June 11, 1940. E. M. GREENLEE ET AL 2,203,958

CENTRIFUGAL PUMP

Filed May 15, 1939 2 Sheets-Sheet 1

Fig 1

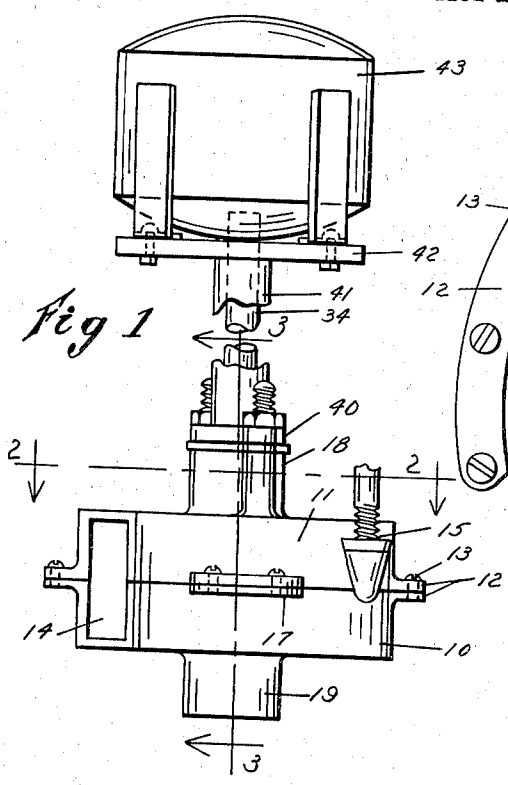


Fig 2

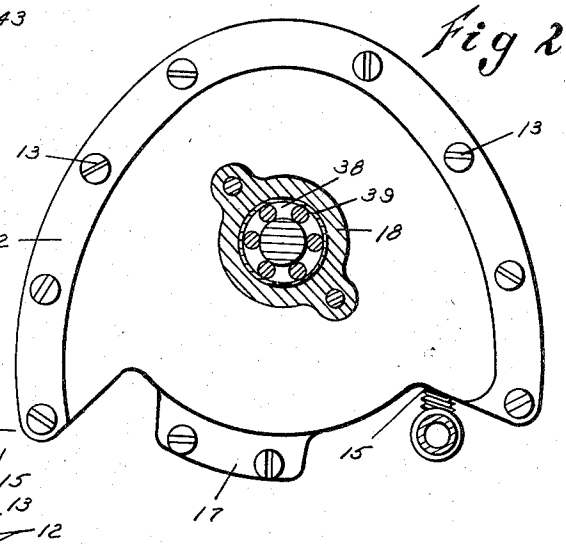


Fig 5

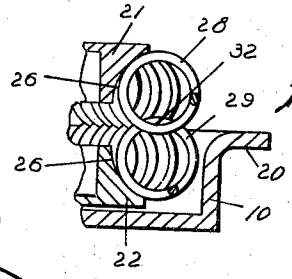
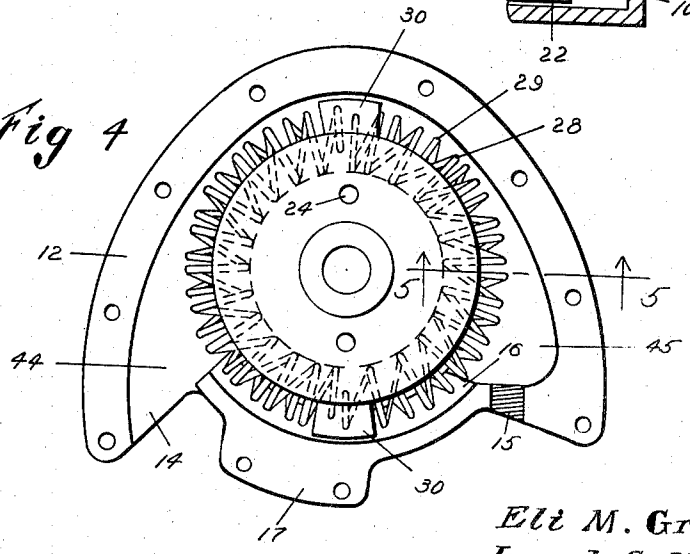


Fig 4



Eli M. Greenlee.
Joseph S. Knittel.
INVENTORS.

