

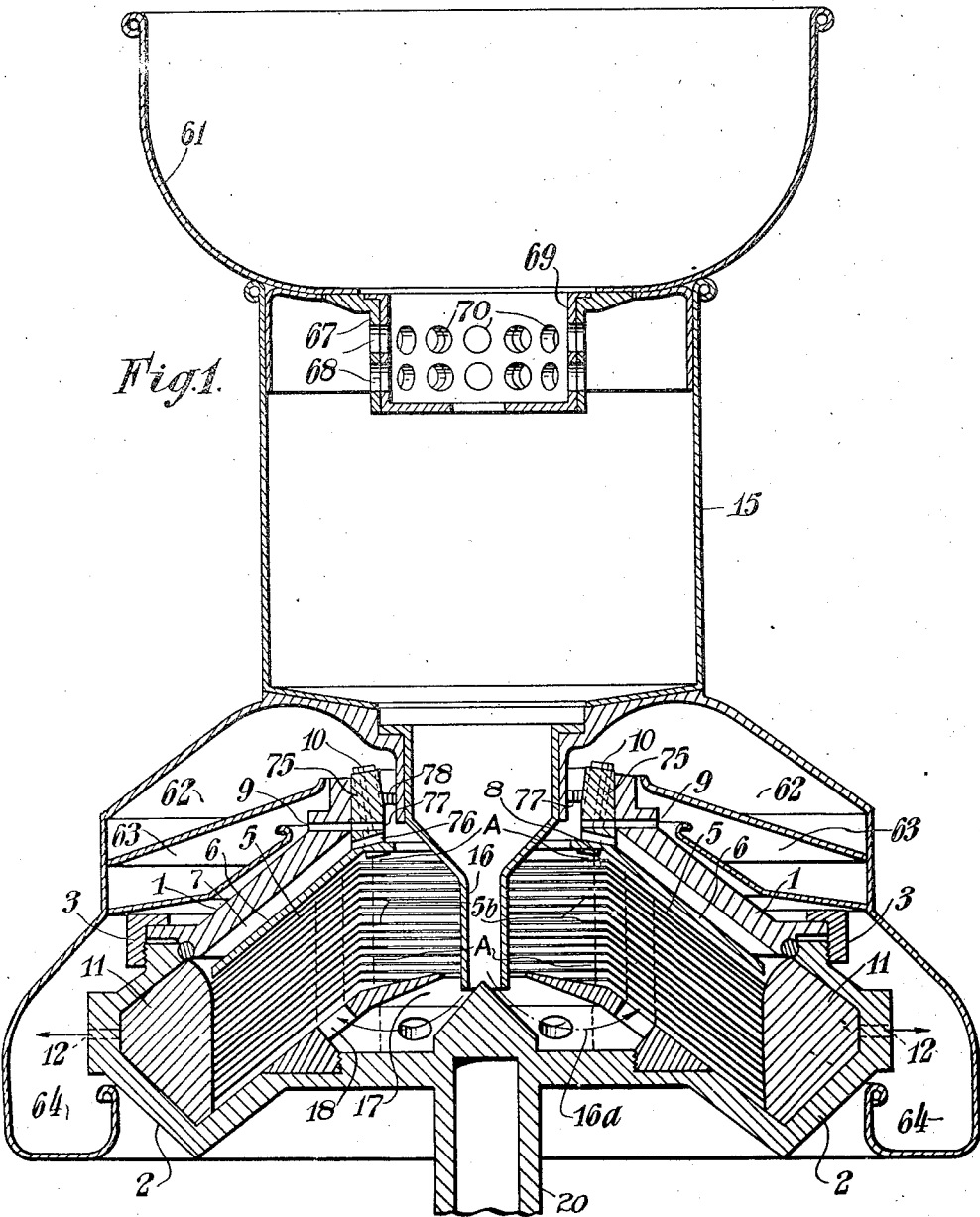
Sept. 19, 1939.

H. W. FAWCETT
CENTRIFUGAL SEPARATOR

2,173,580

Filed Feb. 18, 1937

6 Sheets-Sheet 1



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By [Signature]
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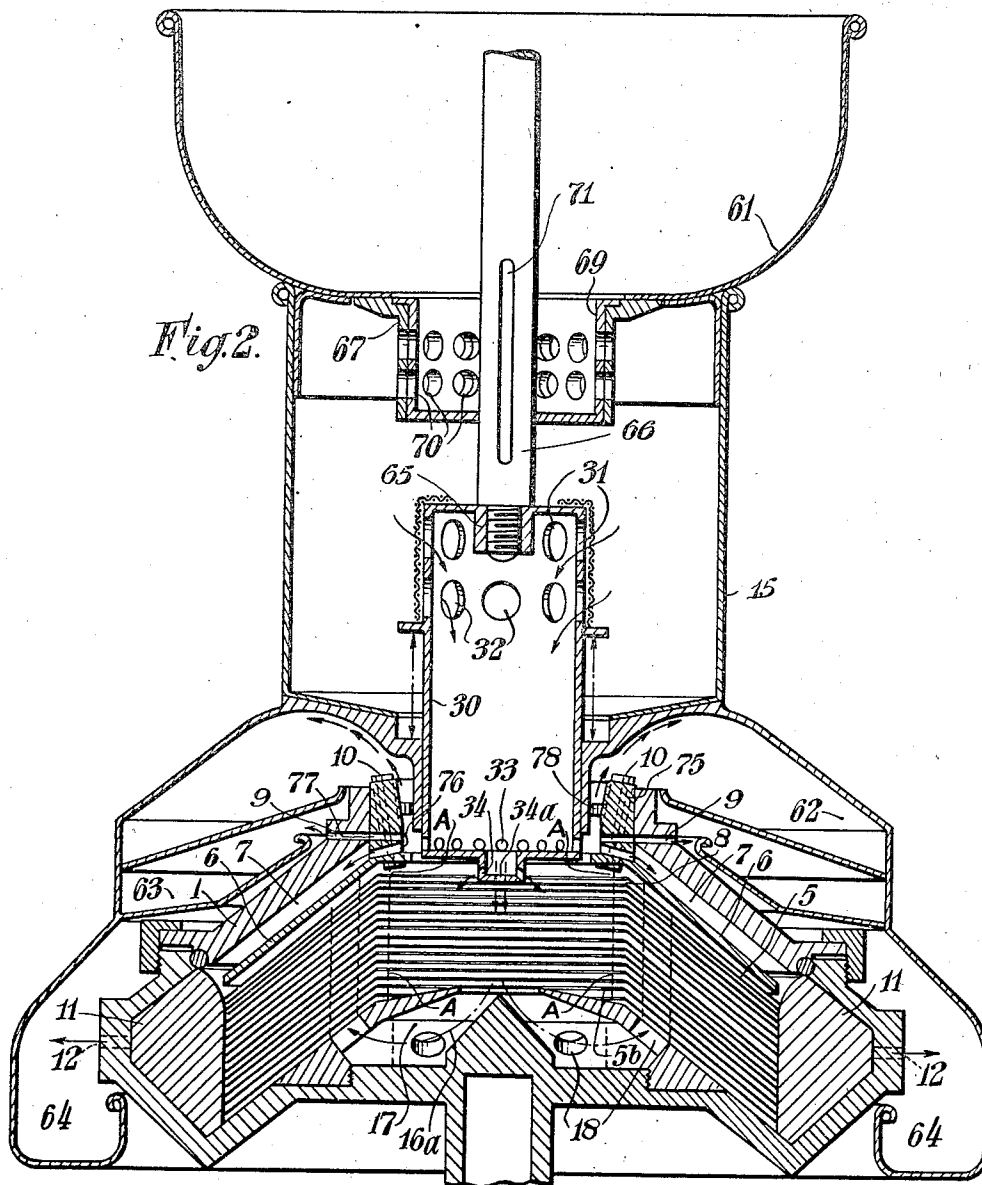
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CENTRIFUGAL SEPARATOR

