

Sept. 13, 1955

F. J. ARMSTRONG

2,717,698

AUTOMATIC BALANCING DEVICE FOR ROTATING CYLINDERS

Filed Dec. 13, 1952

6 Sheets-Sheet 2

Fig. 2.

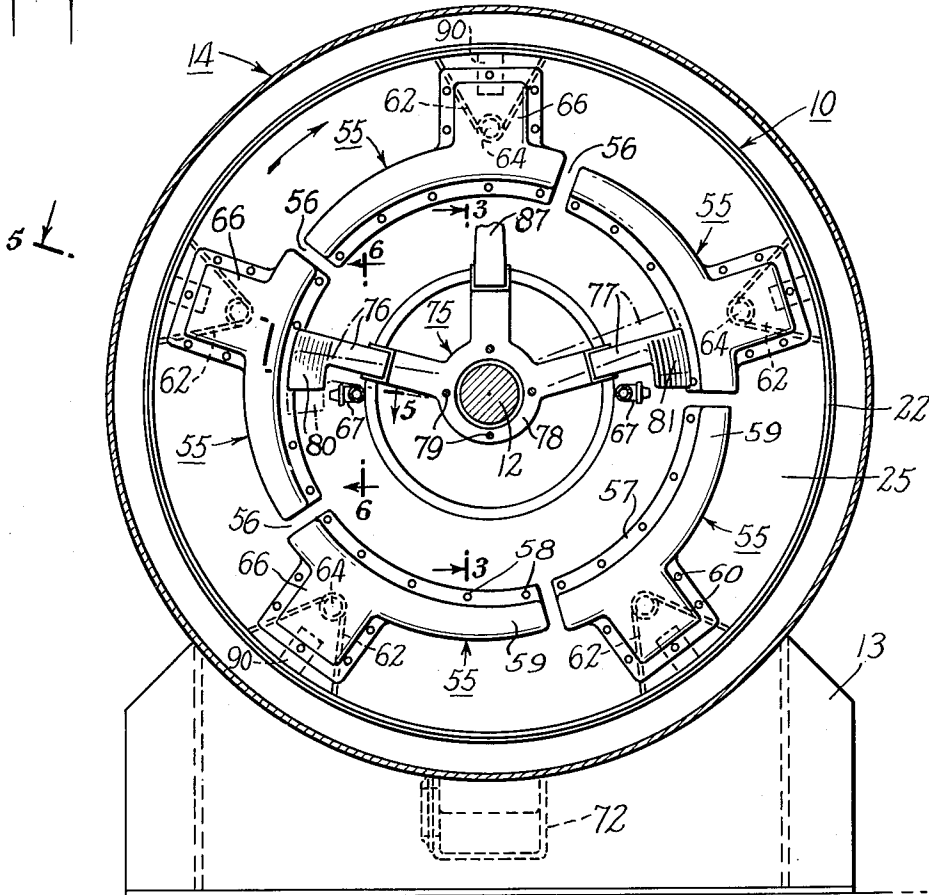
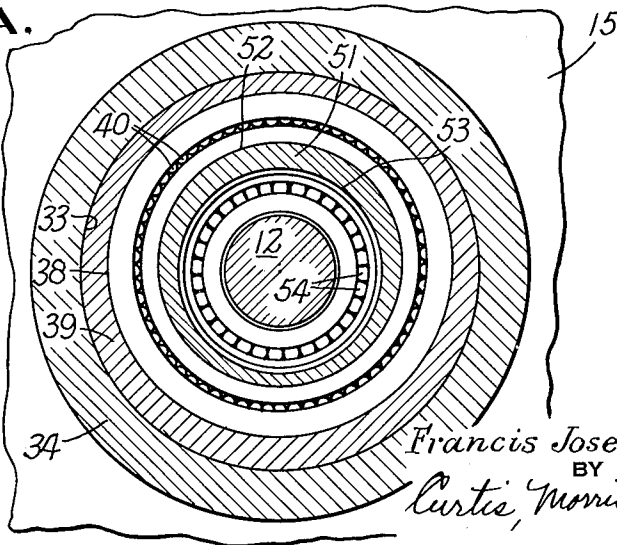


Fig. 3A.



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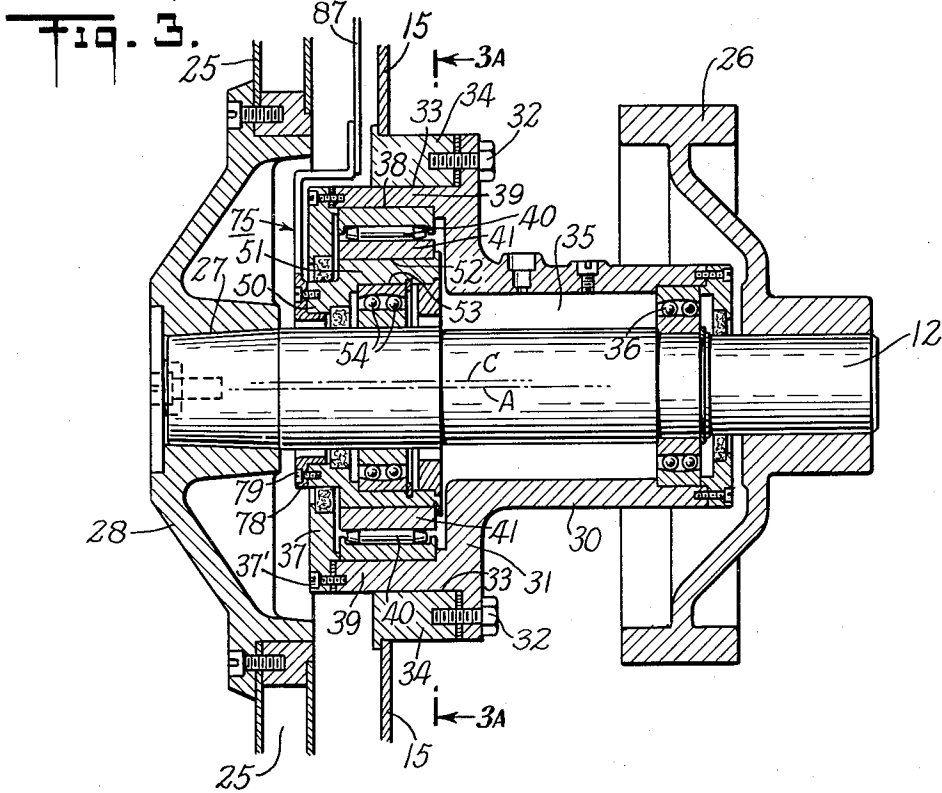


Fig. 9.

