perno de fijación 164 es entonces insertado a través de la abertura 174 y a través de un par opuesto de las ranuras 172 para sujetar de forma desprendible el cubo 22 sobre la flecha 112 en la nueva posición.

Como se vé en la figura 3 el eje de rotación 76 y el disco de semillas 28 coincide con el eje central del cubo 22 cuando el disco de semillas 28 está montado sobre el cubo 22. La parte periférica externa circular generalmente 68 de la caja 12 yace dentro de un plano. El eje de rotación 76 es deseablemente perpendicular a este plano. Tal perpendicularidad pro

porciona la uniformidad de un tamaño de la separación 74. Frecuentemente sucede que la flecha 112 está instalada en el casquillo exterior 110 de manera que el eje central de la flecha 112 no está precisamente perpendicular al plano de la parte periférica externa 68 de la caja 12. Esto normalmente resultaría en una no uniformidad de la separación 74, la cual previamente se notó es indeseable en que proporciona una retención no uniforme de semillas completas 80 dentro de la caja y una expulsión no uniforme de desperdicio tal como partículas 82 desde la caja 12.

De acuerdo con una característica de la invención, la perpendicularidad del eje de rotación 76 del disco de semillas 28 al plano de la parte periférica externa 68 de la caja 12 se mantiene proporcionando una pequeña cantidad de tolerancia o juego entre la parte roscada de la flecha 112 y la abertura central roscada 118 del cubo 22. Más específicamente el diámetro externo de la parte roscada de la flecha 112 se hace más pequeño que el diámetro interno de la abertura central roscada 118 del cubo 22 por una cantidad que proporciona el juego o tolerancia deseado. Esto permite al eje de rotación 76 del disco de semillas 28 el formar ángulos relativamente pequeños con el eje central de la flecha 112 como sea necesaria para mantener la perpendicularidad. Se ha encontrado que tal tolerancia o juego permite la perpendicularidad deseada para lograrse con la rotación del disco de semillas 28 en relación a la caja 12 durante la operación del disco de semillas 10. Esto es más seguramente

debido a los efectos aerodinámicos en los cuales la capa de aire en la separación 74 hace que el ángulo del eje de rotación 76 cambie continuamente en relación al plano de la parte periférica externa 68 de la caja 12 cuando el disco de semillas 28 gira para mantener la uniformidad de la separación 74.

Aún cuando la invención ha sido particularmente mostrada y descrita con referencia a las modalidades preferidas de la misma, deberá entenderse para aquellos expertos en el arte que varios cambios en la forma y detalles hacerse sin departir del espíritu y alcance de la invención.

R E I V I N D I C A C I O N E S

Habiendo descrito la invención se considera como una novedad y por lo tanto se reclama como propiedad lo contenido en las siguientes cláusulas:

1. Mejoras a dosificador de semillas con un arreglo para montar giratoriamente un disco de semillas dentro de una caja del dosificador de semillas, que comprende la combinación de una flecha montadada giratoriamente dentro de la caja y que tiene un tramo de la misma extendiéndose hacia afuera de la caja, un cubo cclocado sobre y movible a lo largo de una parte del tramo de la flecha y adaptado para montar sobre la misma un disco de semilla, y medios para sujetar en forma desprendible el cubo en cualesquiera de una pluralidad de lugares diferentes a lo largo de la parte del tramo de la flecha.

2. Mejoras a dosificador de semillas tal y como se reivindica en la cláusula 1 caracterizadas porque los medios para sujetar en forma desprendible comprenden un perno adaptado para enganchar ambos la flecha y el cubo.

3. Mejoras a dosificador de semillas tal y como se reivindica en la cláusula 1 caracterizadas porque la parte del tramo de la flecha está roscada y el cubo tiene una abertura roscada en el mismo para enganchar con la parte roscada del tramo de la flecha.

4. Mejoras a dosificador de semillas tal y como se reivindica en la cláusula 3 caracterizadas porque el mecanismo para sujetar desprendiblemente puede operarse para evitar la rotación de la abertura roscada del cubo alrededor de la parte roscada del tramo de la flecha.

5. Mejoras a dosificador de semillas tal y como se reivindica en la cláusula 4,caracterizadas porque la flecha tiene una abertura en el mismo, el cubo tiene una pluralidad de aberturas en el mismo separadas alrededor de la abertura roscada en el mismo, y los medios para sujetar desprendiblemente comprenden un perno que se extiende a través de la abertura en la flecha y un par opuesto de las aberturas en el cubo.

6. Mejoras a dosificador de semillas tal y como se reivindica en la cláusula 5,caracterizadas porque el perno tiene un extremo externo del mismo enganchado en una de la pluralidad de aberturas en el cubo distintas al par opuesto de aberturas en el cubo a través de las cuales se extiende el perno.