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6 Sheets-Sheet 2



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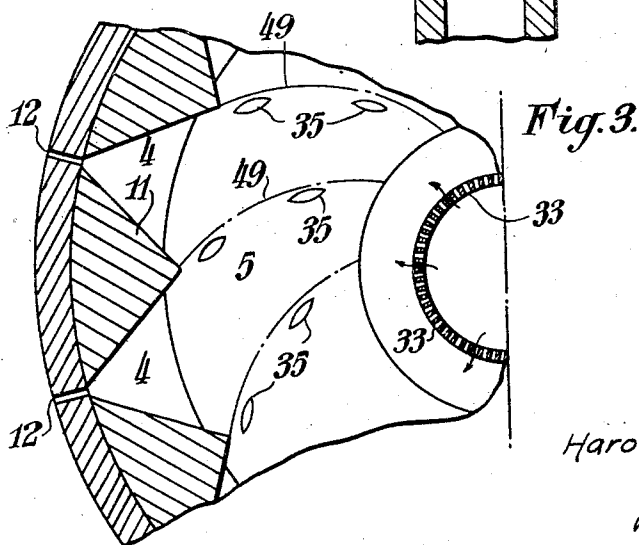
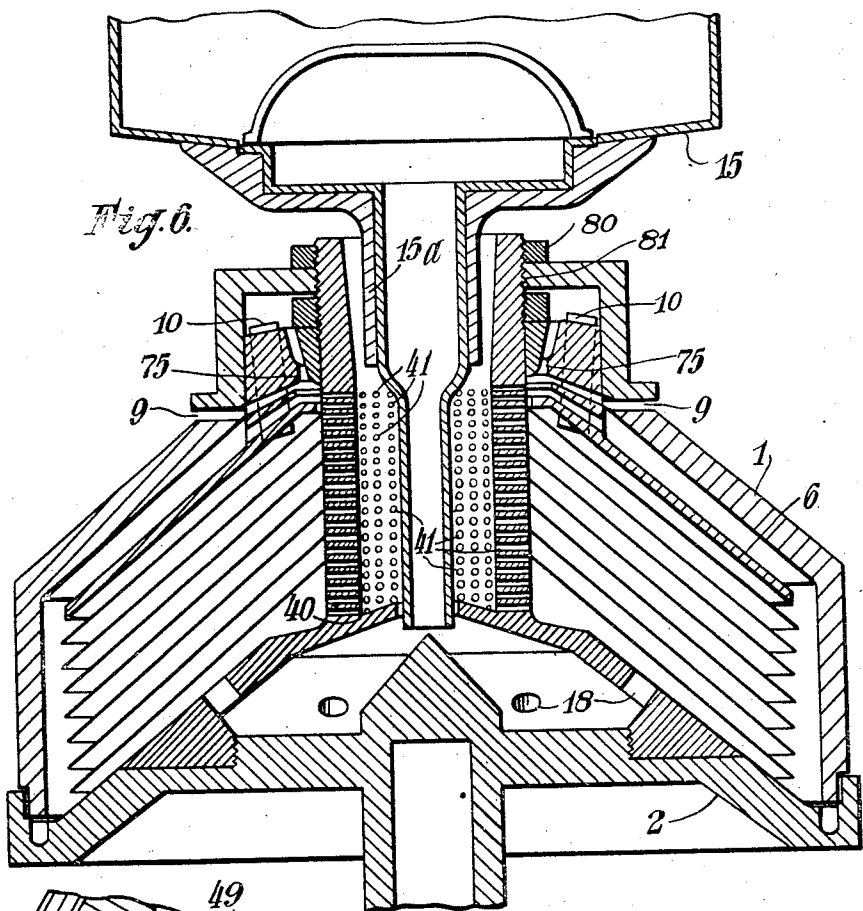
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2,173,580

