July 15, 1952 J. R. ORELIND 2,603,413

POWER WASHING CENTRIFUGAL SEPARATOR

Filed Sept. 8, 1947 2 SHEETS—SHEET 1

Fig. 1.

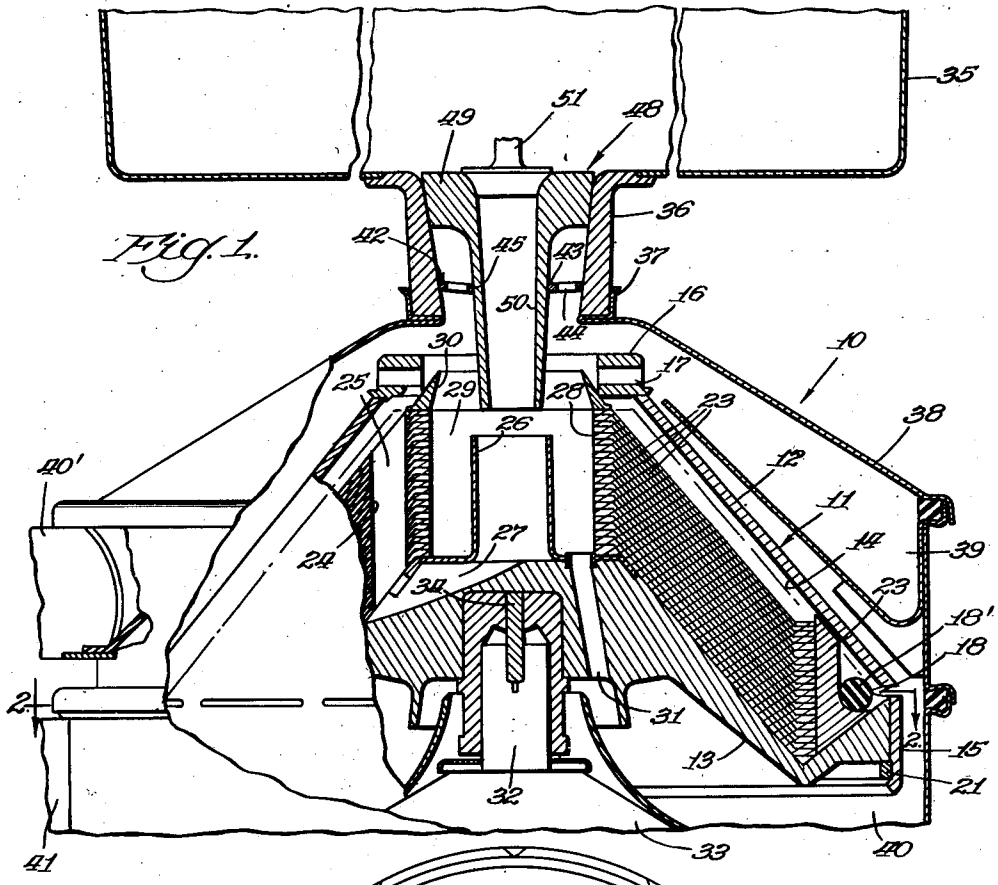
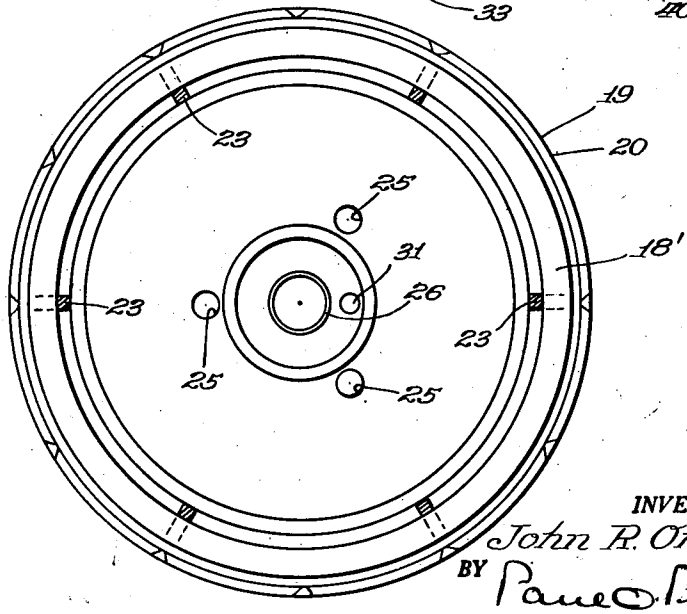


Fig. 2.



