June 7, 1955 B. ARMSTRONG 2,709,957

SCREEN AND FRAME STRUCTURE WITH FRAME FUNCTIONING AS A TORQUE TUBE

Filed Jan. 16, 1953

FIG. 2

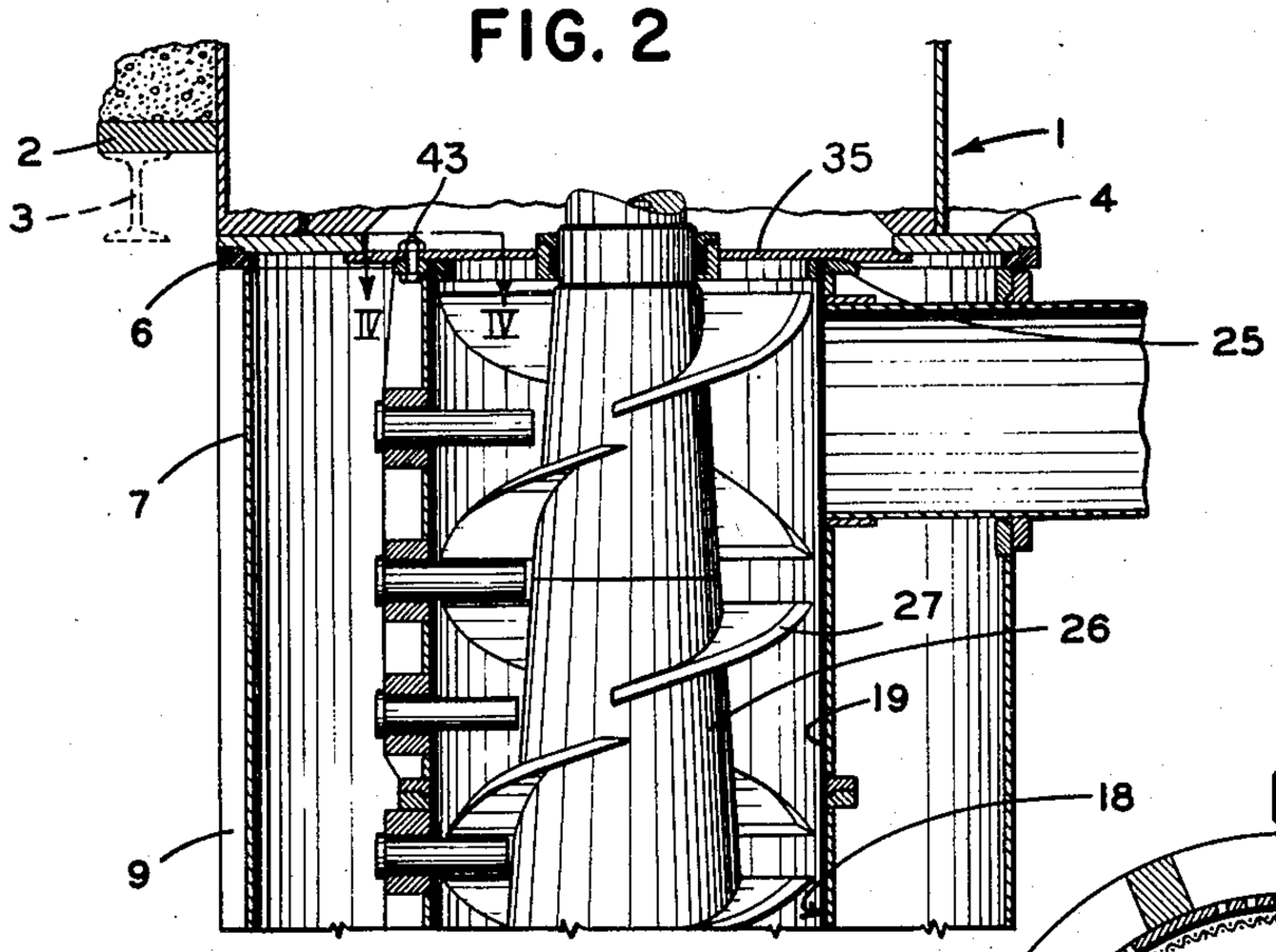


FIG. 4

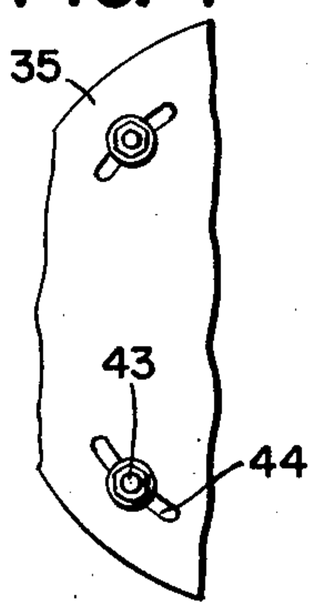


FIG. 3

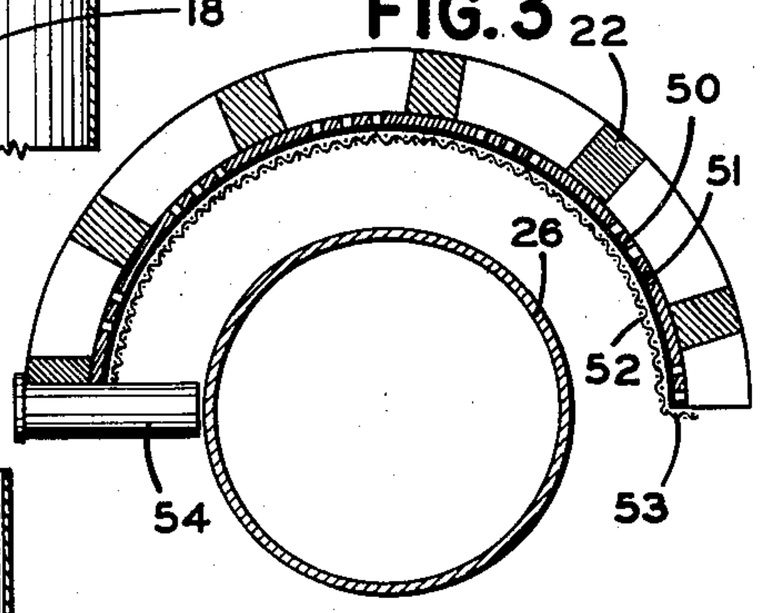


FIG. 1

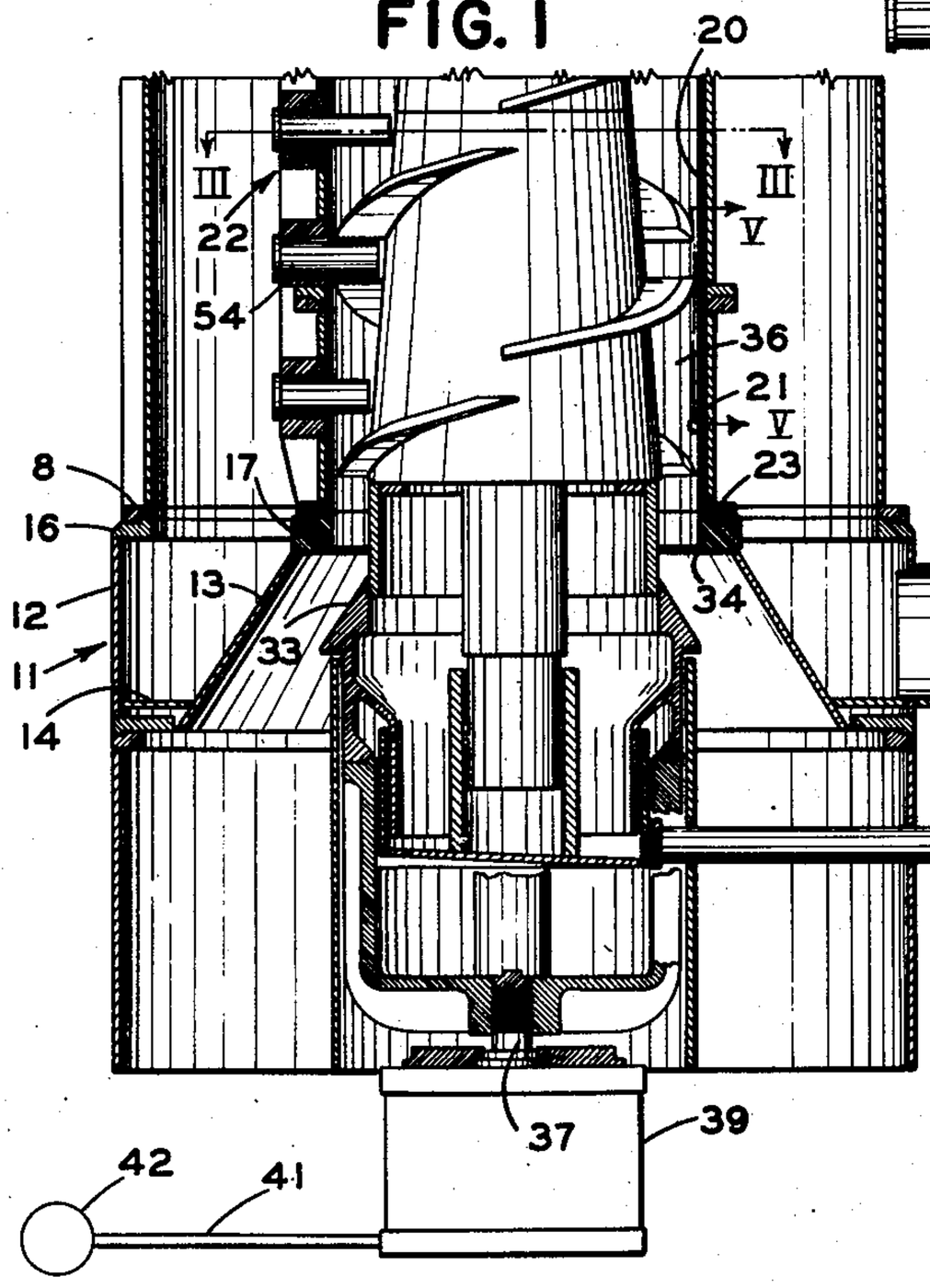
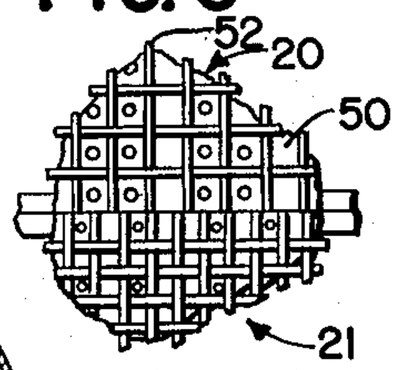


FIG. 5



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SCREEN AND FRAME STRUCTURE WITH FRAME FUNCTIONING AS A TORQUE TUBE

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4 Claims. (Cl. 100—117)

This invention relates to screw type presses and it relates particularly to the type thereof having a perforated screen surrounding a pressing spindle and an imperforate tubular housing surrounding said screen, with said housing and screen so related to a supporting frame that the twisting force applied by the spindle to the screen is transferred through a relatively small portion of the screen and, through the press structure to the bottom of the tubular housing and thence to the supporting frame. Thus, the greater part of the screen is free from any substantial torsional stresses and may be provided with a maximum of open area for effecting maximum drainage.

In the operation of conventional presses, it has frequently been observed that the material being pressed, in attempting to follow the rotating spindle, exerts a strong drag on the screen which closely surrounds the spindle, particularly at the lower end thereof, and said screen is thereby unduly twisted. Often said lower end actually becomes circumferentially displaced with respect to the other end of said screen and this may cause buckling or breaking of the screen.

This problem has been apparent in presses of this general type for a great many years and thus far the remedies which have occurred to the industry are (1) to design the screens of strength sufficient to enable them to withstand the twisting forces applied thereto by the spindle, but this made them so heavy as to be extremely expensive and also as to severely limit the amount of open area which was supplied in the upper portion of the screen, (2) to apply to the outside of the screen a reinforcing grill but this was also expensive and it provided a large area over which material would sometimes gather and require cleaning and it further limited said open area, or (3) to so limit the supply of material to the spindle that it would not exceed the torsional strength of the screen but this often improperly restricted the capacity of the apparatus.