6 Sheets-Sheet 3



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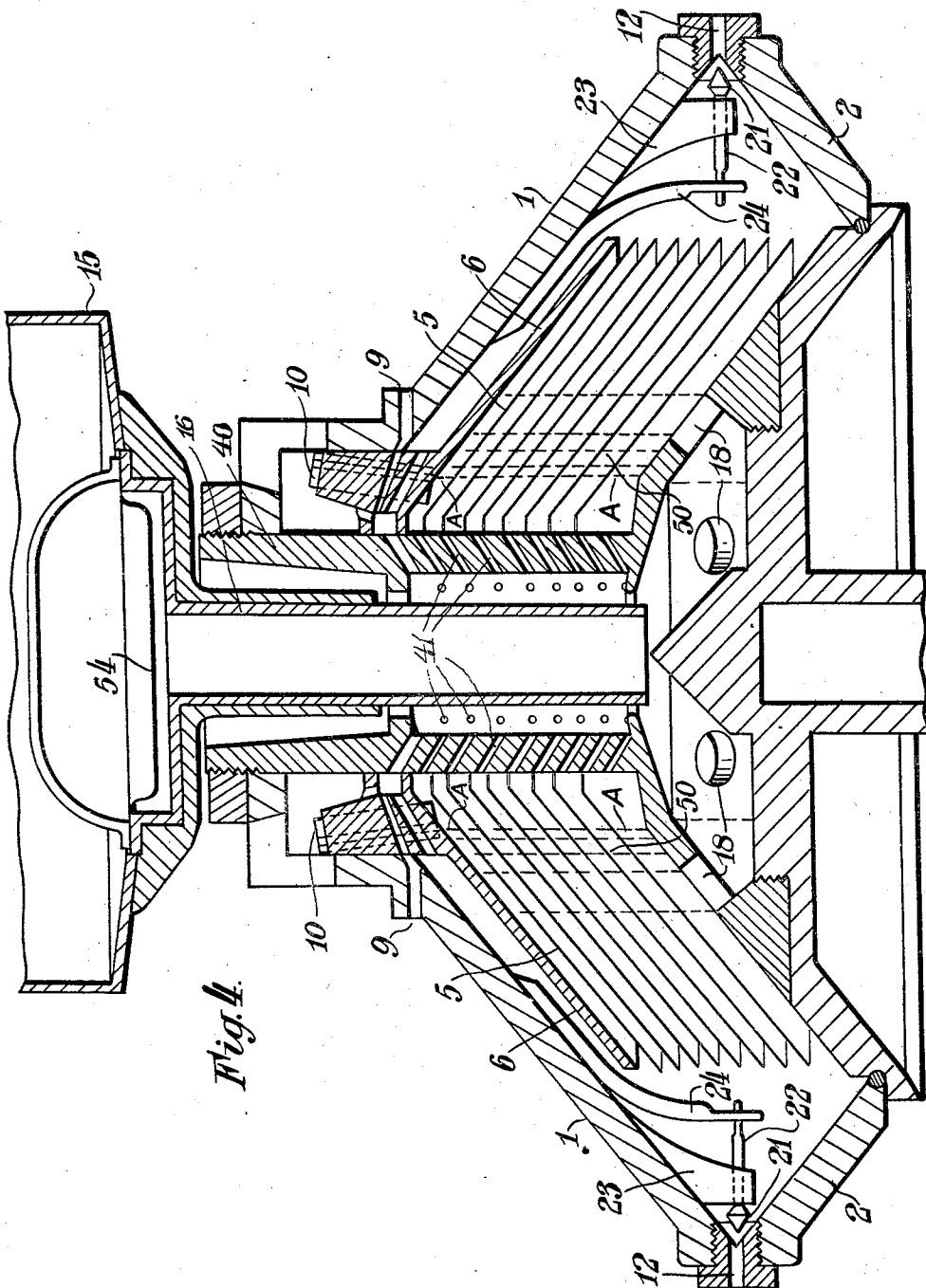
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CENTRIFUGAL SEPARATOR