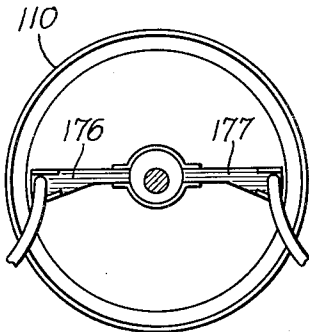


Fig. 10.

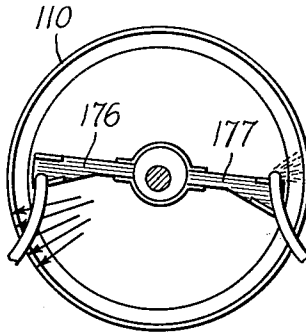
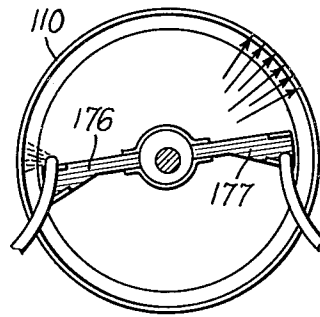


Fig. 11.



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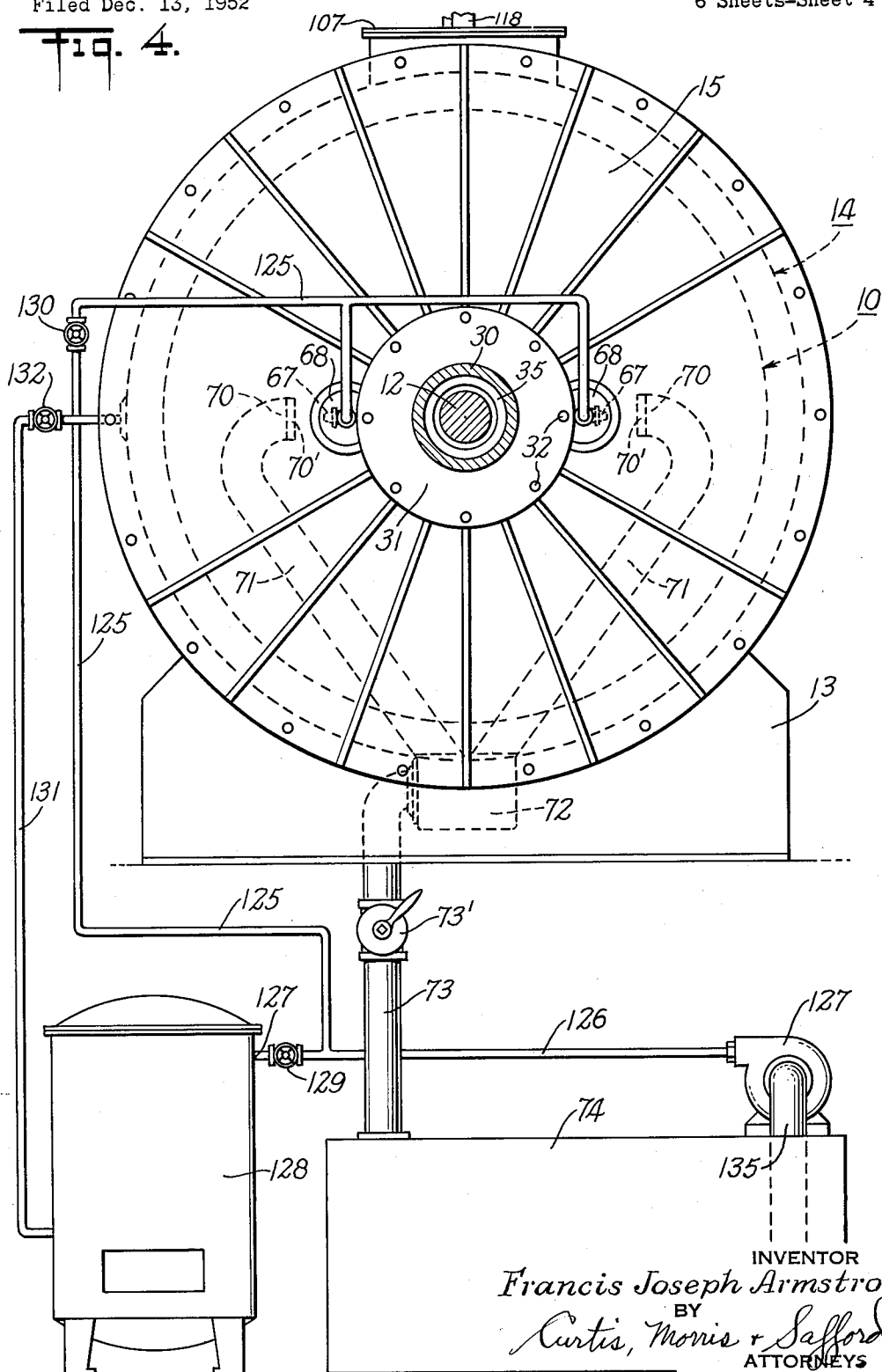
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Fig. 4.



