

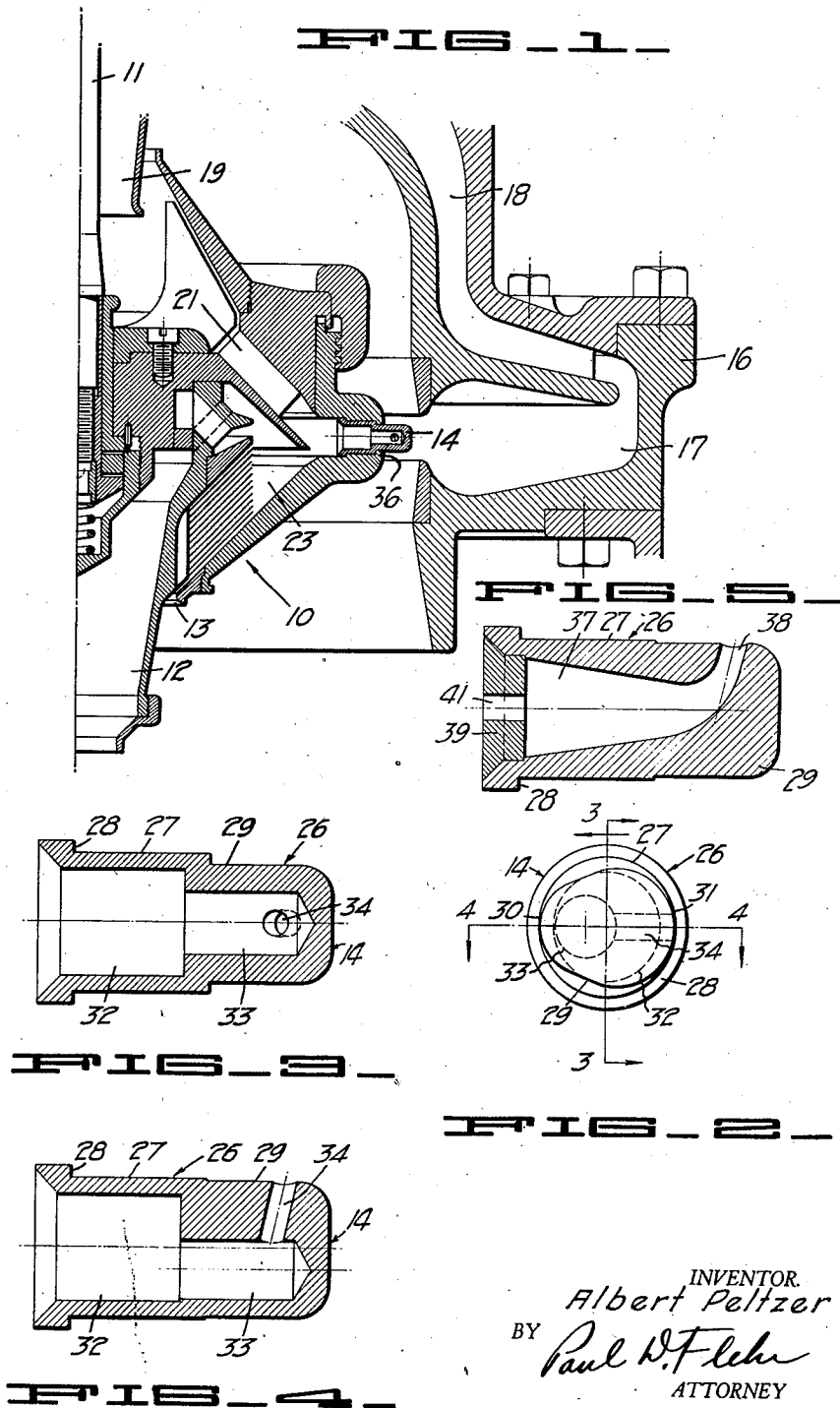
Nov. 10, 1936.