Filed Feb. 18, 1937

6 Sheets-Sheet 4



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CENTRIFUGAL SEPARATOR

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6 Sheets-Sheet 5

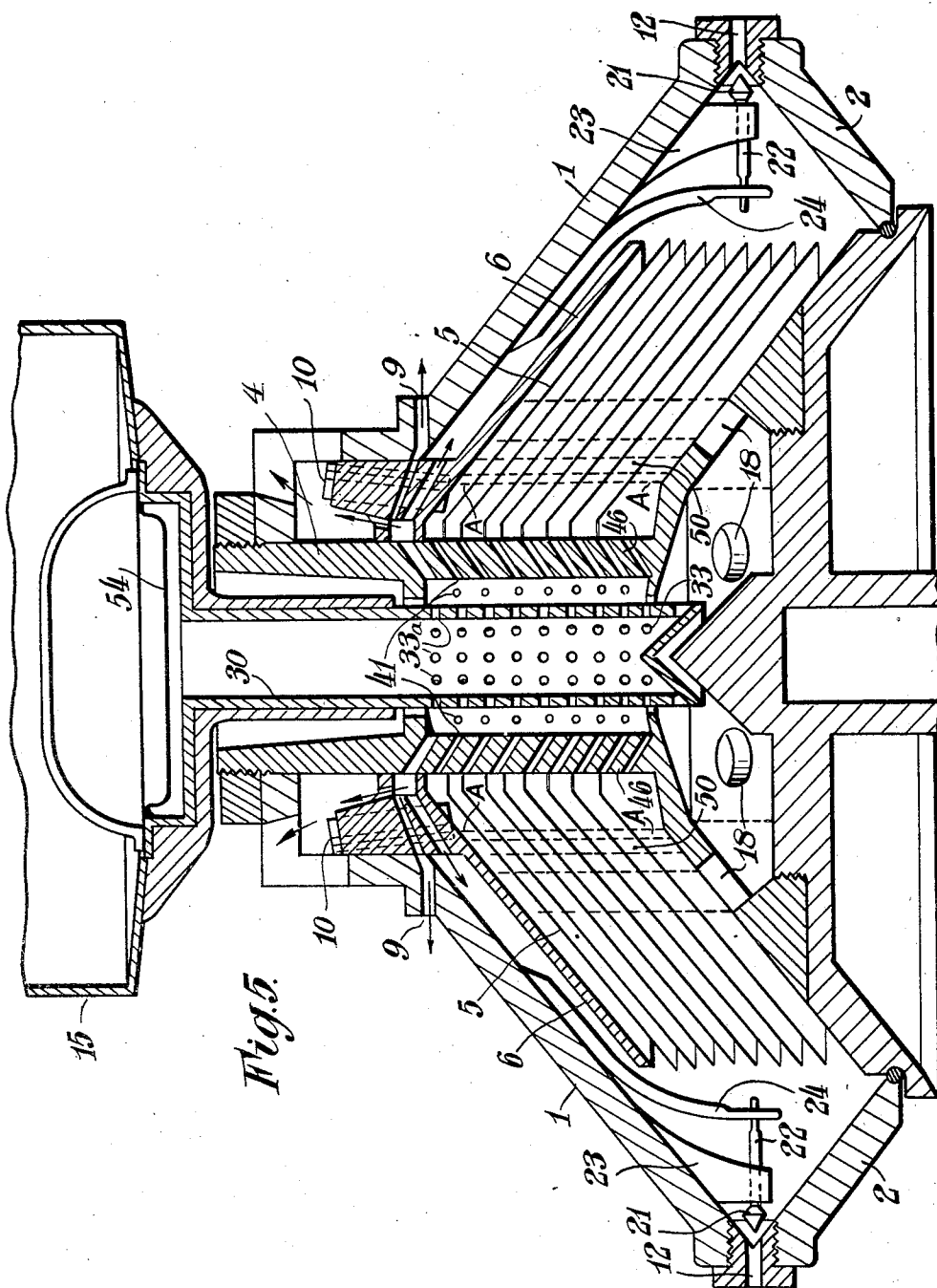


Fig. 5.

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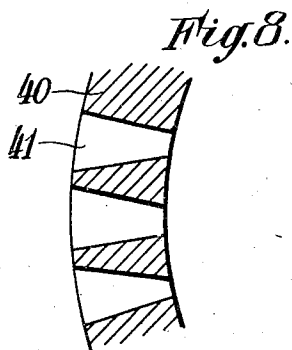
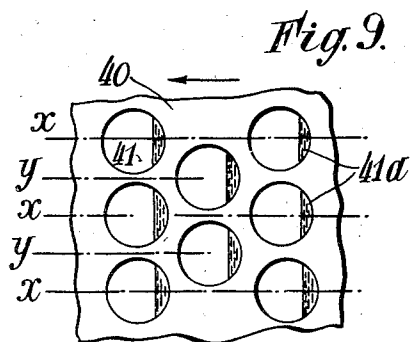
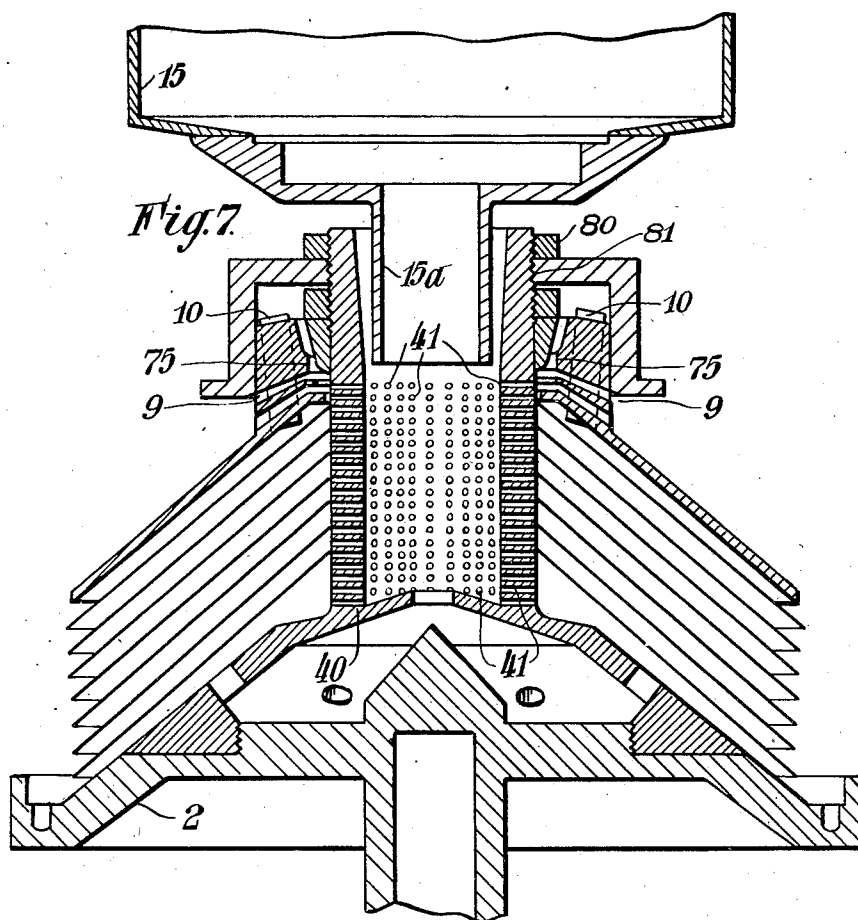
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CENTRIFUGAL SEPARATOR

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6 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

2,173,580

CENTRIFUGAL SEPARATOR

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Application February 18, 1937, Serial No. 126,417
In Great Britain February 21, 1936

15 Claims. (Cl. 233—1)

This invention relates to centrifugal separators and more particularly to cream separators, and the invention aims at providing a method of operation and a construction of separator whereby the internal parts of said separators, and more particularly the discs of the disc pack, can be effectively washed and cleaned during the rotation of the apparatus.

Various proposals have been made for cleaning or rinsing the discs of the disc pack of centrifugal separators during the rotation of the latter, but these proposals have all been based on the idea of causing the washing or rinsing liquid to traverse the same path as the liquid undergoing treatment, i. e., of passing the washing or rinsing liquid to the discs through the normal inlet and distributor and allowing the liquid to escape through the normal outlet openings in the vicinity of the axis of the separator.

I have however found that this method of cleaning the discs is entirely inoperative insofar as the washing or rinsing liquid does not clean portions of the discs which are nearer the axis of the bowl than the feed holes in the discs and the action of said liquid is not sufficiently vigorous to remove the thin films of grease adhering to the discs.