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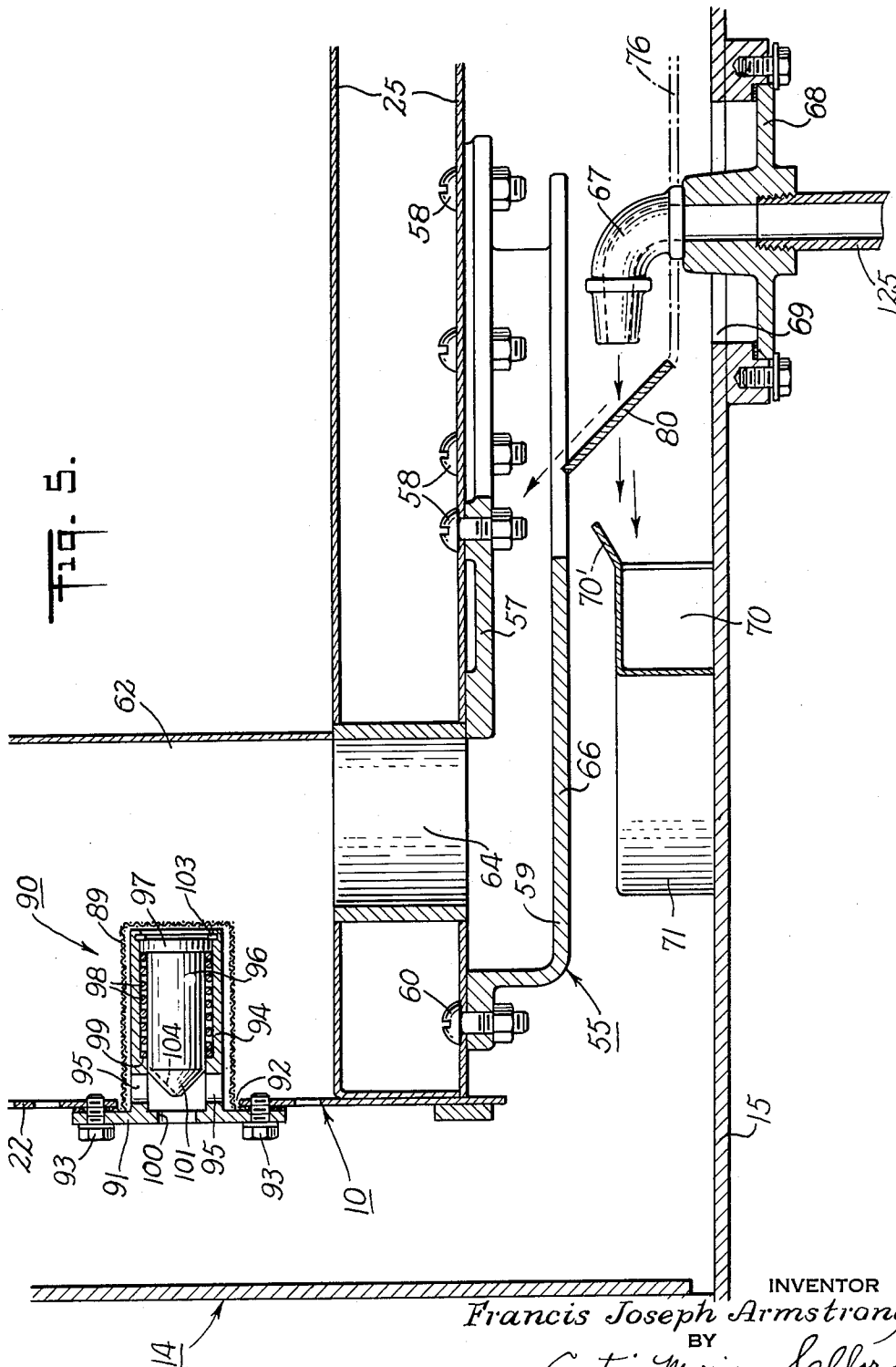
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AUTOMATIC BALANCING DEVICE FOR ROTATING CYLINDERS

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Fig. 6.

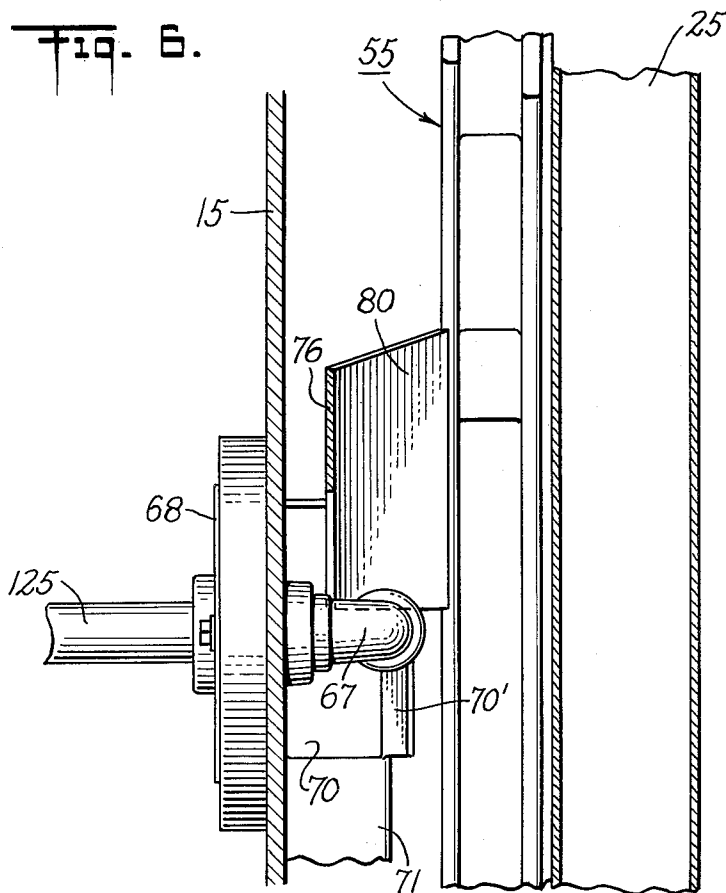
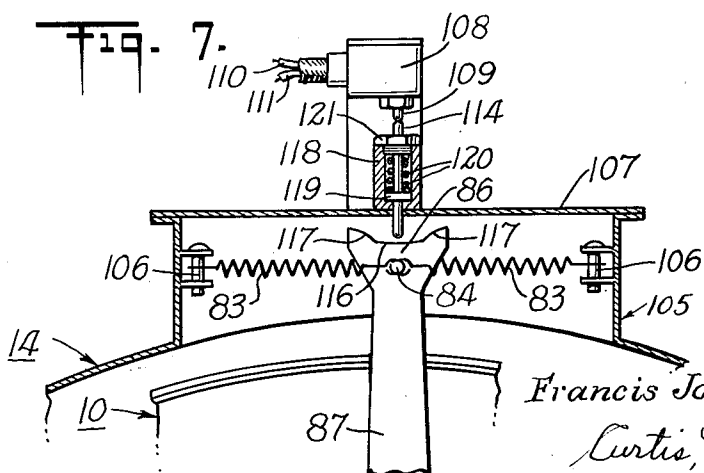