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Fig. 3.

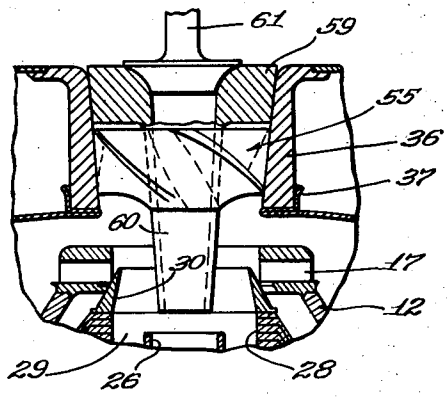


Fig. 4.

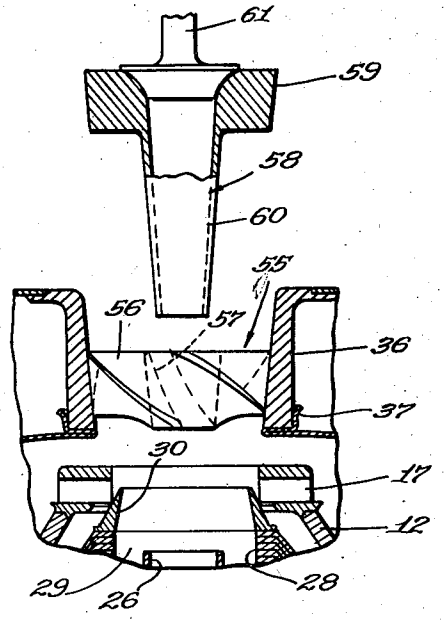


Fig. 5.

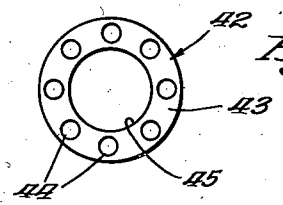
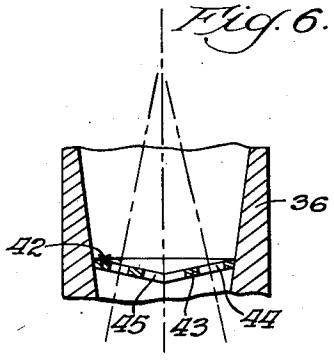


Fig. 6.



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UNITED STATES PATENT OFFICE

2,603,413

POWER WASHING CENTRIFUGAL SEPARATOR

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Application September 8, 1947, Serial No. 772,837

4 Claims. (Cl. 233—14)

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This invention relates to a centrifugal separator, and more particularly to a power washing cream separator. More specifically, it relates to a power washing cream separator having improved means for washing the cream separating bowl.

In power washing centrifugal separators of the type with which the present invention is concerned, a high speed separating bowl is provided with a plurality of superposed separating discs. A washing liquid discharge opening is provided at the maximum internal periphery of the bowl and this opening is controlled by centrifugal valve means.

After the separating operation, washing liquid is introduced at the top of the separating bowl and upon a lowered speed of rotation of said bowl the centrifugal valve means operates to permit the escape of the washing liquid. In this manner the internal parts of the separating bowl are thoroughly washed without the necessity of disassembling the bowl parts. The centrifugal force of the water scours the inner surfaces of the bowl so that power washing is effected. Power washing separators of this type are generally provided with a plurality of superposed separating discs having center holes in alignment with one another to provide a cylindrical space extending axially of the bowl. The individual discs must have their surfaces thoroughly cleaned and washed, and the separated inner peripheral edges of the discs provide the entrances for the washing liquid that flows between and scours the surface of the discs.

It is exceedingly important that sufficient washing liquid be directed toward the inner peripheral edges of the discs since the most difficult place to wash is at this location. It is desirable, therefore, to direct the washing fluid along the inner peripheral edges of the discs in a controlled and predetermined amount.

It is applicant's prime object therefore to provide a construction wherein predetermined amounts of washing liquid can be efficiently directed toward the inner peripheries of the discs.