I have previously proposed a cream separator in which washing liquid is supplied through the normal milk inlet and evacuated by valves in the periphery of the bowl. In this construction however, a good scouring effect is obtained only in the case of a few discs near the point of entry of the washing liquid into the bowl, whilst the remaining discs are not scoured in a satisfactory manner.

In contradistinction to this proposal, according to the present invention, provision is made for keeping the interior of the bowl drained while washing liquid is fed to the edge, nearest the axis, of each internal part which it is desired to wash. In this way the liquid fed to the inner edge of such parts which are rotating rapidly will be given rotary motion and will therefore tend to fly outwardly by centrifugal action. Due to the separator being provided with draining facilities at its maximum internal diameter the full centrifugal force is exerted on the washing liquid which flies unobstructedly towards the outlets with intense velocity. This liquid will pass violently across all surfaces with which it comes in contact and will scour same. The invention thus transforms a centrifugal separator, for example a cream separator when washing is being carried out, from a substantially closed casing

in which liquid is fed at the axis to the distributor and from thence through the feed holes in the discs moving first outwardly and then inwardly to be expelled near the axis of a separator from the skim milk outlet into a form of centrifugal sprayer in which liquid is fed to the axially innermost parts of all portions desired to wash, provision being made for keeping the separator permanently or intermittently drained during the rinsing operation.

According to one embodiment of the invention, the stationary feed tube to the distributor of the separator is made removable and, when it is desired to wash or rinse the interior of the separator, said stationary feed tube is replaced by a stationary or axially reciprocable tube closed at the bottom but having one or more peripheral holes or nozzles adapted to direct a large volume of the washing or rinsing liquid directly on to and between the inner edges of the discs of the disc pack. Said discs then act as a kind of centrifugal pump or sprayer, catching the washing or rinsing liquid and expelling it outwardly between the discs with great velocity, as a result of which the discs are thoroughly cleaned from any adherent greasy or dirty film and left in a bright and polished condition. If the bowl be left in position during the cleaning operation and suitable valves be fitted at the maximum internal periphery of the bowl, the washing or cleaning liquid will clean also the interior of the bowl, the distributor and the various outlets for the separated components.

In another embodiment of the invention the disc-carrying tube of the separator is provided with a large number of apertures or slits directed towards the innermost ends of the discs of the disc pack and inside said disc-carrying tube is normally arranged a non-apertured non-rotating inlet tube which leads liquid to be treated down to the distributor. When it is desired to wash or rinse the discs and the interior of the separator, said non-apertured inlet tube is removed and replaced by a washing tube adapted to distribute the washing liquid evenly to the discs which is closed at the bottom but provided at its periphery with numerous holes. Washing or rinsing liquid issuing through the holes in the washing inlet tube is whirled through the apertures in the disc-carrying tube and is caught up by the discs of the disc pack and expelled outwardly at increasing velocity, thereby effectively scouring and rinsing said discs and other parts of the separator.

In another embodiment of the invention, the

rinsing tube may be omitted and the washing liquid may be supplied direct to the disc-carrying tube.

The invention is particularly useful in connection with centrifugal separators of the kind described in the specification of my co-pending application Serial No. 80,966 but is also applicable to centrifugal separators of other types having outlets of sufficient size to permit the machine to remain drained while the washing or rising operation is being carried out.

In order more clearly to understand the invention, reference is made to the accompanying drawings which illustrate diagrammatically and by way of example, three forms of centrifugal cream separator embodying same, and in which—

Fig. 1 is a vertical section through one embodiment of a separator according to the invention with the milk feed tube inserted therein.

Fig. 2 is a similar section through the same embodiment in which the milk feed tube has been replaced by a supply tube for washing liquid.

Fig. 3 is a partial horizontal section through Fig. 1, the cover being removed.

Fig. 4 is a vertical section through a second embodiment of the invention showing a milk feed tube inserted into the bowl.

Fig. 5 is a vertical section through said second embodiment showing the milk feed tube replaced by a supply tube for washing liquid.

Figs. 6 and 7 are two vertical sections of a third embodiment, showing the same with and without milk feed tube, respectively.

Figs. 8 and 9 illustrate details of the washing liquid distributing tube shown in Fig. 7.

In said drawings, like parts are denoted by like reference characters.

Referring first to Figs. 1 to 3, reference numerals 1 and 2 denote the two parts of the casing of the cream separator which are secured together by a lock ring 3. The casing 1, 2 is so constructed as to provide a number of conical bays 4 (see Fig. 3), and the angles of slope of the inner surfaces of the parts 1, 2 and the bays 4, are preferably made greater than the sliding angle or angle of friction of the separated heavy component. Located inside the casing 1, 2 is the usual disc pack 5, of conical separating plates mounted between the casing part 2 and the usual top disc 6, which provides passages 7 and 8 leading to outlets 9 and 10 respectively, the outlet 9 being the skim milk outlet whilst the outlet 10 is the cream outlet.

The discs of the disc pack 5 are mounted at their outer periphery in peripheral carrier members 11 and their inner ends are unsupported.

The conical bays 4 (Fig. 3) are located between the disc carriers 11 and in the apex of each bay is a discharge aperture 12 for draining the bowl and evacuating the washing liquid.

Milk to be separated is poured into a stationary tin 15, from a supply basin 61, and flows through a non-apertured non-rotating inlet pipe 16 (see Figure 1) in the direction of the broken arrows 16a, into a rotating distributor space 17 provided with bays and from there through holes 18 to the disc pack 5. The casing 1, 2, is mounted on a rotating spindle 20, in the usual manner.

Each peripheral discharge aperture 12 is controlled by a discharge valve 21, in the manner described in the specification of my aforesaid application Serial No. 80,966 this valve not being illustrated in Figs. 1 to 3 but shown in Figs. 4 and 5.

