April 19, 1960 M. D. ISSERLIS 2,933,045

CENTRIFUGAL PUMPS

Filed Jan. 27, 1954

Fig_1

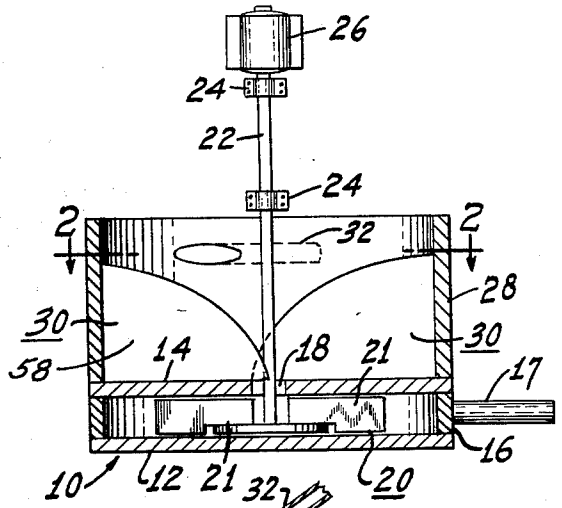


Fig_2

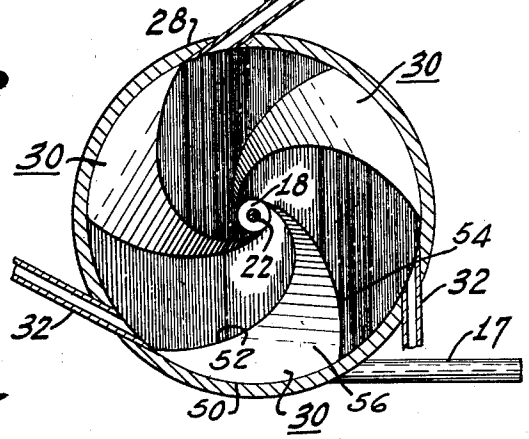
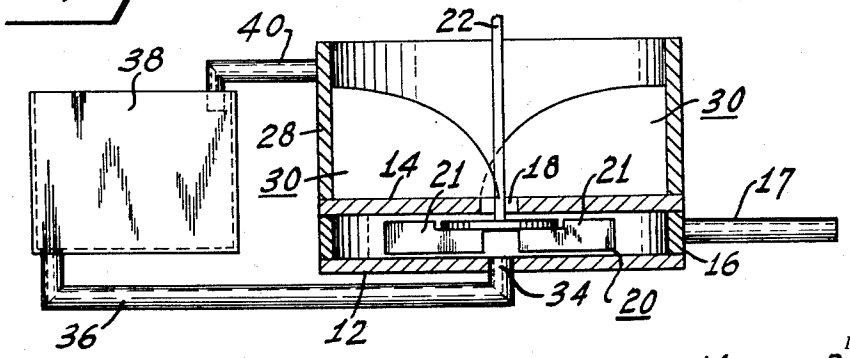


Fig_3



INVENTOR.
MORRIS D. ISSERLIS

BY Robert A. Green

ATTORNEY

United States Patent Office 2,933,045 Patented Apr. 19, 1960

2,933,045

CENTRIFUGAL PUMPS

Morris D. Isserlis, New Brunswick, N.J.

Application January 27, 1954, Serial No. 406,496

1 Claim. (Cl. 103—103)

This invention pertains to rotary pumps and particularly to centrifugal pumps suitable for pumping liquids containing solid materials by pressure or gravity feed and by suction.

A typical centrifugal pump comprises a housing having fluid inlet and outlet conduits connected thereto and an impeller rotatably mounted therein for directing the passage of fluid into and out of the housing. Ordinarily, the rotor or impeller is carried by a drive shaft which is driven by a motor. The drive shaft extends through the pump housing which is closed by a packing box designed to prevent liquid from leaking out of the housing and air from entering the housing. However, such packing boxes are generally not completely effective, particularly after a period of time during which wear takes place and the operation of the pump is adversely affected. When a packing or stuffing box loses its sealing efficiency, fluid leaks out of the pump and air leaks in. The presence of air in the pump prevents the proper feeding of liquid into the pump and the pump becomes inoperative. This condition is known as air-binding.

