Jan. 18, 1966 W. D. HESSLER 3,229,641

CENTRIFUGAL PUMP FOR HANDLING SUSPENSIONS CONTAINING LARGE PARTICULATE MATTER

Filed Feb. 24. 1964 3 Sheets-Sheet 1

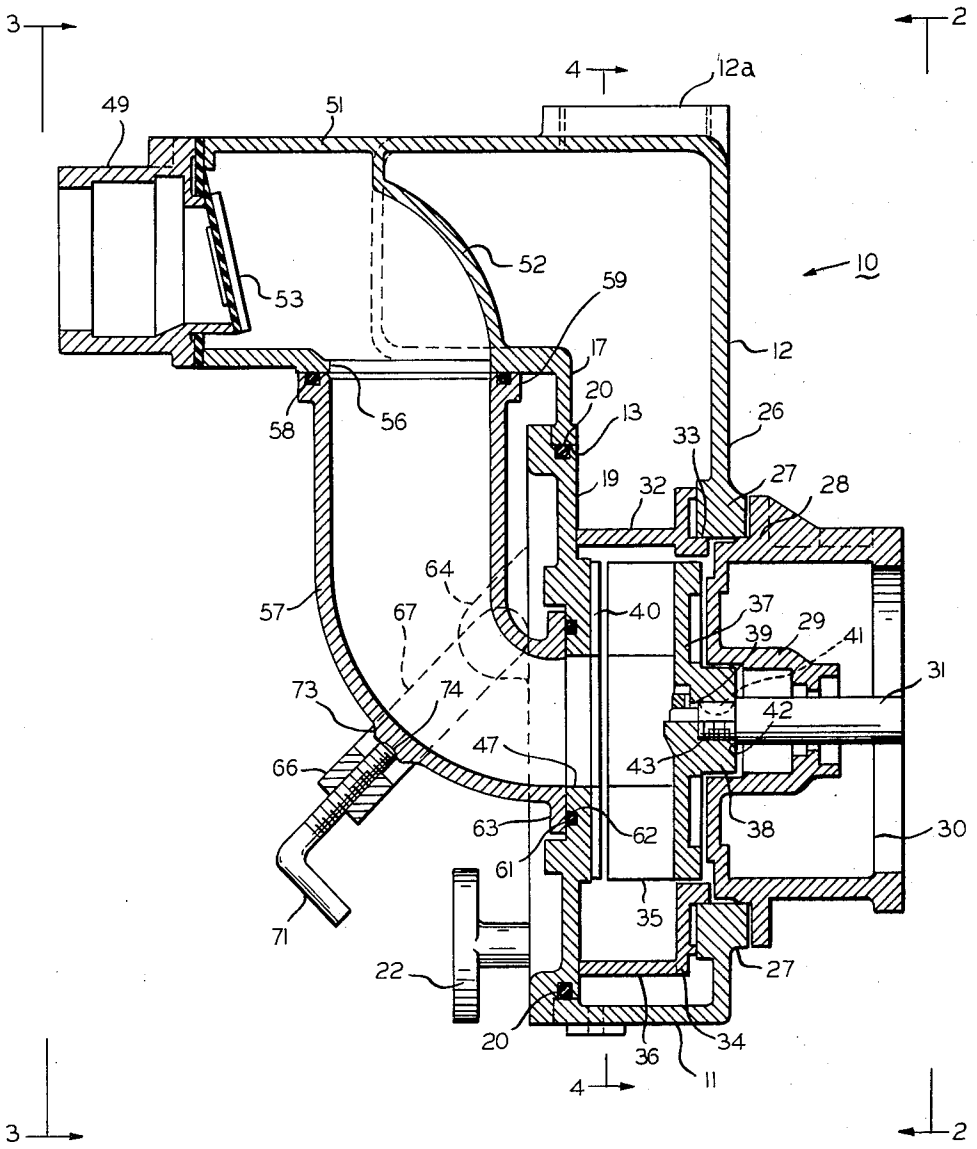

FIG. 1

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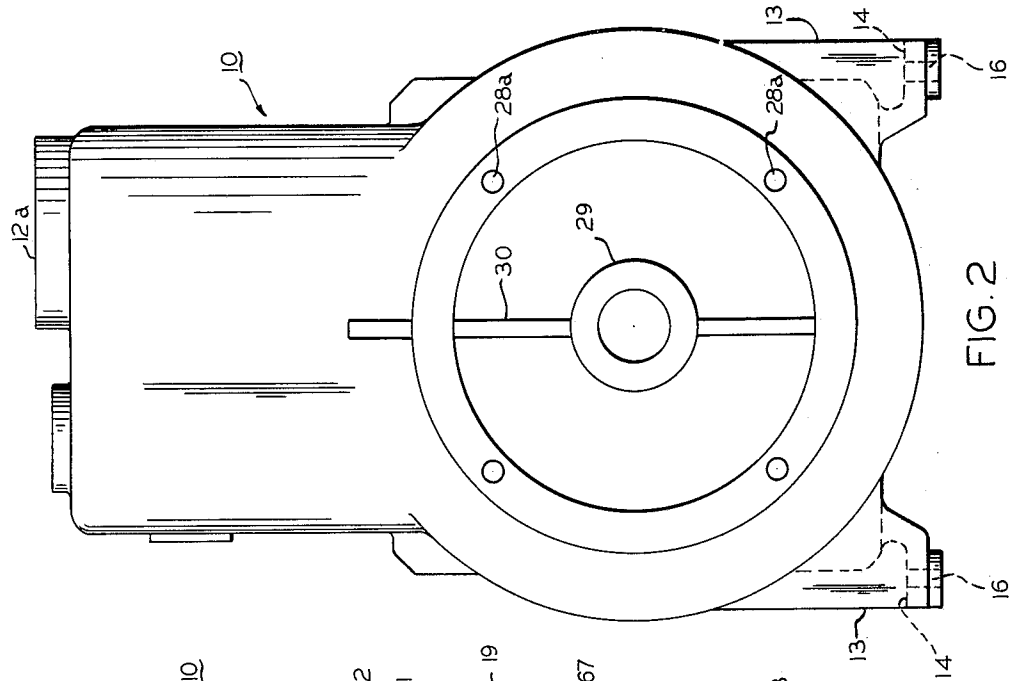