7. Mejoras a dosificador de semillas que comprende la combinación de una caja que tiene una parte periférica de la misma extendiéndose alrededor de un eje central, una flecha montada en forma giratoria dentro de la caja y extendiéndose a lo largo del eje central, la flecha tiene una superficie externa roscada de la misma extendiéndose a lo largo de una parte de la flecha desde un extremo externo de la misma opuesto a la caja, un cubo que tiene una abertura roscada en el mismo recibiendo y atornillándose sobre la superficie externa roscada de la flecha y medios para fijar desprendiblemente el cubo de una pluralidad de posibles ubicaciones del cubo a lo largo de la flecha.

8. Mejoras a dosificador de semillas tal y como se reivindica en la cláusula 7 caracterizadas porque incluye un disco de semillas montado sobre el cubo y que tiene una parte periférica del mismo separada de la parte periferica de la caja por una distancia determinada por la ubicación a lo largo de la flecha en la cual el cubo está fijado desprendiblemente.

9. Mejoras a dosificador de semillas tal y como se reivindica en la cláusula 7 caracterizadas porque el cubo tiene un eje que se extiende a través de la abertura roscada y coincidente nominalmente con el eje central y la abertura roscada es más grande que la superficie externa roscada de la flecha por una cantidad suficiente para permitir el movimiento del cubo en relación a la flecha de manera que el eje del cubo forma pequeños

ángulos con el eje central.

10. Mejoras a dosificador de semillas tal y como se reivindica en la cláusula 7 caracterizadas porque la flecha tiene una abertura que se extiende a través de la misma generalmente perpendicular al eje central, el cubo tiene una pluralidad de ranuras en el mismo espaciadas alrededor de la abertura roscada en el mismo, y los medios para fijar desprendiblemente comprenden un perno que se extiende a través de la abertura en la flecha y un par opuesto de las ranuras en el cubo.

11. Mejoras a dosificador de semillas tal y como se reivindica en la cláusula 10 caracterizadas porque el perno tiene una parte relativamente recta que se extiende a través de la abertura en la flecha y el par opuesto de la pluralidad de ranuras en el cubo y una parte curva que se extiende hacia afuera desde la parte recta y que termina en un extremo curvo externo yaciendo elásticamente en una de la pluralidad de ranuras en el cubo colocadas entre el paro opuesto de la pluralidad de ranuras.

12. Mejoras a dosificador de semillas tal y como se reivindica en la cláusula 10 caracterizadas porque la pluralidad de ranuras en el cubo comprenden cuatro ranuras substancialmente separadas igualmente alrededor del cubo.

13. Mejoras a dosificador de semillas que tiene una caja, un método para montar giratoriamente un disco de semillas en un lugar deseado dentro de la caja que comprende los pasos de montar giratoriamente una flecha dentro de la caja, colocar un disco de

semillas montando el cubo sobre la flecha de manera que el disco de semillas cuando está montado sobre la misma esté en un lugar deseado dentro de la caja; y sujetar el cubo sobre la flecha así colocado.

14. Mejoras a dosificador de semillas tal y como se reivindica en la cláusula 13 caracterizadas porque el paso de la colocación del disco de semillas montando al cubo sobre la fecha comprende los pasos de colocar inicialmente un cubo de montaje de disco de semilla sobre la flecha, montar el disco de semilla sobre el cubo y avanzar el cubo a lo largo de la flecha hasta que el disco de semillas esté en el lugar deseado dentro de la caja.

15. Mejoras a dosificador de semillas tal y como se reivindica en la cláusula 14 caracterizadas porque la flecha y el cubo están roscados, el paso de colocar inicialmente comprende atornillar inicialmente el cubo sobre la flecha y el paso de avance del cubo comprende girar el cubo en relación a la flecha hasta que el disco de semillas está en el lugar deseado dentro de la caja.

16. Mejoras a dosificador de semillas tal y como se reivindica en la cláusula 15 caracterizadas porque la flecha tiene una abertura a través del mismo, el cubo tiene un par opuesto de ranuras en el mismo y el paso de sujetar al cubo, comprende insertar un perno a través de la abertura en la flecha y el par opuesto de ranuras en el cubo.

17. Mejoras a dosificador de semillas que comprende una

flecha, una caja montando giratoriamente la flecha y que tiene una parte periférica de la misma que se extiende alrededor de la flecha y un disco de semillas que tiene una parte periférica del mismo, un método para ubicar la parte periférica del disco de semillas de esa misma distancia deseada de la parte periférica de la caja que comprende los pasos de, montar el disco de semillas sobre el cubo, avanzar el cubo a lo largo de la flecha en dirección hacia la caja a una posición en la cual la parte periférica del disco de semillas está a una distancia deseada de la parte periférica de la caja; y sujetar el cubo en la flecha

18. Mejoras a dosificador de semillas tal y como se reivindica en la cláusula 17 caracterizadas porque la flecha tiene una parte externa roscada, el cubo tiene una parte interna roscada, y el paso de avanzar el cubo a lo largo de la flecha comprende el girar la parte interna roscada del cubo alrededor de la parte externa roscada de la flecha.