Fig. 7.



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AUTOMATIC BALANCING DEVICE FOR ROTATING CYLINDERS

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Application December 13, 1952, Serial No. 325,844

8 Claims. (Cl. 210—63)

This invention relates to improvements in automatic balancing devices, wherein liquids are used to balance rotating tumblers, and particularly to compensate or correct unbalance of horizontally rotatable washing and/or extractor drums or cylinders, whether supported for rotation at one or both ends of the drum or cylinder, such as are employed in laundries and dry cleaning establishments. These usually comprise perforate cylindrical tumbler walls supporting pluralities of peripheral, longitudinally extending tumbling ribs.

In the operation of rotary tumblers of this type for extracting cleaning fluid from the load under treatment, it is often difficult equally to distribute the weight of the load. Thus, because of unbalanced centrifugal forces, a cylinder may have a tendency to take on dangerous vibration at the higher extraction speeds of rotation to which it may be submitted.

In my earlier application, Serial Number 264,127, filed December 29, 1951, now U. S. Patent No. 2,687,215, there is disclosed apparatus adapted to correct unbalance due to unequal loading, or other cause, through the operation of valves mounted on the rotating cylinder and which control the admission of liquid to the interior of certain balancing ribs or tanks. In the said apparatus the extractor cylinder was mounted for normal rotative movement about a horizontal axis and for pendulous oscillation about an axis disposed eccentrically directly above its normal axis of rotation. The liquid for balancing was contained in an annular reservoir concentrically carried by a head of the cylinder, each balancing tank being connected through a control valve, by a conduit, with the interior of the reservoir at its periphery; whereby upon the opening of such valve, fluid would be compelled by centrifugal force to enter one or more of the ribs or tanks, which, at the time of unbalanced operation, happened to be located opposite the heavy side of the unbalanced tumbler. The valves were selectively opened by means of thrust rods rotatable with the drum, but radially movable into contact with the respective valve stems by engagement of the inner ends of the rods with a member mounted in concentric relation to the supporting frame bearings of the machine. Thus fluid would be continuously admitted to tanks disposed on the light side of the cylinder until balance had been attained and pendulous movement of the cylinder, sidewise with respect to its normal axis, ceased.

It is an object of the present invention to provide improved means, operating within the scope of the principle disclosed in said prior application for furnishing fluid to the balancing tanks of an extractor in a more simple, more reliable and more efficient manner.

Other objects will be in part obvious and in part will be pointed out hereinafter.

The invention accordingly consists of the features of construction, combinations of elements, and arrangement of parts, described herein, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings showing alternative em-

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bodiments of my present invention, similar parts being indicated by similar reference characters throughout.

Fig. 1 is a vertical section of a so-called open end washing and extracting machine, having a drive shaft and bearing structure associated with one end only of the machine;

Fig. 2 is a vertical sectional view, taken substantially on line 2—2 of Fig. 1, in the direction indicated by the arrows, showing the means for controlling the supply of balancing liquid to a plurality of annular sectors providing a plurality of troughs or receivers which are suitably positioned in circular or annular alignment to receive and supply the liquid to balancing ribs or tanks;

Fig. 3 is an enlarged cross section of the drive shaft and bearing structure, taken on line 3—3 of Fig. 2, looking in the direction of the arrows;

Fig. 3A is a cross section on line 3a—3a of Fig. 3;

Fig. 4 is a left or rear elevation of the housing for the horizontal cylinder shown in Fig. 1, the bearing housing and drive shaft being in cross section and also showing diagrammatically the supply and discharge means for handling both cleaning and balancing liquid;

Fig. 5 is an enlarged detail section, taken on line 5—5 of Fig. 2, as indicated by the arrows;

Fig. 6 is an enlarged fragmentary sectional detail view taken on line 6—6 of Fig. 2, as indicated by the arrows;

Fig. 7 is an enlarged detail view taken on line 7—7 of Fig. 1;

Fig. 8 is a cutaway side elevation of a washer and extractor showing a modification whereof the horizontal cylinder is rotatably mounted and driven at both ends in the two heads of a horizontal housing, some concealed parts being indicated by broken lines;

Figs. 9, 10 and 11 show an alternative structure for diverting the liquid discharge to the balancing tanks under different conditions of unbalance of the cylinder. As shown diagrammatically in the figures in this case the control arms 176, 177 are normally in line with each other and the horizontal axis of the cylinder 110.