A. PELTZER
CENTRIFUGE CONSTRUCTION

2,060,239

Filed July 2, 1934

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

FIG. 6

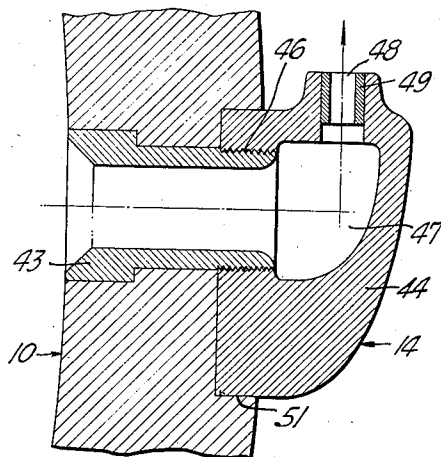


FIG. 7

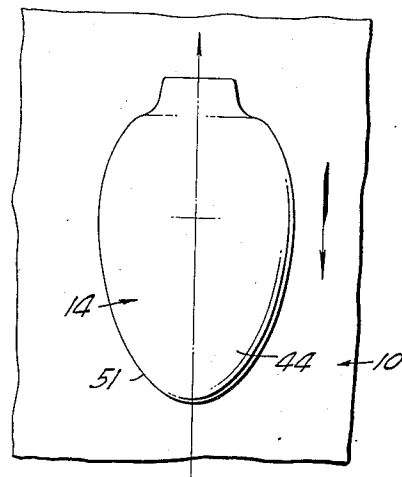


FIG. 8

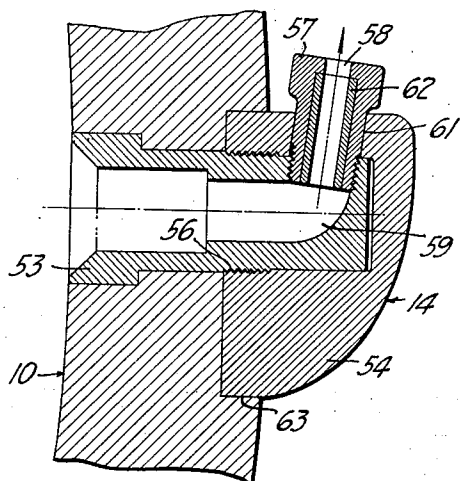
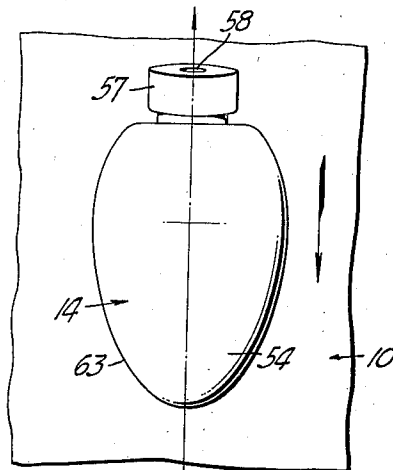


FIG. 9



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3 Sheets-Sheet 3

FIG. 10.

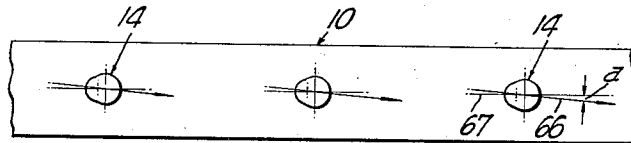


FIG. 11.

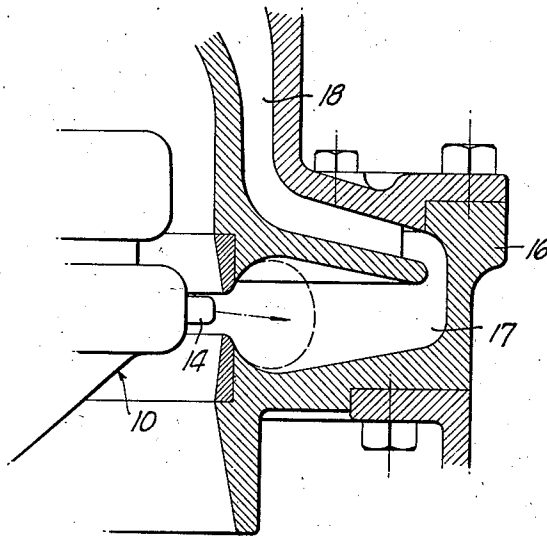
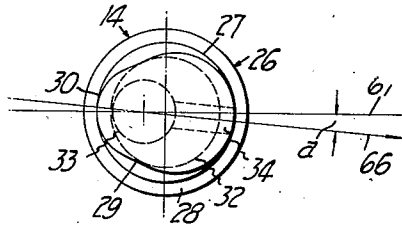


FIG. 12.