BY Murray Sachhoff & Paddack.

ATTORNEYS.

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Filed May 15, 1939 2 Sheets-Sheet 2

Fig 3

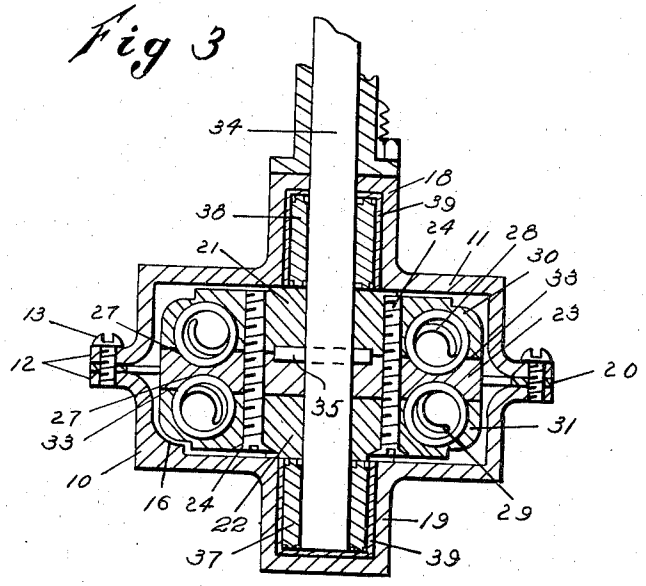
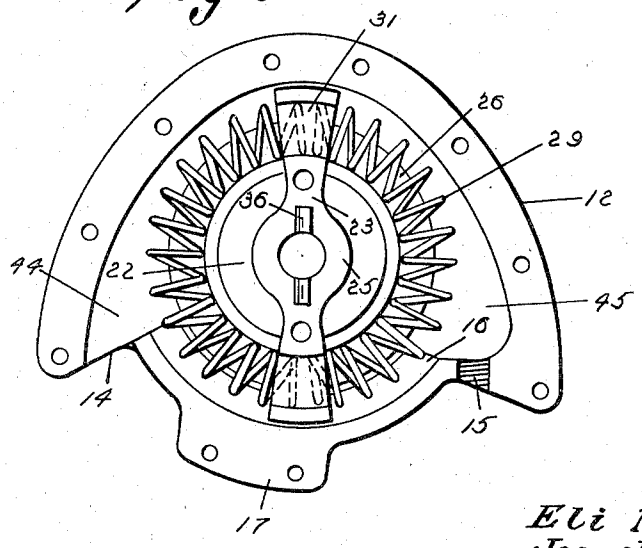


Fig 6



Eli M. Greenlee.
Joseph S. Knittel.
INVENTORS.

BY Murray Sackhoff & Paddack.
ATTORNEYS.

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UNITED STATES PATENT OFFICE

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CENTRIFUGAL PUMP

Eli M. Greenlee, Newport, Ky., and Joseph S. Knittel, Hartwell, Ohio

Application May 15, 1939, Serial No. 273,704

8 Claims. (Cl. 103—96)

This invention relates to a centrifugal pump of the type adapted to be positioned and operated in tanks or containers of stationary fluid for the purpose of removing the fluid therefrom under pressure.

An object of the invention is to provide a pump of this nature comprising novel impeller means.

Another object is to provide such a pump which operates with high efficiency and produces a full and steady flow of the projected fluid.

Another object is to provide a pump of this kind in which the impeller is spaced at a substantial distance from the adjacent casing walls so as to obviate injury to the impeller and other parts of the pump due to the passage of grit and other foreign material therethrough.

