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MEANS FOR FEEDING LIQUIDS TO CENTRIFUGAL SEPARATOR BOWLS

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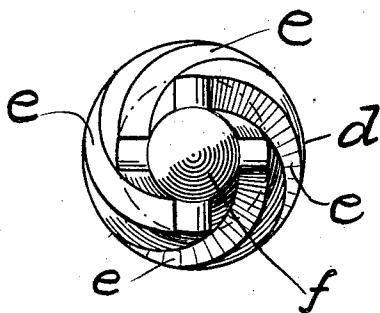


FIG. 2.

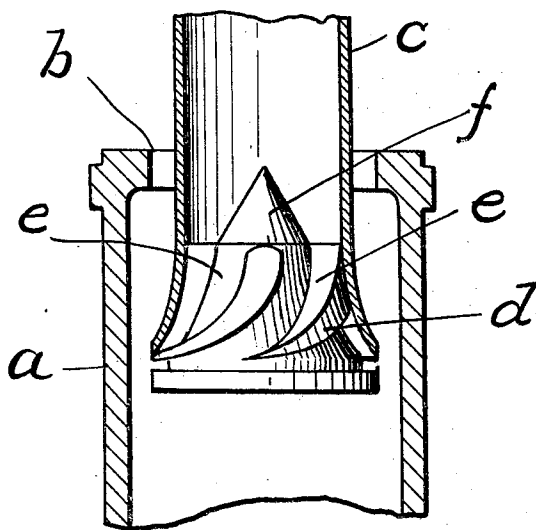


FIG. 1.

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MEANS FOR FEEDING LIQUIDS TO CENTRIFUGAL SEPARATOR BOWLS

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In feeding liquid from a stationary feed tube to the feed tube or receiving chamber which forms part of and rotates with a centrifugal bowl, the slowly moving liquid stream which enters such receiving chamber is picked up by very rapidly rotating bowl parts, the effect of which is to violently agitate, emulsify, stir or churn the liquid. The liquid is thereby put into a condition which is often quite unfavorable to the most efficient centrifugal separation or purification.

One size of a well known separator the bowl, which is given a speed of 6000 R. P. M., has a liquid receiving chamber about two inches in diameter. The inner circumference of this chamber, therefore, moves with a linear velocity of over fifty feet per second. When liquid whose velocity is near zero is hit by this rapidly moving wall, the mixing action is extremely severe.

The object of the invention is to reduce to a minimum the specified agitating, emulsifying, stirring or mixing action.

The invention comprises means whereby the liquid, in the course of its flow from the stationary feed tube toward the receiving chamber of the bowl, will have imparted to it such direction and accelerated speed that when it is discharged into the receiving chamber it will have a rotational movement that, in angular speed and direction, will approximate more or less the angular speed and direction of the bowl; the liquid also being so guided, in the course of its flow toward the receiving chamber, that it will discharge thereinto comparatively close to the wall thereof, so that the linear velocity of such wall will not greatly exceed the linear velocity of the liquid impinging thereon.

One preferred means for effecting this mode of operation is shown in the drawing, in which—

Fig. 1 is a side view, partly in section, of the upper part of the rotatable receiving chamber of a centrifugal bowl and its stationary feed tube and contained plug.

Fig. 2 is a plan view of the plug.

The upper part of the rapidly revoluble receiving chamber *a* of the centrifugal bowl has a reduced diameter check ring *b* that

prevents escape of liquid at the top. The feed tube *c*, which may be stationary, like the ordinary feed tube, extends through the open top of chamber *a* into the interior thereof.

Inserted in the bottom of the feed tube *c* is a plug *d*, on the top of which is a centrally positioned cone *f*. Extending from the top of the plug *d* (between the cone and the tube wall) downward toward the lower end of the plug and along its periphery are a number of helical grooves *e*, their circumferential direction of extension being the same as the direction of rotation of the centrifugal bowl. The liquid entering the top of tube *c* flows downward to the plug *d*, where it is spread by the cone *f* and enters the upper or inlet ends of the grooves *e*. The lower or discharge ends of the grooves open, preferably, in the side wall of the plug. The liquid, because of the helical shape of the grooves, flows therethrough at a good rotary speed and discharges from the grooves, against the rotating wall of the receiving chamber, in a direction corresponding to the direction of rotation of such wall.

In order to fully attain the object of the invention, the co-existence of several other structural features is advisable, and one or more of such features are necessary. It is highly advisable, although not absolutely necessary, that the tube *c* shall be expanded in diameter toward its lower end and that the plug, filling the tube, should be similarly expanded in diameter toward its lower end so that the outlet openings of the grooves *e* will be brought quite close to the inner wall of the receiving chamber. The grooves should be of progressively decreasing pitch from top to bottom so that the liquid will discharge therefrom in a direction which more or less approaches the horizontal. Finally the grooves should be of progressively decreasing cross-section from top to bottom, so that the speed of the liquid will be very greatly accelerated during its flow through the grooves. By proper adjustment of the size of the grooves, the shape of the grooves, and the pressure, the liquid may be discharged from the tubes at a velocity ap-

proaching the surface speed of the receiving chamber wall.