FIG. 2

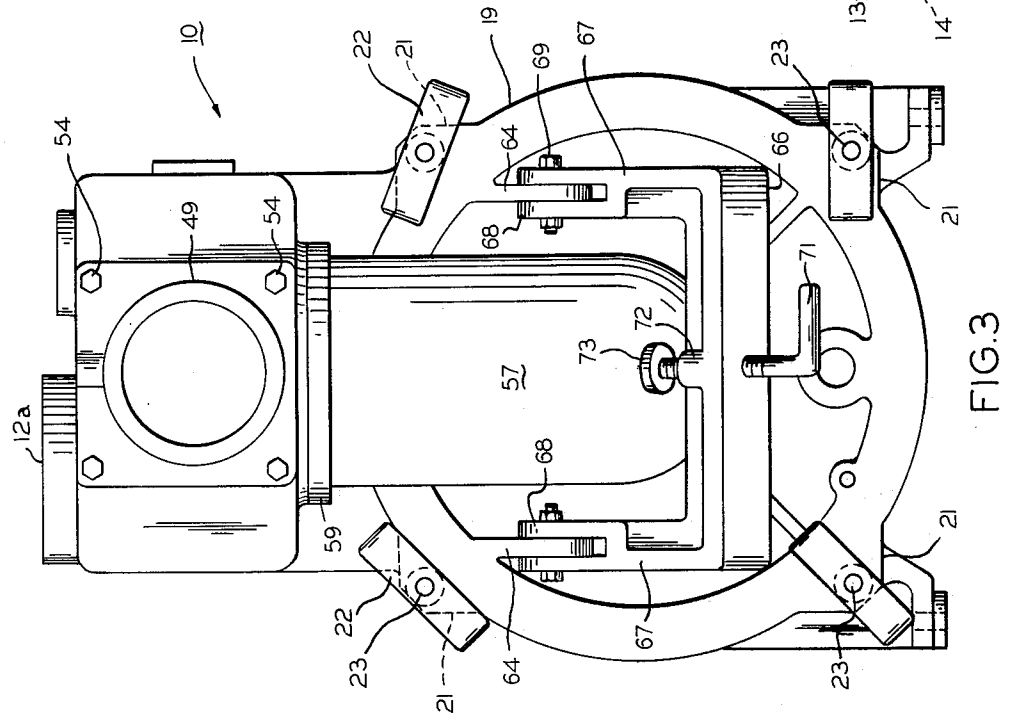

FIG. 3

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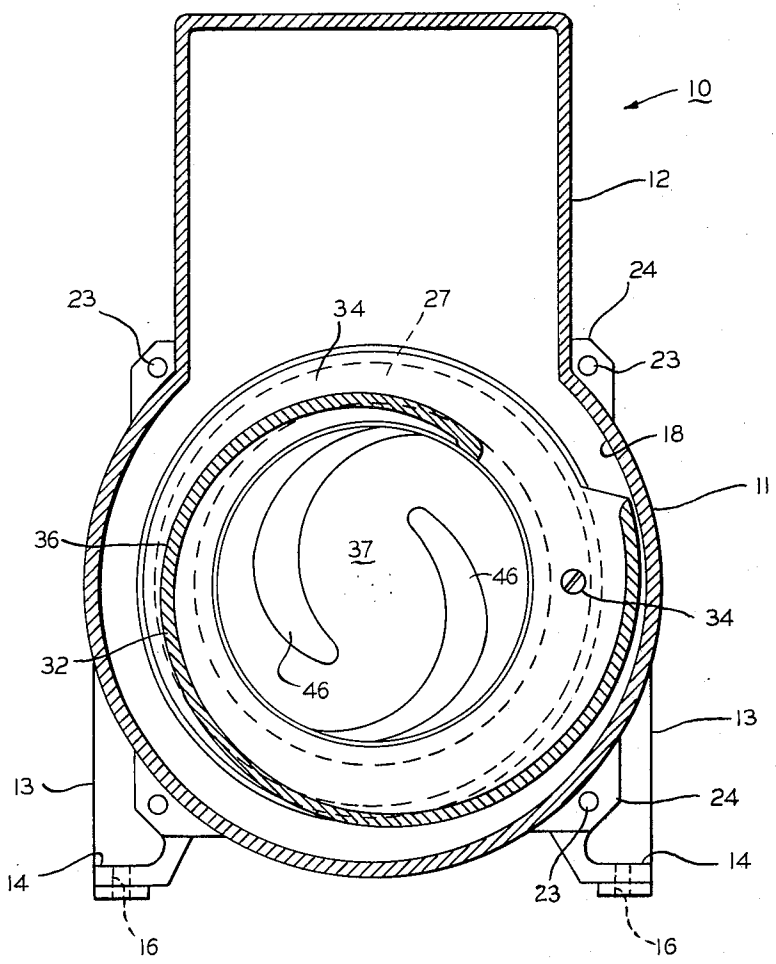

FIG. 4

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3,229,641

CENTRIFUGAL PUMP FOR HANDLING SUSPENSIONS CONTAINING LARGE PARTICULATE MATTER

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1 Claim. (Cl. 103—103)

This invention relates generally to centrifugal pumps, and particularly to a pump adapted to pump slurries, sludges or silt containing trash, rock, debris or other large particulate matter.

One of the principal objects of this invention is to provide a pump adapted to pump liquids containing large particulate matter in suspension, and to provide in such a pump structure whereby the inlet side of the pump can be disassembled to provide ready access to the pump interior to remove solid matter which has become lodged in the pump body.

Another object is to provide a readily detachable suction elbow connecting a fixed suction pipe with the eye of the pump, which suction elbow can be readily disconnected from the pump body, so that large particulate matter can readily be removed when the same is jammed in the pump impeller and volute scroll, and to provide in such pump further removable structure for laying open the entire pump cavity for replacing the volute scroll and the pump impeller when the same becomes necessary, or for permitting the dislodgement of the particulate material when the same is not readily possible by removal of the suction elbow alone.

Other objects of the invention will become apparent from a study of the following specification taken with the drawings, which together illustrate and describe a preferred embodiment of the invention and what is now considered to be the best mode of practicing the principles thereof. Other embodiments of the invention may be suggested to those having the benefit of the teachings hereof, and such other embodiments are intended to be preserved especially as they fall within the scope and purview of the subjoined claims.