19. Mejoras a dosificador de semillas que tiene una caja con una parte periférica de la misma que se extiende alrededor de un eje central del disco de semillas un método para montar giratoriamente el disco de semillas dentro de la caja de manera que la parte periférica del mismo está a una distancia deseada de la parte periférica de la caja que comprende los pasos de: proporcionar una flecha que tiene una parte externa roscada; montar la flecha dentro de la caja para girar alrededor del eje central; proporcionar un cubo que tiene una abertura roscada en el mismo; girar la abertura roscada del cubo sobre

la parte externa roscada de la flecha para montar inicialmente el cubo sobre la flecha; montar el disco de semilla sobre el cubo;girar el cubo en relación a la flecha para avanzar el cubo y el disco de semillas a lo largo de la flecha para que la parte periférica del disco de semillas esté a una distancia deseada de la parte periférica de la caja; y fijar el cubo sobre la flecha para evitar la rotación del cubo en relación a la flecha.

20. Mejoras a dosificador de semillas tal y como se reivindica en la cláusula 19 caracterizadas porque la flecha tiene una abertura a través de la misma, el cubo tiene una pluralidad de ranuras en el mismo separadas de la abertura roscada del mismo,y el paso de fijar el cubo sobre la flecha comprende insertar un perno a través de la abertura en la flecha y un par opuesto de la pluralidad de ranuras en el cubo.

21. Mejoras a dosificador de semillas tal y como se reivindida en la cláusula 19,que incluye los pasos adicionales de remover el disco de semillas del cubo siguiendo el paso de girar el cubo en relación a la flecha para avanzar el cubo y el disco de semillas y antes del paso de fijar el cubo sobre la flecha, y montar el disco de semillas sobre el cubo después de fijar el cubo sobre la flecha.

En testimonio de lo cual firmo la presente en México, D.F. el 2 DIC 95

DEERE & COMPANY

José Antonio Miranda L.
Apoderado

*ap

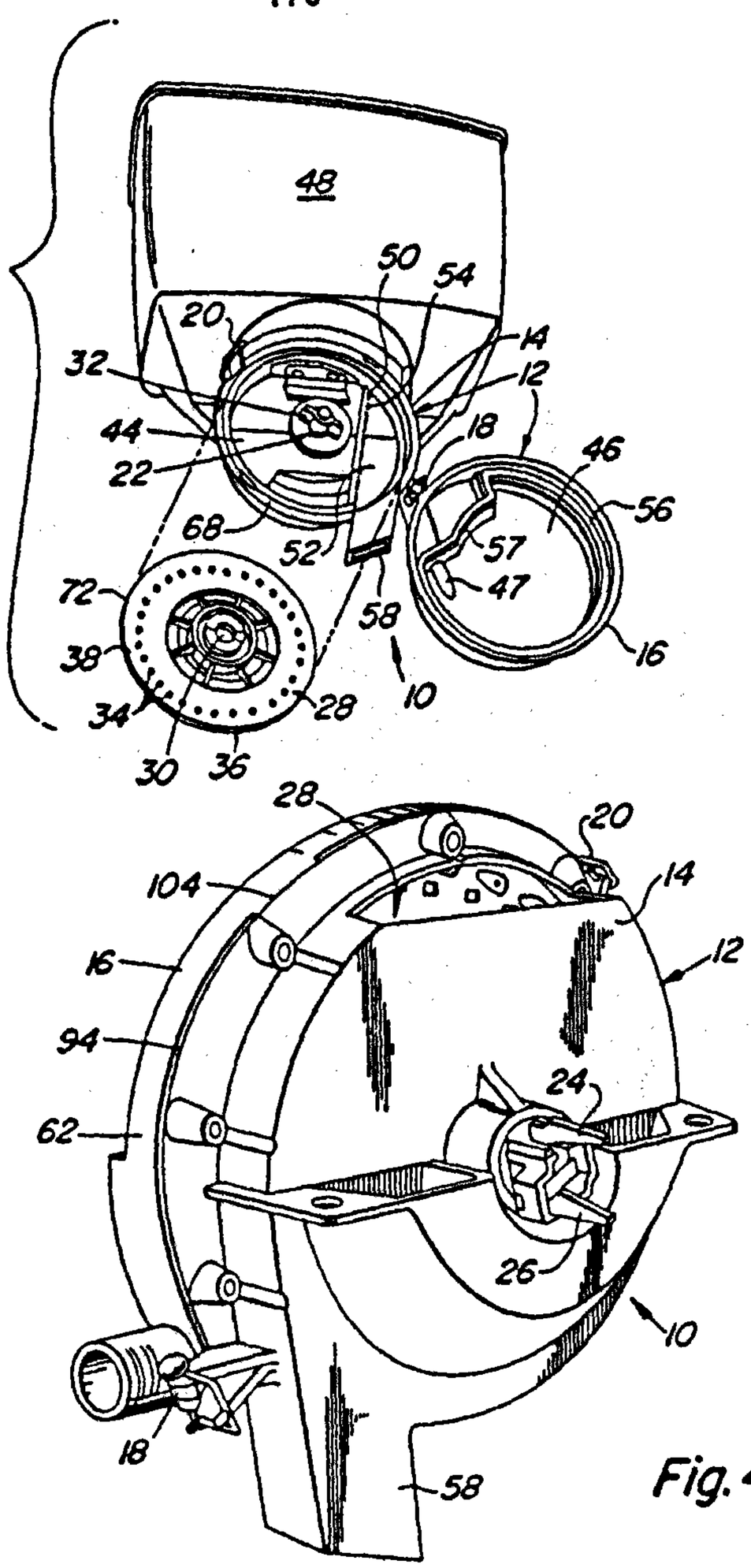
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Fig. 1