Referring to the drawings, one embodiment of the invention is disclosed in Fig. 1 in relation to an open end cylindrical washer and extractor, suitable for wet or dry cleaning. The basket 10 is mounted on a horizontal shaft 12. This shaft is supported and rotates on anti-friction bearings which, contrary to usual practice, are not fixed to the main structure but are free to shift their center of rotation when under the influence of unbalanced centrifugal forces. This freedom of lateral motion is provided through the employment of a second set of bearings which are mounted in fixed relation to the main shell or housing of the machine, but are disposed eccentrically to the shaft and basket, and support a third set of bearings on which the shaft rotates. The center of this eccentric bearing is placed slightly above the center of the bearing it supports. For a better understanding of this pendulum suspension of the cylinder rotation bearing, reference may be had to my Patent Number 2,687,215. This suspension of the rotation bearing serves as a pendulum, permitting the entire basket or tumbler assembly to rotate on its own central axis A with the drive shaft and also to swing or oscillate as a unit about a different and higher axis (as C), see Figs. 3 and 3A.

Between the oscillation and rotation bearings is an eccentric annular housing (or spacer) which rocks or swings with the basket. Attached to this spacer are two control arms extending radially at a slight angle above the horizontal. Adjacent the outer ends of these arms and supported in fixed relation to the stationary supporting frame of the machine are two liquid inlet nozzles. These under ordinary balanced conditions (as shown in Figs. 1 to 8) discharge liquid under pressure (normally the same liquid used for washing) through

conduits within the interior of the housing, by which it is returned to a sump or tank for recirculation through the machine. Under these conditions no balancing effect is produced. However, under conditions of unbalance, the arms rock with the eccentric spacer as the basket swings, and periodically permit liquid to be diverted, as will later appear, into one or more of the independent annular sectors or troughs which are supported upon the rear head of the cylinder or basket.

From each said sector or trough liquid is admitted to a substantially liquid tight balancing tank or rib which extends parallel to the axis, the full length of the interior of basket, at or near its periphery. These tanks serve the dual purpose of ribs for lifting the garments, and as liquid receivers for balance compensation. This improved manner of supplying liquid for balancing does away with valves, requiring fine adjustment, and permits the use of the cleaning liquid or fluid of the machine, whether clean or soiled, since there are no valves to become clogged or put out of operation, as may happen where valved conduits are employed to carry liquid to the balancing tanks. This arrangement constitutes an advantage of the present device over the embodiment disclosed in my earlier patent.

In Fig. 1 the extractor cylinder is shown at 10, mounted at its rear end upon a horizontal shaft 12 to rotate about an axis substantially though not actually in fixed relation to a shell or housing 14 which is mounted on legs 13 and provided with a rear head 15 and a front head 16. The front head has a central opening 18, which during operation of the machine is held in sealed condition by a cover or door 20 adapted for manipulation and lockable by means of a handle 21. The drum 10 has a generally perforate cylindrical wall 22 and a front wall 23. In the latter wall is a load receiving opening 24 which registers with the shell door opening 18.

The shaft 12 may be driven in any suitable manner, as by an electric motor and belt, which may serve to rotate the pulley 26, fast mounted on said shaft. As shown in Fig. 3 of the drawings, the shaft 12 is suitably affixed to the double walled rear head 25 of the basket by keying or otherwise fastening within the central bore 27 of a hub 28, rigidly secured to the drum head 25. The support, i. e. the rotation and oscillation bearing construction, may be generally like the bearing structure suspending the cylinder in my above mentioned patent, inasmuch as a similar pendulum suspension is provided, though the present one is modified somewhat to support a cantilever basket construction having a support bearing at one end only of the shaft.

As stated above, the bearing structure comprises first and second bearing units which support the tumbler for both rotation and oscillation about spaced points or axes. These axes, i. e. C and A, are spaced apart, one above the other, by approximately $\frac{1}{8}$ ". The structure comprises a bearing supporting housing 30, having a flange 31, fastened rigidly by means of bolts 32 to outer end of a hub 34 which projects, to the right in Fig. 3, from the head 15 of the shell 14. The bearing housing 30 extends both to the right and left of the flange 31. The right end comprises a space 35 in which is concentrically seated the outboard self-aligning shaft support bearing 36, which, in turn, supports the outer end of the drive shaft 12, the transverse center of the bearing being overhung by the belt pulley 26.

To the left the bearing supporting housing 30 extends into a position contained within the structure of the rigid hub member 34 and supports the tumbler for lateral oscillation about the support axis C, Fig. 3, with respect to the rotation axis A. This end of the housing 30 is shaped to provide an outer surface 33 concentric with axis A and supported within the hub 34 and an eccentric bearing supporting surface 38 which centers on said oscillation axis C disposed about $\frac{1}{8}$ " higher than the rotation axis A.

Fitted within the hub 39, which is bolted to the fixed hub 34, is a suitable bearing, such as an ordinary needle bearing, having the rollers 40 supported on an inner retaining cage 41. This bearing is concentric with the bearing supporting surface 38, the latter being, as mentioned previously, eccentric with the surface 33 inside hub 34. Supported on the inside surface 52 of bearing cage 41 is an annular spacer member 50 having an integral sleeve 51 whose outside surface mates with surface 52 and whose inside surface 53 is eccentric relative thereto. Fitted flush within surface 53 is a rotation bearing 54 which may be of the self-aligning ball type and which supports the shaft 12 for rotation around the axis A.