Accordingly, it has long been desirable to provide a construction which would relieve a screen from the severe torsional stresses incident to previous practice without the necessity of unreasonably limiting the output of the machine.

Thus, a major object of the invention is to provide a press in which the screen may be of relatively light construction and have a large open area therein without subjecting it to severe torsional stress or displacement.

A further object of the invention has been to provide a press, as aforesaid, in which practically the entire torsional load imposed onto the screen by the rotation of the spindle is absorbed by an imperforate tubular housing.

A further object of the invention has been to provide a press, as aforesaid, in which the tubular housing provided for absorbing the reaction to the rotation of the spindle is the same tubular housing which is placed radially outwardly of the screen for guiding expressed liquids downwardly.

A further object of the invention is a press, as aforesaid, which will accomplish the objects above named without departing materially from the present designs for the major parts thereof.

A further object of the invention is to provide a press, as aforesaid, in which the operation will not be materially different, excepting as indicated above, from the operation associated with present designs.

Other objects and purposes of the invention will be apparent to persons acquainted with apparatus of this general type upon reading the following specification and inspecting the accompanying drawings in which:

Figure 1 is a central section of the lower part of said press.

Figure 2 is a central section of an upper part of said press.

Figure 3 is a sectional view taken along the line III—III of Figure 1.

Figure 4 is a fragmentary, sectional, view taken along the line IV—IV of Figure 2.

Figure 5 is a fragmentary, sectional, view taken along the line V—V of Figure 1.

In accomplishing the objects and purposes above set forth, I have made use of the fact that the greater part of the reaction to the rotation of the screw occurs in the one third or one quarter of the press adjacent the output end. Therefore, by holding the screen at its lower end only and permitting the upper end to move circumferentially, any circumferential movement in the screen that takes place in response to the rotation of the screw will impose an appreciable deforming force through only a relatively short lower portion of said screen, which portion needs relatively little open area and hence can be made very strong, and thence said deforming force is conducted to the means holding said lower end of the screen. Relatively little torsional stress is imposed on the upper two thirds to three quarters of the screen and hence this part can be designed with a maximum of open area. In the present preferred embodiment of the invention, I have mounted the lower end of the screen rigidly onto the inner periphery of the usual liquid gathering trough, and have mounted the outer periphery of said trough rigidly onto the lower end of a coaxial, outwardly positioned, tubular housing whose upper end is suspended rigidly from the mounting structure of the press. Thus, as the spindle rotates and the lower end of the screen is urged to rotate in response to the frictional drag thereon by the material being pressed, the forces are applied to the lower end of the screen which is rigidly attached as above indicated. Thus, essentially all the torsional twisting will take place in the tubular housing only and this structure is such that it will be capable of withstanding the high torsional forces involved, and there will be no damaging torsional stress on the screen.

For purposes of illustration, I have chosen a particular embodiment of the invention wherein the screen and screw portion of the press extends downwardly below the level of the floor to which this portion is secured, but it will be recognized that the principles of the invention may be applied where said screen and screw extend upwardly from a mounting structure or, with slight modications, where said parts extend horizontally. Therefore, for purposes of convenient reference in the hereinafter following description, the terms "upper," "upwardly," and derivatives thereof, and "lower," "below" or "downwardly," and derivatives thereof, will all be taken to refer to such directions when said machine is in its usual position of use, as shown, in which the axis is positioned in a vertical direction, and the terms "inward" and "outward," and derivatives thereof, will refer to directions toward and away from the central axis of the apparatus.

Turning to the drawing in more detail, an upper assembly **1**, containing drive mechanism not here shown, is mounted by a plate 2 onto an I-beam in a floor, or onto other suitable floor structure. Immediately below said upper assembly is fastened a mounting member, here the ring 4 from which is suspended the portion of the press with which the present invention is concerned.