Said valve 21 is mounted on a valve stem 22 guided by a bracket 23 and the rear end of the valve stem is provided with a slot (not shown)

through which passes one end of a wire spring 24, the other end of which is secured to the inside of the casing part 1, by screws or rivets (not shown). The elasticity and centrifugal weight of the spring 24, the centrifugal weight of the valve 21 and its stem 22 and the distance between the valve 21 and its seating are so co-ordinated that at the normal running speed of the separator, said valve 21 closes its peripheral discharge aperture 12, whilst at and below a predetermined speed lower than said normal speed said valve 21 remains open and permits the contents of the separator to be discharged through the aperture 12.

The basin 61 and tank 15 are removably mounted on stationary tinware comprising a series of superimposed trays defining chambers 62, 63 and 64, chamber 62 receiving cream, chamber 63 skim milk, and chamber 64 gelatinous slime and washing or rinsing liquid.

On termination of the treatment of the milk and when it is desired to clean the separator, the supply of milk to the machine is stopped and the speed of the machine is reduced, as a result of which the valves 21 open and permit the contents of the separator to discharge through the peripheral discharge apertures 12 into tray 64. At the same time the stationary non-apertured inlet pipe 16 is removed and replaced by an apertured pipe or tubular chamber 30 (see Fig. 2), having inlet apertures 31, 32 and rings of outlet apertures 33 and 34, and an axial aperture 34a. The apertures 33 are adapted to direct a stream of washing liquid, e. g., water, between the discs 5, whilst the apertures 34 and 34a serve mainly for cleaning the distributor space 17. Preferably the total cross-sectional area of the apertures 33, 34 and 34a is approximately equal to the cross-sectional area of the pipe 30 so as to enable the diameter of the pipe or chamber 30 to be reduced to a minimum.

Experience has shown that in order to wash the top and bottom of two adjacent discs, a large quantity of water supplied at a high rate of flow is required. This is due to the tendency of the washing liquid when being whirled between the discs, to press outwardly against the undersides of the discs and to keep away from the upper sides. If all the discs were washed simultaneously this rate of flow would have to be multiplied by the number of discs in the disc pack. The washing liquid escaping from the revolving bowl has nearly as much rotary speed as the bowl itself. It is therefore found when all the discs are washed simultaneously that the kinetic energy of the escaping liquid is so great that the machine is stopped or slowed down, to such an extent that the washing action is so reduced as to be ineffective. In order therefore to reduce this braking action and enable the driving motor to keep the centrifuge revolving at a sufficiently high speed during the washing operation the washing tube is so arranged that it only washes a fraction of the discs at a time.

In the embodiment shown in Fig. 1, the row of holes 33 pierced in the washing tube only supply liquid to one sixth of the discs of the pack. This reduces the braking effect of the washing liquid to one sixth of what it would be if all the discs were washed simultaneously.

By moving the tube 30 up and down in the direction of the axis while washing liquid is being supplied, the holes 33 are caused to traverse the whole height of the disc pack.

It has been found that the washing liquid issu-

ing from the holes 33 the diameter of which is only one sixth of the height of the disc pack, on striking the rapidly revolving discs tends to spread out over about one third of the disc pack.

5 Due to the washing liquid having to be supplied at a high rate of flow so as to clean the discs effectively, it is found that it is only those discs that are exactly opposite holes 33 that are effectively washed and that the liquid that has spread 10 above and below the position of holes 33 is ineffective. This liquid so spread is therefore doing little effective washing but is adding to the braking of the revolving bowl. In order to prevent this spreading action the discs of the disc pack are 15 divided into groups by discs 5b, which project radially inwards beyond the other discs.

The apertures 31 and 32 are covered by a filter of metal gauze or the like to prevent access of grit to the bowl. The top of the tubular chamber 30 is closed but is provided with a screw 20 connection 65 into which is screwed a solid operating rod 66, by means of which the tubular chamber 30 can be moved along the axis of the bowl.

25 Depending from the basin 61 is a cylindrical sleeve 67 provided with apertures 68. Inside said sleeve 67 is rotatably mounted a cup 69 having apertures 70 adapted to register with the apertures 68 in the sleeve 67. The operating rod 30 66 passes through the bottom of the cup 69 with a sliding fit but is keyed thereto by a key 71, thus enabling the cup 69 to be turned relatively to the sleeve 67 to close the apertures 68.

The top disc 6 of the disc pack has a neck portion 75 in which are provided holes or tubes 35 76, 77 and 78. These tubes 76, 77 and 78 play no part in the separation proper since their inner ends are closer to the axis of the separator than the cream level A—A to which the machine 40 is filled during normal operation. As can be seen from Fig. 2, tube 76 serves to supply washing or rinsing liquid to the passage 7, tube 77 whirled liquid in the form of a spray into the chamber 63 to clean same, whilst tube 78 performs a similar function in regard to the chamber 62. 45

In order to prevent the bowl from filling with liquid during the washing or rinsing operation and thereby hindering or stopping the cleaning action, it is necessary to ensure that the discharge apertures 12 are of sufficient size to allow 50 all liquid to escape at a sufficiently high rate to avoid it submerging the outer edges of the discs. It has been found in practice that owing to the very high rate of supply of the washing liquid necessary to clean the discs, these 55 drain outlets must be surprisingly large and that satisfactory results are obtained when the combined areas of the apertures 12 are greater than $\frac{1}{300}$ of the combined areas of the holes 33, 34 and 34a. 60

In order to obtain the best cleaning effect it is advisable periodically to shut off the supply of washing or rinsing liquid to the bowl, which is effected by turning the operating rod 66 and 65 closing the apertures 70 in the cup 69.

When the inside of the separator has been cleaned, the supply of washing liquid is cut off and the bowl is allowed to drain, dry and stop. When again required for use the separator is run 70 up to normal speed with the result that the valves 21 close the discharge apertures 12, and the apertured pipe 30 is removed and replaced by the normal inlet pipe 16, whereupon the machine is ready for a further separation operation. 75

Heavy or tenacious slime centrifuging out of milk accumulates on the internal periphery and any parts of a normal machine that are parallel to the axis of the separator. Experience 5 shows that the aforementioned rinsing operation will not remove this deposit from such parallel surfaces. It is necessary for its removal that all surfaces that it is desired to wash bacterially clean, should be sufficiently sloped in 10 relation to the axis and towards the point of discharge to enable the washing liquid assisted by the centrifugal weight of the particles of slime acting on the incline on which they are 15 situated to propel them towards the discharge orifices.