It is another object to provide a power washing cream separator bowl, said bowl having in combination therewith a stationary deflector means arranged outside of said bowl for supplying predetermined quantities of washing liquid to the inner parts of the separating bowl.

Still another object is to provide a power washing cream separating bowl having in combination therewith a stationary supply can provided with an annular deflector disc arranged to deflect predetermined quantities of washing liquid directly against the inner peripheral edges of a plurality of rotating separating discs.

A still further object is to provide a power washing cream separating bowl having in combination therewith a deflector means arranged outside said bowl, said deflector means including a fluted element arranged to direct a predetermined quantity of washing liquid against the inner peripheral edges of a disc pack within the bowl.

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Other objects will become more readily apparent from a reading of the description and upon examination of the accompanying drawings.

In the drawings:

Figure 1 is an elevational view, partially in section, of a power washing centrifugal separator structure.

Figure 2 is a sectional view taken along the line 2—2 of Figure 1.

Figure 3 is a sectional view in elevation of a modified form of a deflector element for directing washing liquid to the cream separating bowl.

Figure 4 is a similar view showing a milk feed tube axially displaced above the deflector element.

Figure 5 is a detail view of a deflector element shown in Figure 1.

Figure 6 is a detail sectional view showing the washing liquid deflector as also shown in Figure 1.

Referring particularly to Figures 1 and 2, a centrifugal cream separator structure is generally designated by the reference character 10. The cream separator structure 10 includes a revoluble separating bowl 11 having an upper bowl portion 12 and a lower bowl portion 13. The separator bowl 11 is provided with a sloping inner wall 14 joined at its lower end by a downwardly extending annular rim 15. The upper bowl portion 12 also includes at its top end a collar 16 having conventional skim milk outlets 17. At the apex of the inner sloping wall 14 with the downwardly extending rim 15 there is provided a substantially continuous washing liquid discharge outlet 18. The discharge outlet 18 is formed by means of a plurality of arcuate shaped openings 19 separated by a plurality of diverging separator elements 20. The upper bowl portion 12 and the lower bowl portion 13 are joined in telescoping and assembled relation by means of a snap split ring 21.

The separating bowl 11 is provided with a disc pack consisting of a plurality of superposed separating discs 22. The outer peripheral edges of the separating discs 22 are supported on a plurality of circumferentially spaced upwardly extending wings 23. The wings 23 are spaced to provide a support for a centrifugal valve element or rubber sealing ring indicated at 18'. Each separating disc is provided with a plurality of eccentric openings 24 in alignment with one another to form a passageway 25.

A milk inlet tube 26 is centrally positioned for rotation therewith on the lower bowl portion 13. The inlet tube 26 is in communication with distributor chambers 27, only one of which is shown in the present disclosure. It is to be understood, however, that each passageway 25 is in com-

munication with at least one distributor chamber 27. Each disc is provided with a centrally disposed opening 28, and the inner peripheral edge of each opening is in alignment with the others to provide a substantially cylindrical space 29 extending axially of the bowl 11. A skim milk dividing collar 30 is provided on the uppermost disc 22.

The lower bowl portion 13 is provided with a downwardly extending cream outlet 31, the upper end of which is in communication with the cylindrical space 29. A driving member 32 projects upwardly into the lower bowl portion 13. The driving member 32 is driven by an electric power unit 33, and is connected to the bowl portion 13 by means of a key 34.

A liquid supply container 35 is positioned above the separating bowl 11. The supply container 35 includes a discharge spout or conduit 36 extending downwardly toward the separating bowl. The lower end of the discharge spout, or conduit 36, is supported on an annular collar 37 forming the upper end of a stationary tinware structure generally designated by the reference character 38. The tinware structure 38 includes a skim milk receiving chamber 39 and a cream receiving chamber 40. The skim milk receiving chamber 39 is in communication with a skim milk discharge spout 40' and the cream receiving chamber 40 is in communication with a cream discharge spout 41.