Positioned immediately below said mounting ring 4 is a torque housing supporting ring **6** which will be rigidly fastened to said ring 4 by any convenient means. From said ring **6** there is suspended a torque housing **7** at the lower end of which is fastened a trough supporting ring, or flange, **8**. A plurality of vertically positioned stiffening ribs, of which one is indicated at **9**, may be provided also if desired.

Suspended from said flange **8** is a trough **11** which trough may be of any conventional construction, which in this instance is made of sheets including an outer side **12** and inner side **13**, a bottom **14**, an outer rim **16** and an inner rim **17**. The lower housing flange **8** and the outer rim **16** may be fastened together in any convenient manner.

A screen **18**, in this embodiment comprising an upper section **19** a middle section **20** and a bottom section **21**, is supported upon a lower screen ring **23**, to which it is preferably welded, which in turn is supported upon the inner rim **17** of the trough **11**. Said lower screen ring **23** and said inner rim **17** are fastened together by any convenient means. A reinforcing structure **22** of any convenient type, here a fabricated steel frame, may be applied to said screen for stiffening same in any convenient manner. The upper end of the screen is affixed as by bolts **43** to the ring **4**, here through an intermediate ring **35**, preferably through a pilot **25**. The manner of such fastening is such as to permit limited circumferential movement, such as, for example, by passing said fastening bolts **43** through elongated, circumferentially arranged openings **44** (Figure 4).

The screen **18** may be constructed in any of several ways. One preferred and novel way is illustrated in Figure 3. A cylinder **50** (only a section of which is shown), properly perforated and conveniently of steel plate, is machined accurately to size.

A backing screen **51** of relatively coarse mesh and of heavy stock, as ⅛ inch thick perforated steel plate, is forced into place under sufficient pressure that it lies tightly against the cylinder **50**. A relatively fine mesh screen **52** is then placed against the screen **51** and its edges bent over at **53**. Thus, the two screen members assume practically the exact contour of the machined cylinder **50** and the inner surface of the inner screen is thus positioned very accurately with respect to the flights of the spindle and very small clearances therebetween may be successfully maintained. With the two halves of the screen structure fastened together, the bent-over edges of the inner screen will be firmly clamped in place.

The middle and upper sections **20** and **19** of the screen will be made with large open areas (Figure 5) to permit free drainage while the lower section **21** is made relatively heavy with somewhat less open area to provide the necessary strength.

Resistors **54** are mounted in the frame structure and extend into the compression space between the screen and spindle at such points with respect to the flights on the spindle that they will not interfere with the rotation of said spindle.

Simultaneously, the spindle **26** is rotated from its upper end by any conventional mechanism, not shown. As the several flights **27** engage said material and force it downwardly through the progressively constricting space between said spindle and said screen, progressively greater pressure is exerted onto said material and the liquid portion thereof is forced through the screen. The resistors **54** prevent the material from merely traveling around with the spindle and insure efficient pressing. As said material approaches the lower end of said space and enters the portion thereof designated by the numeral **36**, the friction between said material and the screen, and the drag of said material against the resistors, both become progressively greater and will tend to cause rotation of said screen in the same direction as the rotation of said spindle. Thus, it will be noted that most of said rotating effect is concentrated at the lower end of said screen inasmuch as it is only at said lower end that said material is sufficiently compressed to cause a substantial amount of frictional drag against the screen and is sufficiently densified to engage the resistors with an appreciable effect. Thus, with the greater part of the rotating forces applied to the lower section **21** of said screen and transmitted downwardly through the trough to the housing **7**, and the upper end of said screen free to move in circumferential direction, the upper end of the screen will substantially follow whatever movement occurs at the lower end and there will be no appreciable torsional stress on, or distortion of, the portion of said screen lying above the section **21** thereof.

The rotative force applied to said screen is transmitted to and through the trough **11** and thence to the lower end of the housing **7**. Since the housing **7** is rigidly affixed through the plate **4** to the base mounting of the device, it is fully able to withstand torsional stress placed at its lower end, and even if a certain amount of torsional displacement does occur, it will cause no harm.

Thus, since the sections **19** and **20** will be subjected to relatively little torsional stress, it is possible to make them of light construction and with large open areas, both of which features are conducive to efficient operation of the press.