In the drawings:

FIG. 1 is a vertical sectional view taken through a centrifugal pump having the improvements according to the present invention embodied therein;

FIG. 2 is an end view thereof looking in the direction of the arrows 2—2 of FIG. 1;

FIG. 3 is an opposite end view looking in the direction of the arrows 3—3 of FIG. 1; and

FIG. 4 is a vertical sectional view looking in the direction of the arrows 4—4 of FIG. 1.

Referring now to the drawings, the improved pump according to the present invention is referred to generally by the reference numeral **10** and includes a generally cylindrical pump housing **11** which is surmounted by a discharge and priming tank **12** having a discharge opening **12***a* therefrom. The lower extremities of the housing **11** have webs **13** extending therefrom, which terminate at their lower end in spaced feet **14** having drilled openings **16** therein whereby the pump housing can be secured to any suitable base, not shown.

The housing **11** has a front wall **17** provided with a circular opening **18** to receive a front closure **19** sealed at opening **18** by an O-ring seal **20**. The closure **19** has ears **21** extending therefrom, and the same are held in position by wing nuts **22** threaded onto studs **23** extending from ears **24** on the pump housing **11**, and registering with drilled holes in closure **19**.

The housing **11** has a rear wall **26** spaced from the front wall **17**, and wall **26** may be cast integrally with an annular rib **27** to receive a generally annular shaped shaft support **28**. The center of shaft support **28** has a hub **29** enclosing the conventional shaft seals and bearings, not shown, for a shaft **31**. Hub **29** may be cast integrally with a stiffener web **30** extending to shaft support **28**, and the latter is secured to housing **11** by cap screws **28***a* tapped into housing **11**.

As seen in FIGS. 1 and 4, the opposite side of the annular rib **27**, within housing **11**, is arranged to receive a volute scroll **32** having an annular rib **33** fitting snugly within the annular rib **27** of the housing **11**, and an annular flange **34** bearing against the inside of annular rib **27**. The volute scroll **32** is located properly in position at the annular rib **27** by an aligning screw **34** tapped into the rib **27**.

The volute scroll **32** has a wall **36** extending against the closure **19**, as seen more particularly in FIG. 1, and the wall **36** has a curve in the form of an involute, as seen more particularly in FIG. 4.

An impeller referred to generally by the reference numeral **35** consists of a disc **37** having a central hub **38** connected to the shaft **31**. One such form of connection to the shaft **37** may be by means of a milled slot **39** in the hub **38** and shaft **31** and a conventional Woodruff key **41**, in a manner well known, the hub **38** bearing against a shoulder **42** on the pump shaft **31**. The assembly is held against longitudinal displacement on shaft **31** by a retaining nut threaded to the end of shaft **31**. Another mode of connection of the impeller **35** to the shaft **31** consists of threading the end of the shaft **31** as at **43** and blind tapping the hub **38** with complementary threads.

The impeller **35** has vanes **46** which are curved in the manner shown, and which are spaced a distance at their inner ends corresponding to the diameter of an opening **47** in the closure **19**. Opening **47** is coaxial with the axis of the drive shaft **31**, opening **47** being large enough to accommodate the larger size particulate matter, which is moved together with the liquid suspending the same by curved vanes **46** to the discharge and priming tank **12** having the discharge opening **12***a* therefrom.

The inner face of closure **19** is provided with an annular wear plate **40** which is hardened and surface ground. Wear plate **40** is held to closure **19** by counter sunk screws, not shown.

The housing **11** and the discharge tank **12** are cast integrally with a fixed inlet suction pipe **51** having an inlet fitting **49** secured thereto. Inlet suction pipe **51** includes a curved wall **52** separating the discharge chamber **12** from the inlet pipe **51**. A suction valve indicated generally by the reference numeral **53** is interposed between the inlet fitting **49** and the inlet pipe **51**, and is held in place by cap screws **54**, see FIG. 3, which also hold the inlet fitting **49** in place against the inlet pipe **51**.

An opening **56** is provided from the inlet suction pipe **51**, and the opening **56** is coterminous with a suction elbow **57** connecting the suction inlet pipe **51** with the opening **47** in the removable closure **19**. A gasket **58** is held in an annular rib **59** on the upper end of the suction elbow **57**, and against the opening **56** of the inlet pipe **51**. A similar gasket **61** is held in a recess **62** at the removable closure **19**, and gasket **61** seals against a flange **63** at the lower end of the suction elbow **57**.