A washing liquid deflector element is generally designated by the reference character 42. The deflector 42 consists of an annular disc shaped member 43 having a plurality of circumferentially downwardly extending openings 44 and a centrally disposed opening 45. The annular disc shaped member 43 is dished or slightly of tapering construction so that imaginary center lines through the openings are non-parallel with respect to a center line through the disc member. The openings are angularly positioned to direct the liquid radially outwardly against the inner peripheral edges of the discs. The deflector element 42 is suitably fastened within the discharge spout 41 by means of welding, brazing, or other connecting operation. A milk feed tube 48 is provided with an annular shoulder 49 which seats upon the inner upper surfaces of the discharge spout 36. The shoulder 49 serves to seal the discharge spout 36 from the liquid supply container 35. The milk feed tube 48 is provided with a narrow tapering conduit 50 which extends through the center opening 45 of the deflector element 42. The tapering conduit 50 is in axial alignment with the milk inlet tube 26 and extends downwardly to a point terminating near the upper surface of the top separating disc. A valve member 51 is seated at the upper end of the milk feed tube 48 for controlling the flow of liquid through the tapering conduit 50.

A modified embodiment of the deflector element is shown in Figures 3 and 4. The separating bowl and supply can parts herein shown are the same as in the previous figures and therefore the same reference characters apply. The deflector element shown in this embodiment is generally designated by the reference character 55. The element 55 includes a plurality of spiral fluted openings 56 and also a centrally disposed opening 57. A milk feed tube 58 having an annular shoulder 59 is axially movable to close and open the discharge spout 36. The milk feed tube 58 also includes a narrow tapering conduit 60 which is adapted to be inserted through the central opening 57 of the deflector element 55. A valve member 61 is provided for regulating the flow of fluid through the tapering conduit 60. Figure 4 shows the axial displacement of the milk feed tube 58 so that the relationship of the parts may be more clearly apparent.

The separating operation of the cream separating bowl is conventional. Whole milk from the supply can 35 is free to course downwardly through the tapering conduit 50 upon the displacement of the valve element 51. The skim milk escapes through the skim milk openings 17 to the skim milk receiving chamber 39. The cream leaves the bowl through the cream outlet 31 and thereupon flows into the cream receiving chamber 40. The separating speed may be somewhere near 10,000 R. P. M.

After the separating operation is completed, the operator fills the liquid supply container 35 with a washing liquid. The milk feed tube 48 is thereupon axially displaced upwardly and washing liquid thereupon descends downwardly through the discharge conduit 36. As the washing liquid engages the upper surface of the deflector element 42, it is divided into a plurality of individual streams by means of the tapered openings 44. The tapered openings 44 are so arranged that the individual streams of water are directed downwardly and radially outwardly against the inner peripheral edges of the separating discs. The individual streams of water are thereupon broken up by the inner peripheral edges of the discs and the water thereupon is whirled centrifugally outwardly between said discs. In this manner a sufficient quantity of washing liquid is properly directed to clean the most difficult surfaces, namely, the surfaces of the separating discs. As this water is whirled centrifugally outwardly the speed of rotation of the separating bowl decreases until a speed of approximately 6,000 R. P. M. is reached. At this point the valve ring 18' contracts sufficiently to permit the washing liquid to be discharged through the discharge opening 18. A small quantity of washing liquid descends through the central hole 45 of the deflector element 42. This quantity is directed downwardly into the milk inlet tube 26 and serves to wash this tube and the distributor chambers 27.

The deflector element 42 is stationary and the streams of washing liquid which descend through the openings 44 are undisturbed until they strike the inner peripheral edges of the rotating disc pack. Immediately upon striking these surfaces the streams are broken up and particles of water are pumped centrifugally outwardly by virtue of the centrifugal force actuated by the rotating bowl. By utilizing deflector elements having openings of varying sizes the amount of water descending into the separating bowl can be varied according to the amounts desired. Thus a predetermined amount of water can be directed to the inner peripheral edges of the discs. Thus unnecessary amounts of washing liquid need not be poured into the separating bowl and the washing liquid can be effectively directed to the place where the greatest quantity of liquid is needed.

The operation of the embodiment shown in Figures 3 and 4 is substantially the same as above described. In this construction the washing liquid is suitably divided and directed against the inner peripheral edges of the separating discs by means of the spiral fluted openings 56.

It can thus be seen that the objects of the invention have been fully achieved. Applicant has

provided a deflector element which is stationarily positioned outside of a rotating bowl. This deflector element is constructed and arranged to direct predetermined quantities of washing liquid against the inner peripheral edges of the separating discs. Thus applicant directs the washing liquid to the place where it is most needed. It is to be understood that modifications and changes may be made in this construction which do not depart from the spirit of the invention as disclosed nor the scope thereof as defined in the appended claims.