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CENTRIFUGE CONSTRUCTION

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Application July 2, 1934, Serial No. 733,446

8 Claims. (Cl. 233-47)

This invention relates generally to machines for the centrifugal separation of heavier and lighter components of a fluid feed material. It is concerned particularly with the construction of the nozzles utilized for the discharge of the heavier separated material.

It is an object of the invention to provide a nozzle construction for centrifuge machines, which will minimize power losses, which will have a relatively long, useful life, and which may be replaced in the event of undue wear.

A further object is to provide a centrifuge nozzle which can have only one position with respect to the rotor, thereby avoiding improper application.

A further object of the invention is to provide a nozzle which will afford a means for controlling the capacity of the machine and the velocity of discharge.

Another object of the invention is to provide a nozzle construction and arrangement which will avoid undue wear upon the advancing faces of the projecting nozzle portions.

Further objects of the invention will appear from the following description in which the preferred embodiment of the invention has been set forth in detail in conjunction with the accompanying drawings.

Referring to the drawings:

Fig. 1 is a side elevational detail, in cross-section, showing a portion of a centrifuge machine with my nozzle construction applied thereto.

Fig. 2 is an end view of the nozzle construction shown incorporated in the machine of Fig. 1.

Fig. 3 is a cross-sectional detail taken along the line 3-3 of Fig. 2.

Fig. 4 is a cross-sectional detail, taken along the line 4-4 of Fig. 2.

Fig. 5 is a view similar to Fig. 4, but showing a modified type of nozzle.

Fig. 6 is a cross-sectional detail showing a further modified nozzle having a separate wearing head.

Fig. 7 is a view looking toward the outer end of the nozzle shown in Fig. 6.

Fig. 8 is a cross-sectional detail showing another modified nozzle having a separate wearing head.

Fig. 9 is a view looking toward the end of the nozzle shown in Fig. 8.

Fig. 10 is a side elevational view showing a part of the centrifuge rotor, and illustrating a further modification.

Fig. 11 is a view similar to Fig. 2, but likewise showing a further modification.

Fig. 12 is a cross-sectional detail similar to Fig. 1, showing the desired relationship between the jetting from the nozzles and the volute.

The portion of the centrifuge machine illustrated in Fig. 1 is in accordance with the machine disclosed in United States Patent No. 1,923,455, dated August 22, 1933. In a machine of this character, only a portion of the underflow, or heavier separated material, is removed for final delivery, while the remainder is continuously returned into the centrifuge rotor. Briefly, the machine consists of a rotor 10, carried by a rotatable shaft 11. Feed material is introduced into the rotor through passage 12, lighter separated material is discharged over wiper 13, and heavier separated material or underflow is discharged from the circumferentially-spaced nozzles 14. Surrounding the rotor 10 there is a volute structure 16, which is formed with an annular chamber 17 for receiving the material discharged from nozzles 14. A part of the heavier material or underflow discharged into chamber 17 is removed for final delivery, and the remainder is returned, by way of passages 18, conduit 19, and ducts 21, to the outer portion of the inner rotor chamber 23.

With a centrifuge such as described above, it is evident that a relatively large quantity of material is discharged into chamber 17, and since the nozzles 14 are disposed on the periphery of the rotor, they are subjected to relatively high fluid pressures. As the underflow material is discharged from the nozzles 14, a certain amount of splattering occurs, and splattered particles are therefore encountered by projecting portions of the nozzles during their rotation. Likewise, a nozzle in its rotation may be impacted with material discharged from a preceding nozzle, before such material has had an opportunity to clear the path of rotation of the nozzles. It has been found that the impact of discharged particles upon the projecting portions of nozzles 14 may absorb a material amount of power and cause considerable wear.

Referring now to the particular nozzle construction illustrated in Figs. 2 to 4 inclusive, the construction shown therein consists of a body 26, which is ported for flow of fluid material therethrough, as will be presently explained. The enlarged cylindrical portion 27 of body 26 is adapted to snugly fit within a machined opening in the outer wall of the centrifuge rotor. A machined shoulder 28, formed upon the inner end of the nozzle body, serves to seat upon a similar shoulder formed in the rotor, thus retaining the

nozzle against the pressure of fluid. The head portion 29 of the nozzle body is oval in cross-sectional contour, as is apparent in Fig. 2. As the nozzle is disposed in the centrifuge rotor, the advancing face 30 of head portion 29 is of reduced width with respect to the trailing face 31, and all exposed surfaces are rounded to afford a minimum of resistance.