Structure is provided for holding the suction elbow **57** in position between the opening **56** of the inlet suction pipe **51** and against the removable closure **19** at the opening **47** therein, and comprises a pair of spaced abutments **64** which are preferably cast integrally with the removable closure **19**. The two abutments **64** cooperate with a securing member in the form of a yoke **66** straddling the suction elbow as seen in FIG. 3. Yoke **66** has leg members **67**, each of which terminates in a clevis

68. Suitable bolt means 69 afford a pivotal connection between the abutments 64 and the clevises 68.

Structure is provided which cooperates with the yoke 66 to hold the suction elbow 57 in position, and includes an "L" screw 71 which is tapped centrally of the yoke 66 at a boss 72 therein, to bear against a boss 73 on the suction elbow 57, the "L" screw 71 bearing against a conical depression 74 in the boss 73.

It should be noted that the two abutments 64 lie in a plane which is a bisector of the included angle of suction elbow 57, and that the yoke member 66 and the legs 67 thereof likewise lie on such plane when securing suction elbow 57 in position. Such structure insures that the force exerted by the yoke 66 and the screw 71 is such that it can be divided into two components insuring firm seating of the upper end of the elbow 57 at the opening 56, and of the lower end of the elbow 57 at the opening 47 in the closure 19.

Usually, if there is clogging of the pump 10, the same can be corrected by quickly releasing the screw 71 and rocking the yoke 67 to a position where it will not hinder the removal of the suction elbow 57. The yoke 66 will customarily be rocked in a counter-clockwise direction as seen in FIG. 1 upon release of the screw 71, whereupon the suction elbow 57 can be readily removed. The opening 47 in the removable closure 19 is of a size permitting insertion of suitable tools to dislodge any matter which is "hung up" at the impeller 35 or at the volute scroll 32.

In those cases where the particulate matter is of such a size that it cannot be removed by the aforedescribed operation, the closure 19 may then be readily removed by releasing the wing nuts 22 seen in FIG. 3, the closure then being guided along the studs 23 for such removal.

It will be seen from the foregoing description that there have been provided some new and useful improvements in the art of centrifugal pumps for pumping heavy liquid suspensions having large suspended particulate matter therein. The structure disclosed according to the present invention makes it possible readily and expeditiously not only to correct a clogged condition thereof, but also to make immediate repairs which may become necessary by wear of the parts, these repairs being capable of being done in the field, if necessary. For example, the volute scroll 32 can readily be removed from the pump housing 11 by release of the securing screw 34 seen in FIG. 4. Since the closure 19 carries the hardened and ground wear plate thereon, a new closure 19 may be supplied or a new wear plate 40 substituted for the worn one.

While the invention has been described in terms of a preferred embodiment thereof, the scope is intended to be limited only by the claims hereto appended.

I claim:

In a centrifugal pump particularly adapted to pump fluids having large particulate matter suspended therein and adapted to permit rapid opening of the pumping chamber to dislodge said particulate matter when necessary, a pump housing including a pump volute therein defining a pumping chamber, a pump impeller adapted to rotate about an axis within said pump volute, a readily removable closure for said pump housing including an opening in said closure lying on the axis of rotation of said impeller, a fixed suction pipe spaced from said opening, suction elbow means connecting said fixed suction pipe with said opening in said closure, and means for holding said suction elbow in position between said fixed suction pipe and said opening and for providing ready removal of said suction elbow apart from said closure to enable said particulate material near said axis to be removed from said impeller without removing said closure, said means comprising a pair of abutments formed on said closure flanking the opening of said closure, the centers of said abutments lying in a plane which is approximately a bisector of the included angle of said suction elbow, a yoke member straddling said suction elbow and having leg members pivotally connected to said flanking abutments, and threaded means acting between said yoke member and a point on said suction elbow and along the plane which is the aforesaid angle bisector, said closure being removable together with said yoke member after removal of said suction elbow to expose said volute and impeller for the removal of particulate matter lodged therein.

References Cited by the Examiner

UNITED STATES PATENTS

2,635,549	4/1953	Rupp	103—114
2,831,434	4/1958	Paashaus	103—113
3,040,669	6/1962	Rupp	103—111

FOREIGN PATENTS

378,662	7/1923	Germany.
520,141	3/1955	Italy.

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