What is claimed is:

1. A power washing centrifugal separator comprising a rotatable bowl, a pack of frusto-conical discs within said bowl, sad discs having center holes, the inner peripheral edges of which are in substantial axial alignment with one another to form a substantially cylindrical space extending axially of said bowl, a milk inlet tube centrally disposed within said cylindrical space for rotation with said bowl, a discharge opening at the outer peripheral edge of said bowl, and centrifugal valve means for regulating the discharge of washing liquid from said bowl, the combination therewith of a stationary supply container positioned above said bowl, said supply container having a discharge conduit in axial alignment with and above the cylindrical space of said bowl, a milk feed tube within said discharge conduit, said milk feed tube being in axial alignment with said milk inlet tube, and a deflector means arranged above said bowl, said deflector means including a disc shaped element supported within said conduit above said bowl, said disc shaped element having a center hole encircling said milk feed tube and a plurality of radially disposed openings positioned angularly with respect to a center line through said disc and arranged outwardly of said center opening to direct individual streams of washing liquid radially outwardly against the inner peripheral edges of said separating discs.

2. In a power washing centrifugal separator comprising a rotatable bowl, a pack of frusto-conical discs within said bowl, said discs having center holes, the inner peripheral edges of which are in substantial axial alignment with one another to form a substantially cylindrical space extending axially of said bowl, a discharge opening at the periphery of the bowl and centrifugal valve means for regulating the discharge of washing liquid through the discharge opening from the bowl, the combination therewith of a stationary supply container positioned above said bowl, said supply container having a discharge conduit in axial alignment with and above the cylindrical space of said bowl, a milk feed tube within said discharge conduit, said milk feed tube being of less cross-sectional dimension than said discharge conduit, a deflector supported within the discharge conduit, said deflector extending transversely across the conduit and having a centrally disposed opening encircling the milk feed tube, said deflector having deflecting portions disposed radially outwardly from the milk feed tube, the deflecting portions extending angularly with respect to a center line through said conduit to direct streams of washing liquid radially outwardly against the inner peripheral edges of the separating discs.

3. In a power washing centrifugal separator comprising a rotatable bowl, a pack of frusto-conical discs within said bowl, said discs having center holes, the inner peripheral edges of which are in substantial axial alignment with one another to form a substantially cylindrical space extending axially of said bowl, a discharge opening at the periphery of the bowl and centrifugal valve means for regulating the discharge of washing liquid through the discharge opening from the bowl, the combination therewith of a stationary supply container positioned above said bowl, said supply container having a discharge conduit in axial alignment with and above the cylindrical space of said bowl, a milk feed tube within said discharge conduit, said milk feed tube being of less cross sectional dimension than said discharge conduit, a deflector supported within the discharge conduit, said deflector comprising a disk extending transversely across the conduit and having a centrally disposed opening encircling the milk feed tube, said disc having deflecting openings disposed radially outwardly from the milk feed tube, the deflecting openings extending angularly with respect to a center line through said conduit to direct streams of washing liquid radially outwardly against the inner peripheral edges of the separating discs.

4. In a power washing centrifugal separator comprising a rotatable bowl, a pack of frusto-conical discs within said bowl, said discs having center holes, the inner peripheral edges of which are in substantial axial alignment with one another to form a substantially cylindrical space extending axially of said bowl, a discharge opening at the periphery of the bowl and centrifugal valve means for regulating the discharge of washing liquid through the discharge opening from the bowl, the combination therewith of a stationary supply container positioned above said bowl, said supply container having a discharge conduit in axial alignment with the cylindrical space of said bowl, a milk feed tube within said discharge conduit, said milk feed tube being of less cross sectional dimension than said conduit, a deflector supported within said discharge conduit, said deflector extending transversely across said conduit and having a centrally disposed opening, the opening encircling said milk feed tube and said milk feed tube being axially removable with respect to said centrally disposed opening during a washing operation, said deflector having deflecting portions disposed radially outwardly from the milk feed tube, the deflecting portions extending angularly with respect to a center line through said conduit to direct streams of washing liquid radially outwardly against the inner peripheral edges of said separating discs.

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