The porting for the nozzles is as follows:—

The enlarged portion 27 of the nozzle body is provided with a cylindrical passage 32 which communicates with the interior of the rotor. Leading from passage 32 there is a cylindrical bore 33 of reduced diameter, which is offset from the general axis of the nozzle, as is apparent from Figs. 2 and 4. Communicating with the outer end of bore 33, there is a final discharge port 34 which opens through the trailing face 31 of the nozzle portion 29.

Generally, the centrifuge bowl is provided with a plurality of nozzles as described above. The positioning of these nozzles is such that, with respect to the direction of rotation, ports 34 deliver material backwardly from the trailing nozzle faces 31. The body of the rotor has a lip 36 surrounding the portion 29 of each nozzle, with an opening therein corresponding to the oval contour shown in Fig. 2. Therefore, each nozzle can be placed in only one position with respect to the rotor, with the discharge port 34 directed backwardly and in the plane of rotation.

It has been found that with nozzles of this character a minimum amount of power loss is caused by the projecting nozzle portions 29 impacting with particles of discharged material. This is because of the oval, stream-lined contour of the projecting nozzle head portions, which present leading faces of reduced width for contacting the particles. The offset positioning of passage 33 makes possible a relatively large amount of metal surrounding the port 34, thus insuring good wearing properties.

No special securing means is required for retaining nozzles of the above type in proper position with respect to the rotor, since they are held in tight engagement with the rotor through centrifugal force and through the pressure of fluid material within the rotor. However, upon dismantling the rotor, the nozzles can be readily removed for replacement.

In Fig. 5 there is shown a modified type of nozzle made of a cored casting in place of the usual machined metal. In this case, the passage 37 is of gradually reduced cross-sectional area to the discharge port 38, and all corners are rounded to afford a minimum of flow resistance. With such a construction the external head portion 29 may wear away to a considerable extent, by impact with discharged particles, without requiring a nozzle replacement. Likewise, the tapered bend to passage 37 minimizes internal wearing away of metal. I have also shown, in conjunction with this modification, a flow choke or attenuating member 39. This member is snugly fitted into the inner end of the nozzle, and is provided with a control port 41. With such a member used together with the nozzle, the rate of discharge from port 38 is reduced somewhat, dependent upon the size of port 41, and the underflow discharge capacity of the machine is somewhat reduced, without, however, reducing the diameter of port 38. This effect is deemed due to turbulence in the enlarged space between ports 38 and 41, which absorbs considerable energy from the flowing material.

Even with the nozzle described above, impact of the outer head portions of the nozzles with particles of discharged material may cause such an amount of wear as to necessitate replacement before other surfaces have been worn away to a detrimental degree. Therefore, in some instances it is desirable to employ a separate wearing head, such as is incorporated in the nozzles of Figs. 6 to 9 inclusive. In the modification of Figs. 6 and 7, the nozzle body is formed of two parts 43 and 44, part 43 being in the form of a ported shank, and part 44 being in the form of an external wearing head. These parts are secured together by a threaded connection 46, and afford a flow passage 47 to the backwardly directed discharge port 48. In order to minimize wear, the discharge port may be provided with a wear resisting liner 49, such as a hard tungsten alloy. As viewed in Fig. 7, the head is ovaloid in contour and its base is seated within a similarly contoured recess 51 formed in the rotor periphery. The external surfaces of the head are rounded or stream-lined, to afford a minimum amount of power loss and to minimize wear by impact with discharged particles. Such a head affords a relatively large amount of metal which is available for receiving wear, before the head requires replacement.

The modification of Figs. 8 and 9 is similar to that shown in Figs. 6 and 7, in that a separate external wearing head is likewise provided. In this instance, the shank 53 is of greater length and has a threaded connection 56 with the head 54. Instead of forming a discharge port directly in the head, a separate fitting 57 is provided, which has a discharge port 58 communicating with the flow passage 59. Fitting 57 is received by an opening 61 in the advancing side of the head and is threaded into the outer end of the shank, thus affording an interlocking assembly. The port 58 is shown provided with a wear resisting line 62, such as a glass tube. The head 54 is shaped generally similar to the head 44 of Figs. 6 and 7, and is seated within a recess 63 formed in the periphery of the rotor. With such a construction the fitting 57 can be separately replaced in the event the port 58 becomes unduly worn, and the head 54 can be likewise removed for replacement.