Also, since relatively little liquid is expressed through the lower section **21**, it will be feasible to make this section with somewhat less open area and this will make possible a desirably strong structure without unduly restricting its efficient operation. Further, since the major torsional forces travel through only a short axial length of the screen, even the lower section **21** may be of lighter construction than was required in previous designs.

Pressure fluid delivered from the source **42** through the conduit **41** into the cylinder **39** will urge upward movement of the rod **37** which will thereby effect upward movement of the cone **33** toward the inner surface **34** of the ring **23**. By maintaining a constant pressure within the cylinder **39** the cone **33** will move upwardly or downwardly to compensate for variations in the quantity of material delivered out from the lower end of the chamber **36** at a given time between the cone **33** and ring **23**. This will assure a constant pressure within said chamber **36** and a constant consistency in the pressed solid material so discharged. It should be particularly noted, however, that the pressure imposed by source **42** upon the cylinder **39** is of a dynamic nature so that a constant pressure is maintained at all times regardless of upward or downward movement of the rod **37** caused by variations in the quantity of material discharged from the chamber **36**.

While the specific embodiment of the invention has been utilized herein for illustrative purposes, it will be recognized that many modifications may be made from said specific embodiment which will all lie within the scope of the appended claims and that said claims will accordingly cover said variations excepting as said claims may by their own terms expressly require otherwise.

I claim:

1. In a pulp press having a rotatable, tapered, spindle with radially extending, spirally arranged vanes positioned along the length thereof and a cylindrical perforated screen surrounding said spindle and positioned

coaxially with respect thereto, means for mounting said screen comprising: a non-rotatable mounting member; means engaging one portion of said screen and supporting same on said mounting member, said means permitting limited rotational movement of said screen around its axis with respect to said mounting member; a cylindrical imperforate housing surrounding said screen and positioned coaxially therewith and affixed rigidly to said mounting member; a liquid gathering trough rigidly affixed both to said housing and to another portion of said screen, said other portion being spaced from said one portion; the point of minimum clearance between said spindle and said screen being nearer to said other portion than to said one portion of said screen.

2. In a pulp press having a rotatable, tapered, spindle with radially extending, spirally arranged vanes positioned along the length thereof and a cylindrical perforated screen surrounding said spindle and positioned coaxially with respect thereto, means for mounting said screen comprising: a non-rotatable mounting member; means engaging the upper end of said screen and supporting same from said mounting member, said means supporting the weight of said screen but permitting limited rotational movement of said screen around its axis with respect to said mounting member; a cylindrical imperforate housing surrounding said screen and positioned coaxially therewith and affixed rigidly to said mounting member; a liquid gathering trough affixed to the lower ends of said casing and of said screen and fastened rigidly with respect to each thereof; the point of minimum clearance between said spindle and said screen being adjacent the lower end of said screen.

3. In a pulp press having a rotatable, tapered, spindle and a screen surrounding said spindle, means for supporting said screen comprising in combination: a mounting member; means affixing one end of said screen to said non-rotatable mounting member and permitting limited movement of said screen around its axis and

with respect to said mounting member; an imperforate cylindrical housing surrounding said screen and having the end thereof adjacent said one end of said screen affixed immovably to said mounting member; means affixing the other end of said housing immovably with respect to the other end of said screen; said spindle being so tapered that the point of minimum clearance between spindle and said screen is adjacent said other end of said screen.

4. In a pulp press having a rotatable, tapered, spindle with radially extending, spirally arranged, vanes positioned along the length thereof and a cylindrical perforated screen surrounding said spindle and positioned coaxially with respect thereto, means for mounting said screen comprising: a non-rotatable mounting member; means engaging the upper end of said screen and affixing same to said mounting member, said means supporting the weight of said screen but permitting limited rotational movement of the top of said screen around its axis with respect to said base; a cylindrical imperforate housing surrounding said screen and positioned coaxially therewith and affixed rigidly to said mounting member; a circular trough and means affixing its radially outer rim rigidly to the lower end of said housing and other means affixing its radially inner rim rigidly to the lower end of said screen; the point of minimum clearance between said spindle and said screen being adjacent the lower end of said screen.

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