Fig. 4

Fig. 2

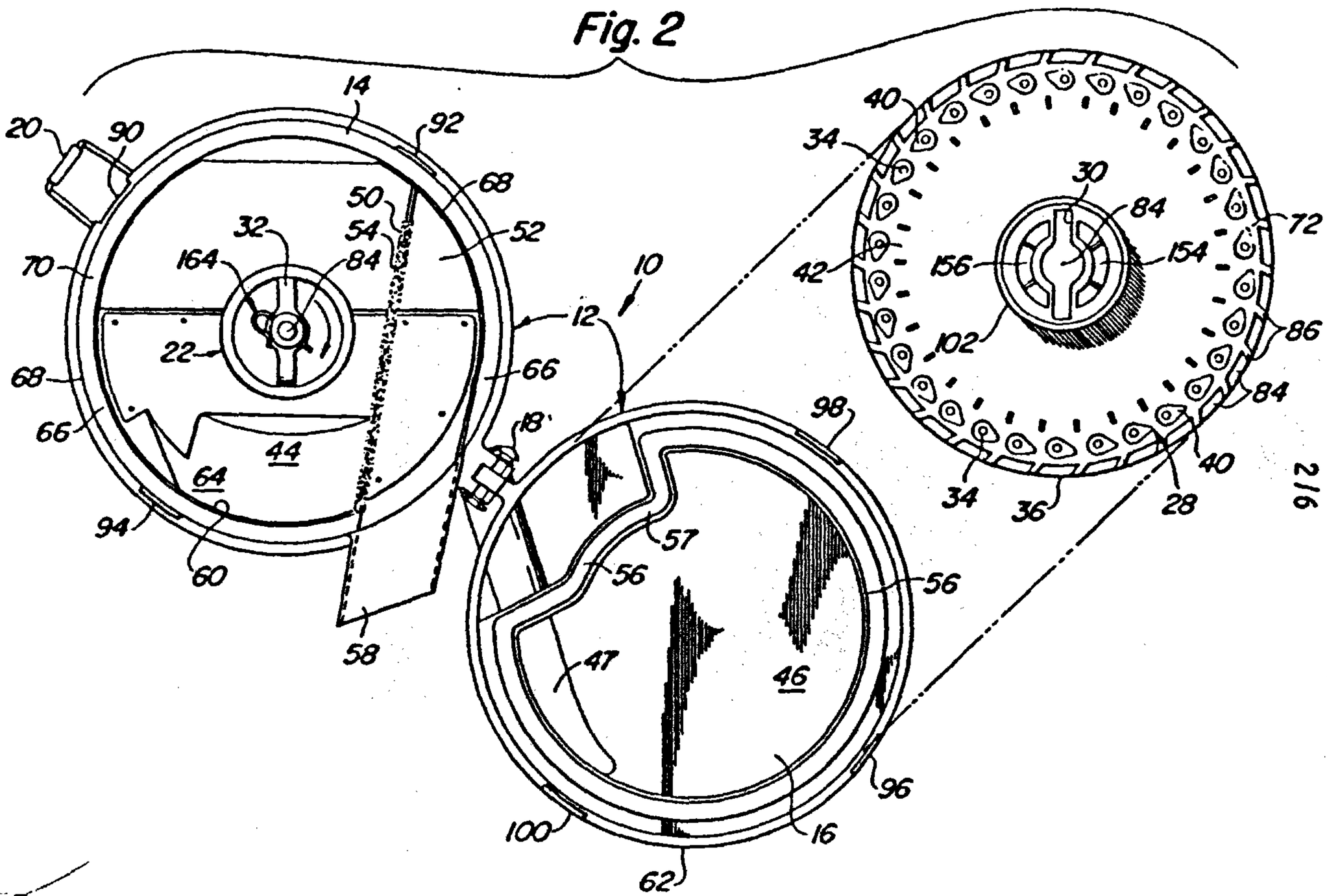
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Fig. 3