By the use of my invention the ordinary churning, agitating or emulsifying action may be reduced to any desired degree or practically eliminated.

Having now fully described my invention, what I claim and desire to protect by Letters Patent is:

1. In a centrifugal machine, the combination with a rotatable receiving chamber, of a relatively stationary feed tube adapted to discharge liquid into the receiving chamber and means in the feed tube and in fixed relation therewith to impart to the liquid flowing therethrough a high speed of rotation in a direction corresponding to the direction of rotation of the receiving chamber.

2. In a centrifugal machine, the combination with a rotatable receiving chamber, of a relatively stationary feed tube extending thereinto, and means in the discharge end of the feed tube and in fixed relation therewith to impart to the liquid flowing therethrough a direction corresponding to the direction of rotation of the machine and a speed approaching that of the wall of the receiving chamber.

3. In a centrifugal machine, the combination with a receiving chamber rotatable with the machine, of a relatively stationary feed tube, and a plug inside and in fixed relation with the tube, said plug having a helical groove extending around its periphery and communicating at its opposite ends with the feed tube and the receiving chamber.

4. The combination with the rotatable bowl of a centrifugal machine, of a relatively stationary liquid feed device comprising a liquid conveying helical groove.

5. The combination with the rotatable bowl of a centrifugal machine, of a relatively stationary liquid feed device comprising a liquid-conveying spiral groove of progressively decreasing cross-section between its inlet and outlet.

6. The combination with the rotatable bowl of a centrifugal machine, of a relatively stationary liquid feed device comprising a liquid-conveying helical groove of progressively decreasing pitch between its inlet and outlet.

7. The combination with the rotatable bowl of a centrifugal machine, of a relatively stationary liquid feed device comprising a liquid-conveying helical groove of progressively decreasing cross-section between its inlet and its outlet.

8. The combination with the rotatable bowl of a centrifugal machine, of a relatively stationary liquid feed device comprising a liquid-conveying helical groove of progressively decreasing pitch and cross-section between its inlet and outlet.

9. The combination with the rotatable

bowl of a centrifugal machine, of a relatively stationary liquid feed device comprising a tube and a plug therein having a liquid-conveying helical groove around its periphery.

10. The combination with the rotatable bowl of a centrifugal machine, of a relatively stationary liquid feed device comprising a tube and a plug therein having around its periphery a liquid-conveying helical groove of progressively decreasing pitch between its inlet and outlet.

11. The combination with the rotatable bowl of a centrifugal machine, of a relatively stationary liquid feed device comprising a tube and a plug therein having around its periphery a liquid-conveying helical groove of progressively decreasing cross-section between its inlet and outlet.

12. The combination with the rotatable bowl of a centrifugal machine, of a relatively stationary liquid feed device comprising a tube and a plug therein having around its periphery a liquid-conveying helical groove of progressively decreasing pitch and cross-section between its inlet and outlet.

13. The combination with the rotatable bowl of a centrifugal machine, of a relatively stationary tube surrounding the axis of rotation of the machine and having an expanded end and in the said expanded end a plug provided with a helical groove extending around its periphery from the smaller diameter end of the plug toward the larger diameter end of the plug and having its discharge end opening in the peripheral wall of the plug below the end of the tube.

14. In a centrifugal machine, the combination with a rotatable receiving chamber, of a relatively stationary feed tube extending thereinto and having an expanded end, of a plug in said tube and having around its periphery a helical groove of progressively decreasing pitch and cross-section between its inlet and outlet.

15. The combination with the rotatable bowl of a centrifugal machine, of a relatively stationary tube surrounding the axis of rotation of the machine and having an expanded end and in the said expanded end a plug provided with a helical groove having an inlet end in the smaller diameter end of the tube and extending around the periphery of the plug at progressively increasing distances from said axis, said groove being of progressively decreasing pitch and cross-section and having a discharge end in the peripheral wall of the plug below the end of the tube.

16. The combination with the rotatable bowl of a centrifugal machine, of a relatively stationary feed tube, a plug in the outlet end of the tube, and a central projection on the feed end of the plug, the plug being provided with helical grooves having inlet ends

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opening in the end of the plug toward which the liquid is fed and between said projection and the tube wall and having discharge ends opening in the peripheral wall of the plug
5 beyond said tube.

17. In a centrifugal machine, the combination, with an upright rotatable receiving chamber, of a relatively stationary vertical tubular feed device extending into said chamber and having, adjacent its discharge end,
10 an interior helical groove diverging from the axis of the receiving chamber and of a pitch diminishing to nearly horizontal at its discharge end, said discharge end being relatively close to the wall of the rotating receiving chamber.
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18. In a centrifugal machine, the combination, with an upright rotatable receiving chamber, of a relatively stationary vertical tubular feed device extending into said chamber and having, adjacent its discharge end,
20 interior helical grooves of progressively decreasing cross-section and also of a pitch which progressively decreases to nearly horizontal at the extremity of their outlets.
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In testimony of which invention, I have hereunto set my hand, at Poughkeepsie, New York, on this 28th day of July, 1930.

ALAN E. FLOWERS.

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