The eccentricity of the spacer member 50 is such that the axis of rotation A is supported approximately $\frac{1}{8}$ inch from the rotation axis C defined by the oscillation bearing 40. When the tumbler 10 is not rotating or when it is rotating under perfectly balanced conditions, so that the forces on shaft 12 act downward only, axis A will be supported directly below axis C and substantially parallel thereto. When, however, the tumbler is rotating in unbalanced condition, there will be forces acting on shaft 12 other than downward and its left end will swing as the bob of a pendulum, having a $\frac{1}{8}$ inch length, around the axis C. This swinging will move axis A slightly out of parallel relation to axis C and will oscillate the diverter means 75 which is fastened to the spacer 50 and whose action will be described hereinafter.

The rotation bearing 54 and the oscillation bearing 40 are held against endwise movement within the housing 30, by means of a retaining ring 37 which is secured to the eccentric member 39 of the housing 30 by means of screws 37', and the general conformation of the eccentric spacer 51. It will be understood that any suitable provision may be made for retaining lubricating materials within the confines of the several bearings and common spring retaining rings (not shown) may be employed to hold the bearing cages in proper position.

From the foregoing, it will be seen that the tumbler and spacer member may swing as a pendulum of short radius about the axis C, under laterally acting forces in a limited manner, while at the same time, they are rotating about the axis A of the support and rotation bearings 36 and 54.

In my Patent 2,687,215, an annular structure for the reception of balancing liquid was mounted upon the cylinder head. In the present case a plurality of annular sectors, as the five chambers 55, are arranged concentrically about the cylinder axis A, but separated one from another circumferentially, as indicated at 56, see Fig. 2. Each annular sector, best seen in Figs. 2 and 5, is in the form of an arcuate trough having an inner wall 57 which is secured to the cylinder head 25 by screw bolts 58, and an outer wall 59 secured to the said head at points spaced radially nearer the wall 22 of the cylinder by screw bolts 60. Corresponding to the five sectional receiving troughs are five tumbling ribs or tanks 62 which extend inwardly radially at equally spaced intervals from the cylinder wall 22. The tanks are angular in shape, see Figure 2, and are positioned with the vertices of the angles directed toward the axis of the cylinder. Openings 64, Figure 5, connect the interiors of the fluid receiving troughs or chambers 55, with the interiors of the ribs 62 by means of open sided radial extensions 66 of the chambers 55, which overlap the ends of the ribs 62, see Fig. 2. Fewer than five sectors may, in some cases, be preferred.

Figs. 2 and 4 disclose a pair of nozzles 67, mounted in the housing head 15, horizontally in line with the center axis of the housing, at equally spaced points from the said axis. Each nozzle is mounted in a fitting 68, Fig. 5, which covers an opening 69, appropriately placed in the said head 15. Each nozzle is so placed that liquid ejected therefrom jets substantially parallel with the head 15 and outwardly towards the peripheral wall of the housing.

Under normal conditions these jets, as indicated by the

solid line arrows in Fig. 5, will be received in the mouths 70 of a pair of conduits 71, supported within the head 15, which conduits lead to a drain box or sump 72, Fig. 4, from which the liquid may be freely returned to a supply tank 74 by means of a pipe 73. A projecting lip 70', Figure 5, is provided on each conduit 71 to prevent splash of the liquid about the mouth 70 of the conduit 71 and undesired entry into the receivers 55.

In order that the liquid may be directed into one or more of the troughs 55, in case of unbalance of the cylinder, diverter means 75, oscillatable with the cylinder, should the latter be swung in a sideways direction about the oscillation axis C, is provided periodically to direct the constantly flowing jets into the troughs leading to the particular balancing tanks or ribs, which happen to be opposite the heavy side of the unbalanced cylinder.

The diverter means 75 comprises a pair of generally oppositely extending control arms 76 and 77, best seen in Fig. 2, which extend radially from a central flange 78, secured by bolts 79 to the inner annular surface of the eccentric spacer 50, see Figs. 2 and 3. At their outer ends the arms 76, 77 terminate in jet diverting vanes 80, 81. These vanes, as shown in Figs. 5 and 6, are disposed, with respect to the ends of their respective control arms, at an angle of about 45°. As shown in Fig. 5, in cross section, one of these vanes is intercepting the jet flow from a nozzle 67 and forcing the liquid into one of the troughs 55. As seen in solid lines in Fig. 2 the arms are in normal inactive position, thus permitting the jets to discharge into the mouth 70 of the drain conduits 71, best shown in broken lines in Fig. 4.

In order to help restore the cylinder to its normal relation to its rotation axis, a pair of opposed horizontal tension springs 83 are provided, see Fig. 7. These springs extend in opposite direction from a pin 84 mounted adjacent the outer end 86 of a centrally upright arm 87, carried by the diverter flange 78 centrally between the arms 76, 77. The arms 76, 77 and 87 have great length as compared with the length of the radius of oscillation of the tumbler, consequently a small movement of the spacer member 5, which oscillates with the tumbler, causes greatly multiplied movement of the vanes 80, 81 and also of the pin 84 to which the springs are attached. Thus the opposed springs 83 also effect strongly the period of oscillation of the spacer member and drum.

A suitable spring tension is one designed to keep the natural period of oscillation of the pendulum suspension at a point just above the desired R. P. M. of the cylinder, at extraction speed.

It is to be particularly noted, that the comparatively great length of the diverter arms effects rapid and positive control of the jet flow to the balancing ribs, in consequence of a very small eccentric movement of the drum sideways with respect to its normal rotation axis.

In the present embodiment the degree of eccentricity of the eccentric bearing is, to the effective distance of the vanes from the axis, about in the ratio of $\frac{1}{8}$ " to $12\frac{1}{2}$ ", thus the magnification of sideways movement has a multiplying factor of about 100, which it will be understood induces very quick compensation for unbalance in the cylinder.