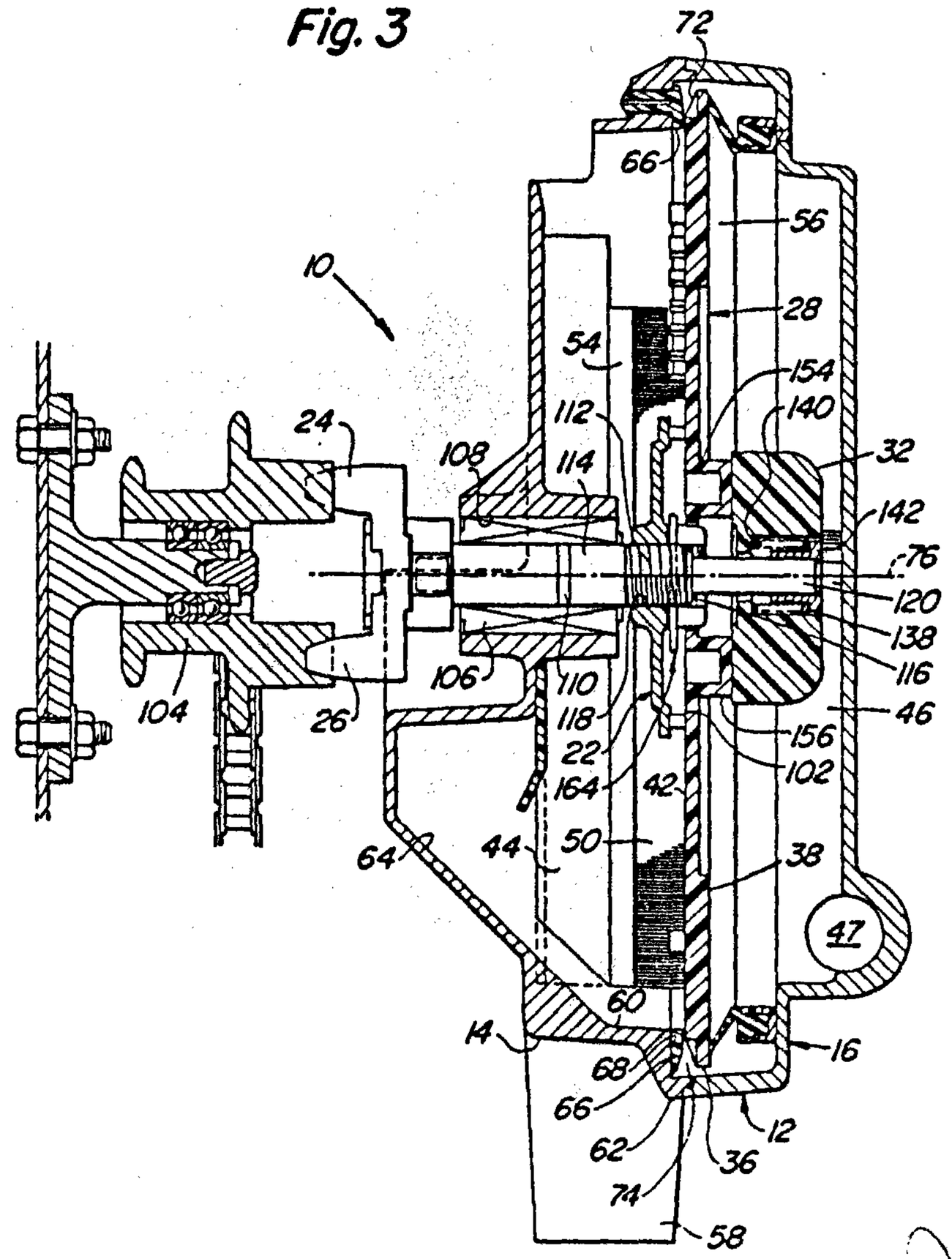
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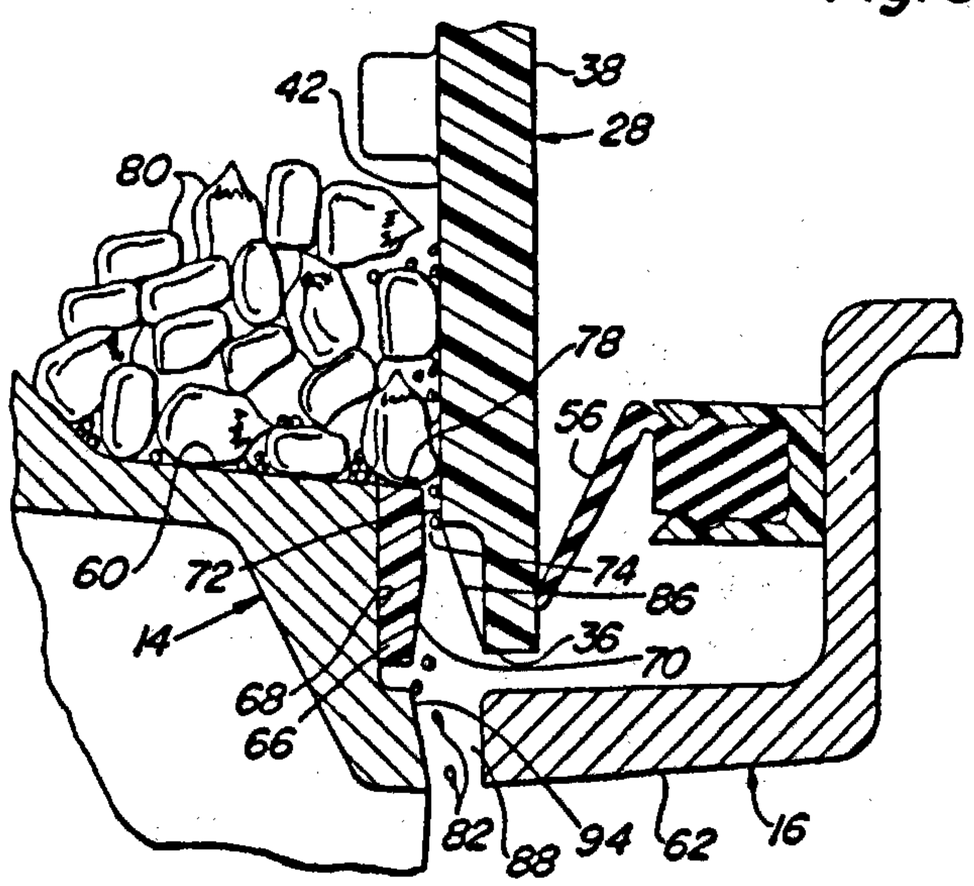
Fig. 5