Accordingly, an important object of this invention is to provide a rotary pump of new and improved form.

Another object of this invention is to provide an improved centrifugal pump having an impeller drive shaft sealed in fluid and adapted for operation without becoming air-bound.

A further object of this invention is to provide an improved vertical centrifugal pump capable of receiving and pumping fluid containing solid materials in large or small volume as desired and without becoming air-bound.

Still another object of the invention is to provide an improved centrifugal pump adapted to operate without a packing box.

In general, the principles and objects of this invention are accomplished by the provision of a vertical centrifugal pump having a housing and a rotary impeller provided therein. A cylindrical fluid feed chamber is connected to one wall of the housing which has an axial fluid feed opening which also provides passage for the impeller drive shaft. The drive shaft is journalled outside of the fluid feed chamber and is driven by a motor. To prevent the pump from becoming air-bound and to promote the feeding of fluid into the pump housing, the fluid inlet chamber is provided with one or more double-curved cup-like baffles which direct the flow of fluid smoothly through the axial opening into the pump housing. According to one aspect of the invention the fluid is fed tangentially into the fluid feed chamber into the cup-like baffles. According to another aspect of the invention, the pump receives the fluid by axial suction feed and the fluid chamber and the curved baffles serve as an overflow control mechanism.

The invention is described in greater detail by reference to the drawing wherein:

Fig. 1 is a sectional elevational view of a vertical centrifugal pump embodying the principles of the invention;

Fig. 2 is a sectional elevational view along the line 2—2 in Fig. 1; and

Fig. 3 is a sectional elevational view of a modification of the pump shown in Figures 1 and 2.

Similar elements are designated by similar reference numerals throughout the drawing.

Referring to Figures 1 and 2, a vertical centrifugal pump according to the invention includes a housing **10** of steel or the like horizontally disposed and having a pair of planar, parallel side walls **12** and **14** and a circumferential wall **16** which are bolted together or otherwise retained in liquid-tight engagement. The housing has a conventional outlet conduit **17**. One wall of the housing, for example **14**, has a circular, axial opening **18**. A rotary impeller **20** of steel or the like having a plurality of vanes or blades **21** is rotatably mounted within the housing and has a drive shaft **22** connected thereto in any suitable fashion. The drive shaft or impeller shaft extends through the axial opening **18** in the wall **14** and is journalled in two or more conventional bearing boxes **24** at a suitable distance from the pump housing. The shaft **22** is connected to a motor **26** which may be of any suitable type. The bearing boxes **24** and motor **26** are supported on any suitable support member.

A hollow cylindrical fluid reservoir or chamber **28** of steel or the like is welded or otherwise fastened in liquid-tight engagement to the wall **14** of the housing **10** at the periphery thereof. According to the invention, one or more fluid flow control baffles **30** are positioned within the fluid chamber **28**. The baffles are generally cup-shaped and are, in effect, portions of spherical surfaces. Each baffle includes a side edge **50**, a top edge **52**, and a bottom edge **54**. The side edge **50** of each baffle is secured to the inner wall of the chamber **28** and the bottom edge **54** is secured to the horizontal wall **14**. Each baffle curves outwardly as it progresses from the top edge to the bottom edge to provide a convex outer surface **56** and a concave inner surface **58**. Each baffle also curves radially inwardly from the inner wall of the chamber **28** toward the central opening **18** in the wall **14**. This can be seen in Fig. 2 by the curve defined by the bottom edge of each baffle at its line of attachment to the horizontal wall **14**. The baffles may thus be defined as being doubly-curved since they extend from the inner wall of the chamber **28** in a smooth, gradual curve inwardly and downwardly toward the central opening **18**. The inner end of each baffle is curved around and surrounds a portion of the central opening so that fluid which strikes the baffles is directed in a swirl into the central opening but at the periphery thereof. The baffles are spaced apart in the chamber **28** with the convex surface of each facing the concave surface of the one behind it and the concave surface of each facing the convex surface of the one in front of it. This construction and arrangement of the baffles insures that, as the fluid enters the housing **10**, air escapes through the opening **18** and air-binding virtually cannot occur.