In Fig. 3, the broken lines 49 show the path 15 taken by the washing liquid in scouring the washing discs. Should this washing liquid meet with any obstruction, it will leave a wake of unwashed disc in its path. 20

In order therefore to prevent any such wake on the discs 5, the distance pieces 35 between 25 adjacent discs 5 are made of small dimensions, their area of contact is kept down to a minimum, and they are so shaped, e. g. knife-edged, and arranged that they substantially coincide with the paths 49 and do not break up the stream of washing liquid. 25

The embodiment shown in Figs. 4 and 5 differs from that described with reference to Figs. 30 1 to 3, in that the discs 5 of the disc pack are not held at their outer periphery but are mounted at their inner periphery on a rotating disc-carrying tube 40 (omitted in the previously described embodiment) which is provided with apertures or slits 41 leading to the inside periphery 35 of the discs 5 and so disposed as to enable the discs to be completely covered with washing liquid.

This is normally extremely difficult to accomplished in practice but it can be effected by causing the streams of washing liquid issuing through the apertures 41, to spread out over the discs 40 by some form of baffling. In the present embodiment therefore the discs have been extended inside the cream level A—A and the jets are projected through said apertures 41 at an angle 45 against the clean parts of the discs inside the cream level A—A in such a manner that the liquid is spread out and completely covers the discs by the time it reaches said cream level. This 50 construction further necessitates the provision of an additional set of holes 50 lying radially outside the cream level A—A, for the passage of separated cream to the cream outlet 10. 55

This embodiment operates in the same manner as that described with reference to Figs. 1 to 3.

The apertured washing liquid supply pipe 30, in this case, extends throughout the disc carrying tube 40 and is provided with holes 33a (see Fig. 60 5) distributed circumferentially and axially over that part of the tube which is located within the disc pack.

Figs. 6 and 7 show an embodiment of separator which differs from the previously described 65 embodiments primarily in that the upper casing part 1 is of normal design, not provided with bays, and is arranged to be easily removable as a whole from the lower casing part 2. To this end the casing part 1 is held in place by a clamping nut 80 which is screwed on to a correspondingly screw threaded part 81 of the disc-carrying tube 40 (see Fig. 6). 70

When it is desired to clean the machine, the bowl is stopped, the supply pipe 16 and tank 15 75

are removed, the clamping nut 80 is unscrewed, and the casing part 1 is taken off and washed by hand. The nut 80 is thereupon again placed on the threaded part 81 and screwed down to clamp the neck portion 75 of the disc pack 5 in position (see Fig. 7). The tank is then replaced and washing liquid poured into said tank 15 said washing liquid issues through a neck portion 15a of the tank 15 into the disc-carrying tube 40. Simultaneously the machine is set into rotation and the washing liquid enters the discs 5 through the apertures 41 and is sprayed out from the edges of the discs.

This construction while not resulting in the machine being cleaned without any dismantling whatsoever nevertheless avoids the discs having to be cleaned by hand, thus obviating risk of damaging them and enabling a larger number of thinner discs to be employed.

In view of the large quantity of washing or rinsing liquid which has to be supplied to the discs per unit period, it has been found necessary to provide the disc carrying tube 40 with the largest number of holes 41 permissible. In order to avoid weakening the disc carrying tube unduly these holes are outwardly flared in the manner shown in Fig. 8.

It has been found in practice that the washing or rinsing liquid issuing through the holes 41 only occupies a fraction of the total cross-sectional area of the holes, assuming the position shown by the shaded portions 41a in Fig. 9. In order to avoid parts of the discs being left unwashed, the holes 41 are so staggered with respect to each other that the portions of adjacent rows of holes occupied by liquid overlap in the direction of rotation of the separator.

I claim:

1. In a centrifugal separator, in combination with a revoluble bowl having near its axis outlets for the liquid to be treated, and a pack of frusto-conical discs disposed in said bowl in spaced superposed relationship to one another and having center holes arranged in axial alignment, the inner peripheral edges of at least the major part of said discs defining a substantially cylindrical space extending axially of said bowl; said discs having substantially smooth conical surfaces and substantially free, unobstructed, outer, peripheral edges, of a distributor tube projecting into said cylindrical space for supplying controlled quantities of washing liquid to and throughout all the circumferential spaces defined by the inner peripheral edges of said discs so as to cause the inner peripheries of the latter being covered completely and uniformly with washing liquid, means for feeding washing liquid to said distributor tube and movable means to allow an unrestricted discharge of the washing liquid in substantially radial direction.

2. A centrifugal separator, as claimed in claim 1, comprising further means at the lower end of the distributor tube for radially deflecting the bulk of the washing liquid.

3. A centrifugal separator, as claimed in claim 1, in which said movable means to allow discharge of the washing liquid in radial direction comprises spring valves disposed at the maximum diameter of the bowl and adapted to open when the speed of revolution falls below a predetermined value.

4. A centrifugal separator, as claimed in claim 1, comprising a collar on the uppermost disc to separate the different fractions of the liquid treated, a plurality of stationary tins outside of

said revoluble bowl for receiving the different fractions discharged from the corresponding outlets, and radial channels provided in said collar to allow part of the washing liquid supplied by said distributor tube to enter and wash said tins.

5. In a centrifugal separator in combination with a revoluble bowl having near its axis outlets for the liquid to be treated, a pack of frusto-conical discs disposed in said bowl in spaced superposed relationship to one another and having substantially smooth conical surfaces and substantially free, unobstructed, outer, peripheral edges, each disc being provided with a center hole and a series of spaced orifices disposed on a circular line intermediate the inner and outer peripheries of the disc, the inner peripheral edges of at least the major part of said discs defining a substantially cylindrical space extending axially of said bowl and the corresponding orifices of all the discs being aligned to form eccentric vertical passages, a distributor chamber disposed at the bottom of the bowl and having outlets opening into said passages, and a feed tube for liquid to be treated projecting through said cylindrical space into said distributor chamber, of a distributor tube projecting into said cylindrical space for supplying controlled quantities of washing liquid to and throughout all the circumferential spaces defined by the inner peripheral edges of said discs so as to cause the inner peripheries of the latter being covered completely and uniformly with washing liquid, means for feeding washing liquid to said distributor tube, and movable means to allow an unrestricted discharge of the washing liquid in substantially radial direction.