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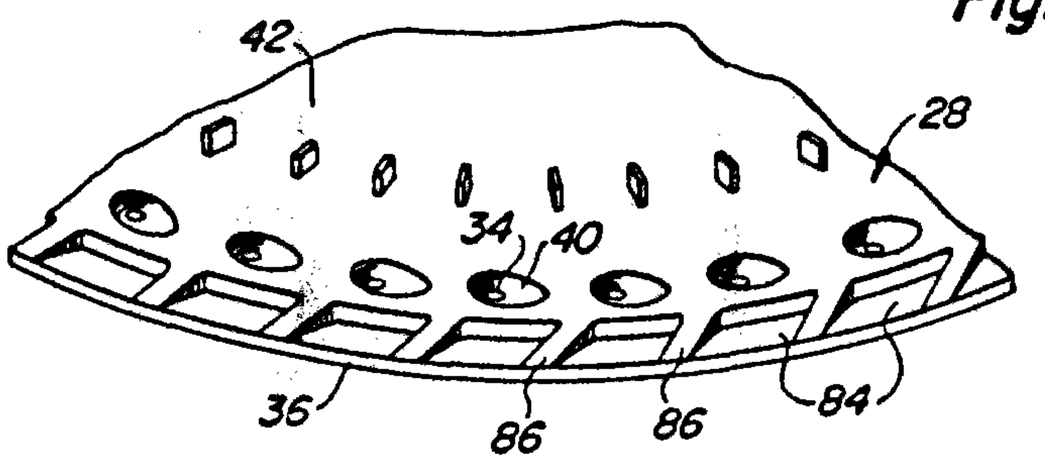