One or more fluid inlet pipes **32** are connected to the chamber **28** and are disposed, preferably with their axes substantially tangential to the periphery of the chamber. The pipes **32** may also be tilted downwardly if desired depending on the point of entry into the chamber **28**. The pipes **32** are thus adapted to feed fluid into the baffles **30** whereby the desired swirling action is promoted.

One of the particular advantages of the pump shown in Figures 1 and 2 is that the axial fluid feed opening **18** may be larger or smaller than such an opening in a pump which is not equipped with the baffles **30**. This is made possible because of the positive force applied to the fluid by the swirling action induced by the baffles and because of the fact that the baffles direct the fluid into the housing by way of the periphery of the axial opening. Thus air may escape from the center of the opening in the vicinity of the drive shaft **22** and air-binding is prevented.

A modification of the pump shown in Figure 1 is shown in Figure 3 and comprises a vertical centrifugal pump which is particularly suitable for providing controlled overflow and feedback or the material being pumped. The pump includes all of the elements shown in the pump of Figures 1 and 2 and includes in addition a central suction inlet opening **34** in the wall **12** to which a conduit or pipe **36** is connected. The pipe **36**, in turn, is connected to a reservoir **38** which contains the liquid or material to be pumped. In addition, an overflow pipe **40** leads from the chamber **28** to the liquid reservoir.

In operation of this embodiment of the invention, fluid is drawn from the reservoir **38** into the housing **10** where it is pumped by the impeller into the outlet pipe **17**. As this pumping operation proceeds, some of the fluid escapes from the axial opening **18** in the wall **14**. However, the escaping fluid strikes the baffles **30** and some of the fluid tends to be returned through the opening into the housing whereby the housing tends to remain filled with fluid being pumped. However, if the fluid continues to escape, its rise in the chamber is controlled and reduced in turbulence by the baffles **30**. As the fluid reaches the level of the overflow pipe, it flows back into the reservoir **38**.

The vertical centrifugal pumps described above have the advantage that extremely close tolerances are not required for any of the component parts. Thus, if the impeller blades should become worn due to abrasion, the motor **26** and drive shaft **22** may be lowered or raised to properly position the impeller within the housing **10**. Furthermore, if holes should be worn in any of the walls of the housing, they may be filled by welding or by any other convenient means.

What is claimed is:

A centrifugal pump including an impeller housing, a horizontal wall comprising a portion of said housing and having a central opening through which fluid material may pass, an impeller horizontally disposed within said housing and having a vertical drive shaft extending through said central opening in said horizontal wall of said housing, a hollow cylindrical reservoir having a peripheral wall extending vertically from the periphery of said housing, and a plurality of baffles spaced apart and secured within said reservoir to said peripheral wall thereof, said baffles curving inwardly from said peripheral wall to said central opening in said horizontal wall, said baffles having concave and convex surfaces and disposed with the concave surface of one facing the convex surface of the one ahead of it, and an inlet pipe secured to said peripheral wall of said reservoir and aimed at the concave surface of one of said baffles whereby fluid flowing into said reservoir is directed into said central opening in the wall of said housing.

References Cited in the file of this patent

UNITED STATES PATENTS

451,827	Lister	May 5, 1891
1,094,836	De Laval	Apr. 28, 1914
1,795,588	Wilson	Mar. 10, 1931
1,891,201	Hoff	Dec. 13, 1932
2,325,477	Collins	July 27, 1943

FOREIGN PATENTS

253,303	Great Britain	June 17, 1926
317,984	Great Britain	Aug. 29, 1929
370,066	Italy	Apr. 6, 1939
386,432	Great Britain	Jan. 19, 1933
440,469	Italy	Dec. 31, 1947
461,227	Great Britain	Feb. 12, 1937