6. In a centrifugal separator, in combination with a revoluble bowl having near its axis outlets for the liquid to be treated, and a pack of frusto-conical discs disposed in said bowl in spaced superposed relationship to one another and having center holes arranged in axial alignment, the inner peripheral edges of at least the major part of said discs defining a substantially cylindrical space extending axially of said bowl, said discs having substantially smooth conical surfaces and substantially free, unobstructed, outer, peripheral edges, of a stationary support above said bowl, a distributor tube suspended from said stationary support and projecting into said cylindrical space free of all rotating elements for supplying controlled quantities of washing liquid to and throughout all the circumferential spaces defined by the inner peripheral edges of said discs, said tube being provided with at least one radial outlet opening disposed and dimensioned to insure the inner peripheries of the discs being covered completely and uniformly with washing liquid, means for feeding washing liquid to said distributor tube, and movable means to allow an unrestricted discharge of the washing liquid in substantially radial direction.

7. In a centrifugal separator, in combination with a revoluble bowl, and a pack of frusto-conical discs disposed in said bowl in spaced superposed relationship to one another and having center holes arranged in axial alignment, the inner peripheral edges of at least the major part of said discs defining a substantially cylindrical space extending axially of said bowl, said discs having substantially smooth conical surfaces and substantially free, unobstructed, outer, peripheral edges, of a distributor tube projecting into said cylindrical space for supplying controlled quan-

titles of washing liquid to and throughout all the circumferential spaces defined by the inner peripheral edges of said discs, said tube being provided at its lower end with at least one radial outlet opening of a cross-section to insure the inner peripheries of the discs disposed opposite said outlet opening being covered completely and uniformly with washing liquid, means for feeding washing liquid to said distributor tube, means for axially displacing said distributor tube so as to bring said outlet opening into successive positions opposite different discs, and movable means to allow an unrestricted discharge of the washing liquid in substantially radial direction.

8. A centrifugal separator, as claimed in claim 7, comprising further a stationary support above said bowl, said distributor tube being axially shiftably suspended from said stationary support and projecting into said cylindrical space free of all rotating elements.

9. A centrifugal separator, as claimed in claim 7, in which some of said discs project radially inwards beyond the inner peripheral edges of the other discs, so as to subdivide said disc pack into a plurality of axial groups to be successively served with washing liquid discharged from said outlet opening at the inner end of said axially moving distributor tube.

10. In a centrifugal separator, in combination with a revoluble bowl having near its axis outlets for the liquid to be treated, and a pack of frusto-conical discs disposed in said bowl in spaced superposed relationship to one another and having center holes arranged in axial alignment, the inner peripheral edges of said discs defining a substantially cylindrical space extending axially of said bowl, said discs having substantially smooth conical surfaces and substantially free, unobstructed, outer, peripheral edges, of an axially fixed distributor tube extending within and throughout said cylindrical space and being provided with axially distributed radial outlets disposed and dimensioned to insure the inner peripheries of all the discs being simultaneously covered completely and uniformly with washing liquid, means for feeding washing liquid to said distributor tube, means at the lower end of the distributor tube for deflecting the bulk of the washing liquid towards said radial outlets, and movable means to allow an unrestricted discharge of the washing liquid in substantially radial direction.

11. A centrifugal separator, as claimed in claim 10, comprising further a stationary support above said bowl, said distributor tube being stationarily mounted on said support and projecting into said cylindrical space free of all rotating elements.

12. In a centrifugal separator, in combination with a revoluble bowl having near its axis outlets for the liquid to be treated, and a pack of frusto-conical discs disposed in said bowl in spaced superposed relationship to one another and hav-

ing center holes arranged in axial alignment, the inner peripheral edges of at least the major part of said discs defining a substantially cylindrical space extending axially of said bowl, said discs having substantially smooth conical surfaces and substantially free, unobstructed, outer, peripheral edges, of a distributor tube projecting into said cylindrical space and being arranged for revolution with said bowl to supply controlled quantities of washing liquid to and throughout all the circumferential spaces defined by the inner peripheral edges of said discs, said distributor tube being provided with a sufficient number of peripherally distributed radial perforations to insure the inner peripheries being covered completely and uniformly with washing liquid, means for feeding washing liquid to said distributor tube, and movable means to allow an unrestricted discharge of the washing liquid in substantially radial direction.

13. In a centrifugal separator, in combination a revoluble bowl having near its axis outlets for the liquid to be treated, and a pack of frusto-conical discs disposed in said bowl in spaced superposed relationship to one another and having center holes arranged in axial alignment, the inner peripheral edges of the discs defining a substantially cylindrical space extending axially of said bowl, said discs having substantially smooth conical surfaces and substantially free, unobstructed outer peripheral edges, of a distributor tube rigid with said bowl and extending axially within and throughout said cylindrical space, said distributor tube being provided with a sufficient number of circumferentially and axially distributed radial perforations to insure the inner peripheries of all the discs being simultaneously covered completely and uniformly with washing liquid, means for feeding washing liquid to said distributor tube, means at the lower end of the distributor tube for deflecting the bulk of the washing liquid towards said radial perforations, and movable means to allow an unrestricted discharge of the washing liquid in substantially radial direction.

14. A centrifugal separator, as claimed in claim 13, in which said bowl includes a bottom part supporting the disc pack, and a cover part resting on the disc pack, said distributor tube being rigid with said bottom part and having a threaded upper end projecting through a center hole in the cover part, a ring nut screwed onto said threaded upper end of said distributor tube and overlapping the cover part of the bowl to draw the bottom and cover parts of the bowl together and to lock the disc pack in its position in the bowl.

15. A centrifugal separator, as claimed in claim 13, in which said discs are supported with their inner peripheral edges on the outer wall of said distributor tube.

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