From the above description it will be understood that, in operation, unbalance of the cylinder caused by too much weight upon one side thereof will cause a lateral swinging of the pendulum comprising the cylinder, and consequent movement of the diverter means 75, in such a way as to cause cleaning fluid from the nozzles 67 to pass into one or more of the tumbling or balancing ribs, which are diagonally opposite the heavy side of the cylinder. Since the openings connecting the chambers 55 with the ribs or tanks 62 are unvalved, the flow of the jets into the ribs will be caused partly by the velocity of the jet as it enters the sectors, and partly by centrifugal force, when the cylinder has attained a sufficient speed of rotation. The ordinary operating speed of these cylin-

ders for extraction purposes is about 600 R. P. M. However, at about 250 R. P. M., long before extraction speed has been reached, the constantly flowing jets are diverted into the sector spaces 55 and the fluid will begin to enter the ribs 62 and be distributed along the periphery of the rib or ribs, so that in a matter of seconds of time, sufficient compensating fluid will have been delivered to the ribs on the light side, to bring the cylinder into operatively satisfactory balance, and freedom from excessive vibration.

In order to avoid a tendency to over compensate, under certain conditions, fluid bleeders or release valves are located at suitable points in the cylinder wall 22 and extend radially downwardly within the several balancing ribs or tanks 62. Such a release valve is indicated in Figs. 1 and 8, at 90, and in detail in Fig. 5. It comprises a flanged casing 91 secured within an opening 92 in the cylinder wall 22 by means of bolts 93. A cylindrical valve casing 94 depends within each rib. This casing is ported as at 95 adjacent the cylinder wall. A screen 89 for the exclusion of grit, lint, or other foreign matter, surrounds the body of each casing. The valve comprising a plunger 96 having a head 97 is mounted to reciprocate within the valve casing.

Normally the plunger is held in the open position shown in Fig. 5 by a helical spring 98 which surrounds the plunger and abuts at one end against the valve head 97 and at the other against a shoulder 99 within the valve body. The valve plunger 96 is moved outwardly in the valve body by centrifugal force gradually to close the ports 95 and the outlet port 100, by the introduction therein of the conical end 101 of the valve plunger. The closing of the valve is resisted by the spring 98. The pressure to force the valve outwardly to shut off liquid release from the rib or tank is the centrifugal force due to the weight of the valve body 96 and is opposed by the said coil spring. The valve plunger may be retained in the casing by a snap ring 103, or other suitable means. The conical end of the valve plunger is provided with a shallow groove, as at 104, which permits a certain degree of drain from the valve chamber, even after the valve is otherwise completely closed, under maximum centrifugal force.

It will be understood that at the lower speeds, the ribs will continuously drain through these valves as the cylinder rotates. Some loss of liquid will take place throughout the extraction period, to a lesser degree through the shallow groove, and there being a sufficient excess of flow from the jets into the annulus segments the constant drain is replenished at the proper balancing rib or ribs, while those on the heavy side are being drained.

The provision of these release valves helps control the rate of balance attainment, prevents over-compensation and makes practically unnecessary the presence of the openings 64, for the purpose of discharging liquid from the ribs.

Referring to Fig. 7, there is indicated a spring-box 105 seated over an opening in the housing 14 of the extractor, adjacent the head 15 thereof. Within this housing are mounted pins 106 to which the outer ends of the springs 83 are secured. This box has a cover 107 which supports a limit switch 108, operable by a plunger 109. Electric wires 110 and 111, which are connected when the switch is closed, are in series in the circuit of any suitable driving motor for the cylinder, such as is shown at 112 in Fig. 1, belt connected to pulley 26.

The said switch plunger 109 is in alignment with an operating rod 114 which passes loosely through the box cover 107 into radial alignment with the arm 87 when the latter is in its normal vertical position. The upper end of arm 87 is formed as a cam having a low dwell portion 116 and, on each side thereof, a high valve operating land 117. The plunger rod 114 slides in a housing 118 carried by the cover 107. Inside housing 118, space is provided for fixed collar 119, which surrounds the rod 114,

to reciprocate therein. A coil spring 120 is seated upon the said collar and the latter is held in a compressed condition by a nut plug 121 which is threaded into the housing 118 in contact with the upper end of the spring. Normally the lower end of the rod 114 clears the central dwell portion 116 of the cam. However, if too great vibration of the basket occurs, causing too much lateral movement of the extractor basket or cylinder 10, one or the other of the lands 117 engages with the rod 114 and moves the rod and plunger 119 to open the limit switch, thus stopping operation of the motor 112. The extractor accordingly ceases operation until the load in the basket has been adjusted to a point of safety.

Fig. 4 illustrates, diagrammatically, on a smaller scale, various other pieces of apparatus employed to effect a cleaning and extracting operation.

It will be noted that suitable piping 125 connects the two nozzles 67 with the discharge pipe 126 of a suitable centrifugal pump 127. This pump is seated above the liquid supply tank 74, from which it draws cleaning fluid, as perchlorethylene, by means of a suction pipe 135. This tank may continuously receive, by means of pipe 73, the liquid which drains away from the machine during operation as an extractor. A suitable dump valve 73' in the pipe 73 may be employed to maintain a liquid level in the cylinder during a washing operation. The pipe 126 also connects with the inlet 127 of a known type pressure filter 128, a valve 129 being located to cut off the flow of liquid from the pump to the filter during an extraction treatment of the cylinder load. A valve 130 in the pipe line 125 may be closed to cut off the supply to the jet nozzles during a washing or wet tumbling period of operation.

The outlet side of the filter is connected by means of a pipe 131 with the interior of the machine housing or shell to supply the liquid for washing. This pipe also is furnished with a shut-off or control valve 132.

Fig. 8 discloses my invention as applied to a horizontal washer and/or extractor, having two end bearings assemblies 150 and two pulley supporting shafts 152. In the smaller sizes of two bearing machines, a drive shaft and pulley at one end of the machine will suffice. In the case of very long cylinders, the drive is more satisfactory and the balance compensation better when opposite end drive and balancing are provided. As the bearing structure and balance liquid receiving receptacles, tanks, etc. may each be similar to those employed with the open end or cantilever type apparatus shown in Fig. 1 and already described, further description of parts common to both structures is thought to be unnecessary. It is important, however, in the case of long, two bearing cylinder structures that liquid diversion control arms be independently operable at the two ends, in order that the two ends may each receive balancing liquid in response to an out of balance condition occurring at the respective ends.