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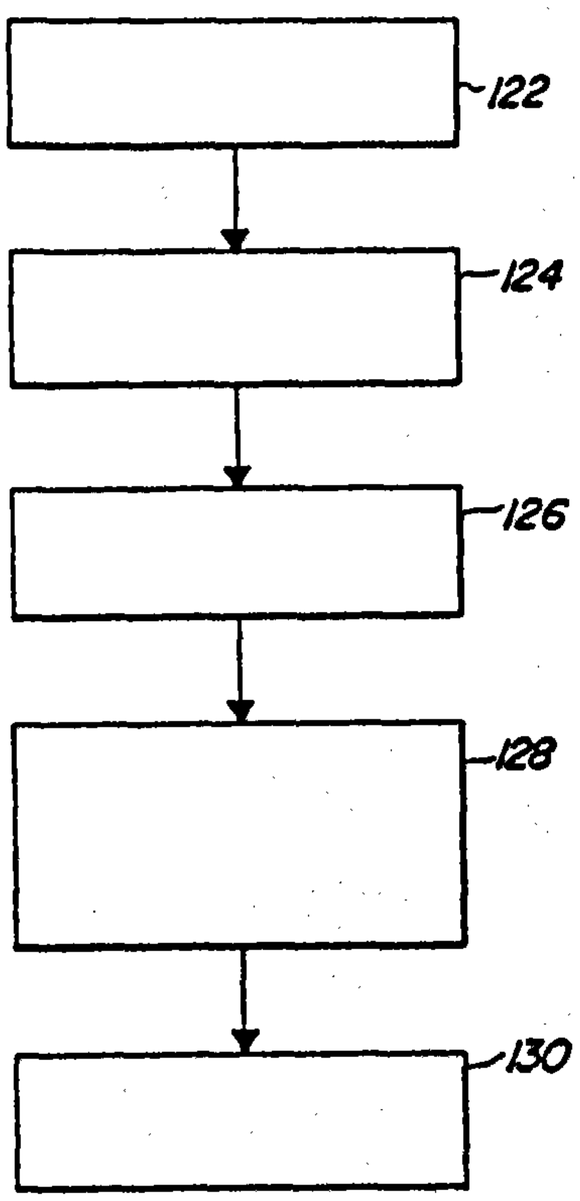

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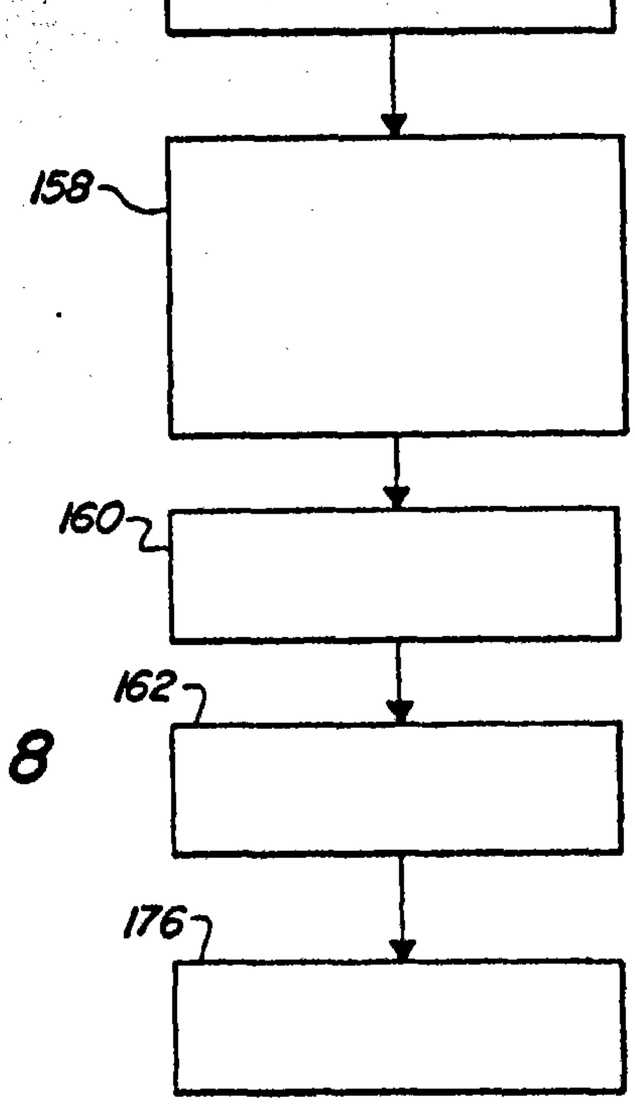