As has been previously mentioned, a nozzle in its rotation may impact material discharged from a preceding nozzle or nozzles, to cause considerable wear and power absorption. To minimize this difficulty, and also to avoid a spilling of material over the walls of volute 17, I have provided the modification of Figs. 10 to 12 inclusive. In this case the nozzles 14, mounted upon the peripheral wall of rotor 10, are substantially of the form shown in Figs. 1 to 4 inclusive. However, instead of having the center lines 66 of ports 34 in the plane of rotation of the rotor (indicated by line 67), the ports are directed downwardly at a slight angle α of say 2% to 5%. Thus the material as it is discharged from a nozzle is caused to move downwardly out of the path of a succeeding nozzle or nozzles. As shown in Fig. 12, the arrangement should be such that the discharged material, which has considerable radial velocity, strikes the body of the material in volute 17 over such an annular area that there is no spill from this body over either the upper or lower volute walls. In other words, such annular area should coincide generally with the medial plane of the volute, as indicated in Fig. 12. If the discharged material were to strike the

body of material in the volute over an annular area near the upper volute wall, resulting swirls would cause a spill over the lower volute lip. For a particular installation and assembly the angle α should be such as to secure the results mentioned, namely, to minimize wear upon the protruding portions of the nozzles and to avoid spilling from the volute.

I claim:

1. In a nozzle construction for use with centrifuge rotors, a body adapted to be mounted upon a centrifuge rotor and being ported for flow of material therethrough, the body having an external head which provides a final discharge port directed backwardly relative to the direction of rotation and which presents rounded surfaces, the leading face of the head being of reduced width compared to the trailing face.

2. In a nozzle construction for use with centrifuge rotors, a body having one portion thereof adapted to be mounted in one wall of a centrifuge rotor and another portion thereof adapted to extend outwardly beyond the rotor, the advancing face of said extended portion being of reduced thickness as compared with the trailing face, said body being ported for the flow of material therethrough, the porting serving to finally discharge material from said trailing face.

3. In a nozzle construction for centrifuge rotors, a two-part body, one part constituting a shank extending through one wall of the rotor and the other part constituting an outer head, means for removably securing the head to the shank, and a backwardly directed final discharge port provided by the head, the rotor having a recess in which the inner face of the head is seated.

4. In a nozzle construction for centrifuge rotors, a two-part body, one part constituting a shank extending through one wall of the rotor and the other part constituting an outer head, means for removably securing the head to the shank, and a separate fitting removably secured to the head and forming a final discharge port, said fitting being interlocked with the shank.

5. In a centrifuge having means for receiving heavier separated material from a rotor, a plurality of circumferentially spaced nozzles carried by the rotor for the delivery of heavier separated material, the final discharge ports being directed backwardly with respect to the direction of rotation of the rotor and at an inclination with respect to the plane of rotation.

6. In a centrifuge, an annular volute for receiving heavier separated material from a rotor, and a plurality of circumferentially spaced nozzles carried by the rotor for the delivery of heavier separated material, the final discharge ports of the nozzles being directed backwardly with respect to the direction of rotation of the rotor and at an inclination with respect to the plane of rotation, the volute being so disposed with respect to the nozzles as to avoid spilling over the walls thereof.

7. In a nozzle construction for centrifuge rotors, a two-part body, one part constituting a shank extending through one wall of the rotor and the other part constituting an outer head in which the outer end portion of the shank is socketed, and a separate fitting secured within an opening in the head and forming a final discharge port, said fitting having its inner end portion interlocked with the outer end portion of the shank.

8. In a nozzle construction for use with centrifuge rotors, a body adapted to be mounted upon a centrifuge rotor and being ported for flow of material therethrough, the body having a shank portion adapted to extend through an opening in one wall of the rotor and also having an external head portion so dimensioned that it can be passed through said opening, the inner end of the shank portion having a shoulder adapted to seat upon said wall, the external head portion presenting rounded surfaces and having a final discharge port directed backwardly relative to the direction of rotation, the leading face of the head portion being of reduced width compared to the trailing face thereof.

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