In Fig. 8 a long rib tank 153, extending to the ends of the cylinder 154, may be connected at its two ends with annular sectors (not shown), which receive jets of balancing fluid, each of which receivers may be of the nature of the sectors 55, shown in Fig. 1. A partition 155 divides each tank 153 into two sections 157. Thus in operation dynamic balance is maintained at both ends of the cylinder. Each section 157 is supplied with a bleed valve 190. These valves are like those described above, but are located adjacent the two ends of the tanks 153. The bleed valve in each half tank is important. It serves to drain ribs at speeds lower than, say 250 R. P. M., but at higher speeds the valve plungers are thrown outward against the pressure of the valve springs, so that only a dribble orifice is left open.

As presently constructed the mass of the valve plungers of the bleed or relief valves is about 10 oz. ($\frac{5}{8}$ lb.). Spring pressure is such as to require about 26 lbs. force to close the valve. At 250 R. P. M. on a cylinder

having a 48" diameter, this gives a force equal to $.00341 \times \frac{5}{8} \times 2 \times 250^3$, or 26.5 lbs.

Figs. 9, 10 and 11 not only show a modification in which action of the diverter, as described above, is reversed in its control of the jets of balancing liquid but illustrate the pertinent positions occupied under conditions of balance and unbalance.

By reference to Fig. 9 it will be seen that when the cylinder is in balance the axis of the cylinder and of the eccentric are in a vertical plane and the diverter arm vanes slant directly in the line of the jetted liquid and cause it to fall downwardly in the cylinder housing to a point where it may be drained away into the supply tank.

Fig. 10 shows the operation when a condition of unbalance causes the plane of the axes to be oblique and the diverter swung to a position relative to the cylinder for permitting the liquid to enter the balancing ribs located on the light side of an unbalanced cylinder. As the cylinder revolves the heavy side will pass to the other side of the vertical axis and the diverter will be swung to a position to permit the oppositely positioned nozzle to discharge into the same ribs or tanks as before, but at an instant after said ribs have turned to the opposite side of the axis, as illustrated in Fig. 11.

Thus it will be seen that in the one case the vanes normally permit discharge from the jet nozzles directly into the drain and are moved in a case of unbalance to divert the flow into the balancing ribs, while in the modified form the vanes normally interfere with the discharge to the balancing tanks but under conditions of unbalance are moved to free the jets to effect discharge into the balancing ribs.

From the foregoing it will be seen that this invention attains the ends and objects set forth herein in a novel and practical manner, without the use of valves and other impractical and unsatisfactory factors, such as rubber supports for the cylinder, or resilient means of an equivalent nature.

As many possible embodiments, other than are suggested herein, may be made without departing from the scope of the invention, it is to be understood that all matter herein set forth, or shown in the accompanying drawings, is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In laundering and dry-cleaning apparatus comprising a housing, an extractor cylinder, means including a drive shaft for rotating said cylinder in said housing, and supporting means for said cylinder shaft having co-operative bearing parts permitting rotation of said cylinder about one horizontal axis and lateral horizontal swinging as a pendulum about a second axis positioned above said one axis by a distance not greater than the diameter of said shaft and a plurality of balancing tanks evenly spaced about the periphery of said cylinder, in combination, balancing liquid distributing means comprising a plurality of independent arcuate troughs carried in annular alignment by and exteriorly of a head of said cylinder and adapted to receive and conduct to said tanks liquid for dynamically balancing said cylinder, means mounted in said housing for supplying continuously a jet of balancing liquid to the space between adjacent heads of said cylinder and housing, means forming part of said cylinder supporting means laterally movable with said cylinder, and a control device secured to said part of said supporting means and movable therewith, adapted to serve as a diverter to interfere with said jet during lateral movement of said cylinder, selectively to control the admission of the liquid of said jet through certain of said troughs into certain of said tanks, thereby to compensate for an undesirable condition of unbalance during operation of said cylinder.

2. Apparatus as defined in claim 1 in which a part of said supporting means is an eccentric bearing spacer mem-

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ber disposed between a rotation and an oscillation bearing.

3. Apparatus as in claim 1 in which a nozzle mounted in and extending through the head of said housing is positioned to discharge a jet of liquid in between said cylinder and housing heads in a direction substantially parallel with said heads.

4. Apparatus as in claim 3 in which a pair of nozzles are positioned to discharge oppositely directed jets towards the periphery of the housing substantially along the line of the transverse axis thereof.

5. Apparatus as in claim 4 in which said diverter means comprises a pair of laterally extending arms carrying at their outer ends angulated vanes adapted, upon lateral pendulous movement of said cylinder, selectively to change the normal direction of flow of said jets thereby, to permit or prevent balancing liquid gaining entrance to the interior of certain of said tanks.

6. Apparatus as in claim 1 in which the cylinder is driven for rotation by a motor connected to a source of electric energy in a circuit containing a normally closed control switch mounted upon said housing, and said control device carries a member adapted upon excessive oscillation of said cylinder to actuate said switch to open said motor circuit.

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7. Apparatus as in claim 1 in which discharge openings are situated in a peripheral wall of each of said tanks, valves in said discharge openings, each of said valves comprising a plunger normally held in open discharge position by a spring, said plunger being weighted to move to varying closed positions of the valve under the action of centrifugal force as the cylinder rotates at different speeds above a predetermined minimum.

8. Apparatus as in claim 7 in which said valve is provided with means to permit a slow discharge from its respective tank, although the valve may stand in closed position.

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