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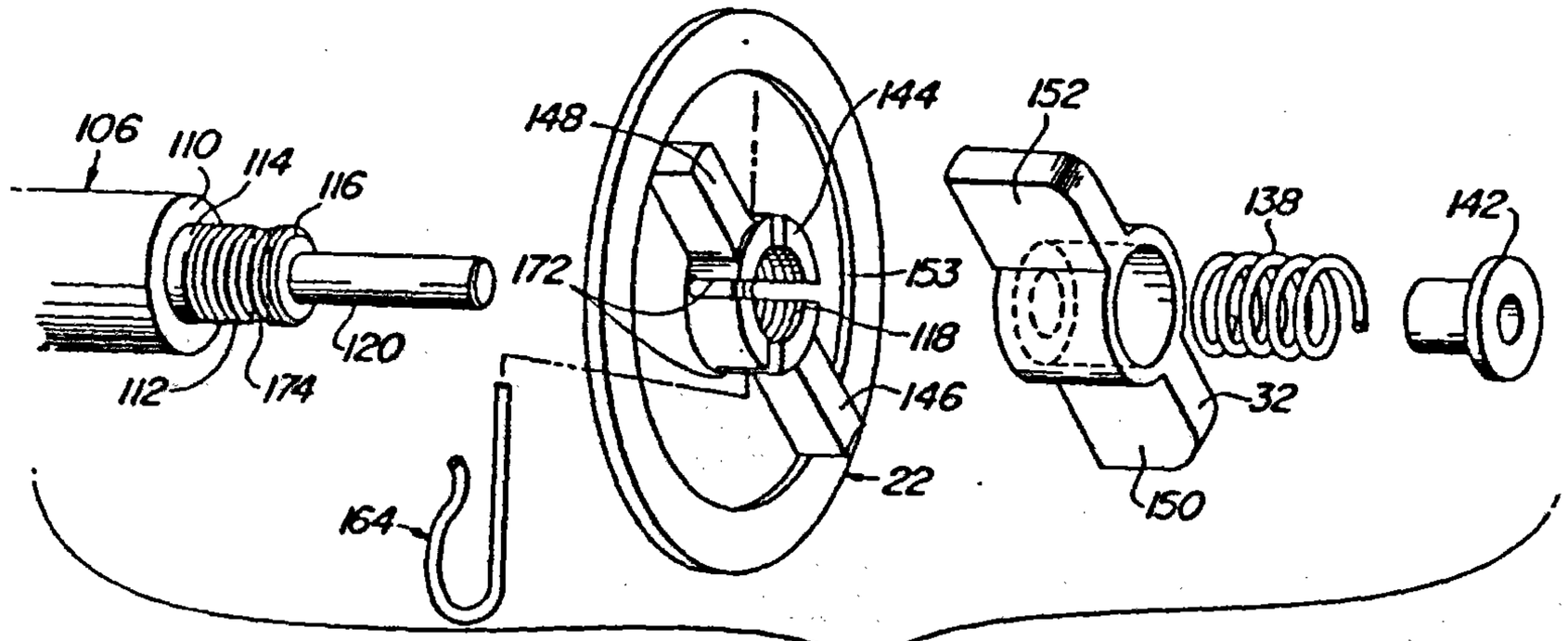
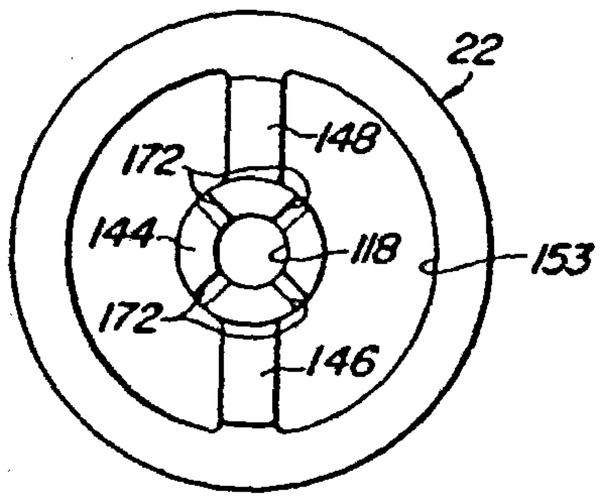


Fig. 10

Fig. 9



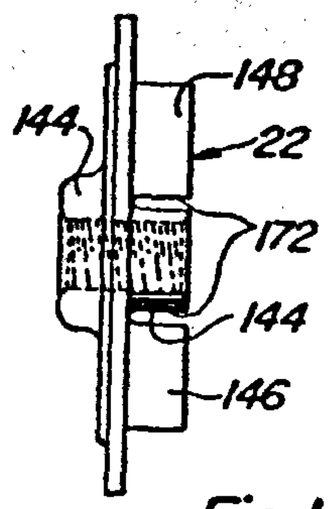


Fig. 11

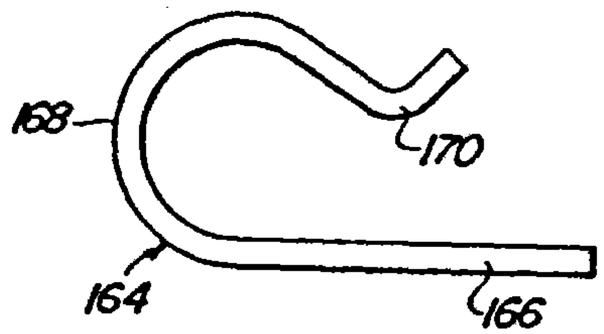


Fig. 12