Another object is to provide a centrifugal pump which may be produced, assembled and operated simply and at a minimum of cost.

These and other objects are attained by the means described herein and illustrated in the accompanying drawings, in which:

Fig. 1 is an elevational view of the pump of this invention associated with a suitable operating motor.

Fig. 2 is a view taken on the line 2—2 of Fig. 1.

Fig. 3 is a cross-sectional view on line 3—3 of Fig. 1.

Fig. 4 is a plan view of the body of the pump with the upper half of the casing and the drive shaft removed.

Fig. 5 is a cross-sectional view on the line 5—5 of Fig. 4.

Fig. 6 is a plan view of the lower half of the pump body with the drive shaft and the upper portions of the impeller removed.

Centrifugal pumps heretofore in use have, in general, been expensive in upkeep due to the relative complexity of their construction and the fineness of adjustment betwetn their parts necessary for insuring efficient operation. More specifically, centrifugal pumps, as known at the present, usually comprise an impeller formed with a number of fins, the impeller being ordinarily positioned in close juxtaposition with the surrounding casing. Under these circumstances, the entry of foreign material, such as grit, metal particles and shavings and the like, readily cause injury, not only to the impeller and its fins, but to the surrounding portions of the casing with the result that regrinding and substitution of parts becomes necessary to restore the pump to good operation. This is obviously costly and time-consuming. It has represented the primary difficulty in devices of the character here considered. The endeavor to overcome these disadvantages to some extent by the use in the pump construction of hardened and expensive metals raises the initial cost of the pump and, of course, its upkeep, if equivalent materials are substituted when repairs are necessary. In addition to all this, the operation of centrifugal pumps heretofore has not been entirely satisfactory due to a limited output of the pumps and uneven flow of the projected fluid.

These and other difficulties heretofore encountered are obviated by the present invention in which, briefly, the pump comprises an impeller in which the peripheral impelling portions are formed of helical spring members which take the place of blades or fins heretofore utilized in pumps of this kind. The pump provided with such an impeller operates with high efficiency and, due to its peculiar character, permits of considerable spacing of the impeller from the surrounding casing so that the danger of injury to the pump parts by the entry of foreign material is eliminated. Moreover, an impeller, formed as described, may be produced inexpensively, since the spring members utilized need not be of special character but merely of such sturdiness or weight as to withstand the anticipated strains.

In greater detail and with reference to the drawings:

The pump of this invention may be formed with a casing comprising a lower half 10 and an upper half 11 of semi-elliptical outline, as seen in Figs. 2, 4 and 6, and provided with lateral flanges 12 adapted to be disposed one on the other and secured together by a suitable means, such as threaded bolts 13.

The cooperating casing halves 10 and 11 are formed with registering openings adapted to form an enlarged inlet port 14 and a relatively reduced outlet port 15 (Figs. 1, 4 and 6). Between these, the lower casing 10 may be formed with an internal rounded shoulder 16 (Figs. 3, 4, and 6) for a purpose to be described. Externally, the adjacent portions of the upper and lower casings 10 and 11 may be formed with reduced flange members 17 adapted to be secured together. It will be seen in Fig. 3 that the connection flanges of the upper and lower parts of the casings are adapted to have gasket means 20 interposed between them.

Both the casing members 10 and 11 are formed with central journals 18 and 19, respectively, adapted to receive and support a drive shaft.

The impeller of this invention is adapted for operation in the chamber provided by the casing

members 10 and 11. The impeller comprises a pair of upper and lower body members 21 and 22, respectively, (Figs. 3 through 6) and an intermediate member 23. These three impeller parts are adapted to be removably secured together as by threaded bolts 24 (Fig. 3). It will be seen, in Figs. 4 and 6, that the upper and lower impeller members 21 and 22 may be generally circular in outline, while the intermediate member 23 may be more in the shape of a transversely extending bar with a central enlargement 25.

The upper and lower impeller members 21 and 22 are correspondingly formed at their peripheries with channels 26. At opposite sides, the upper and lower impeller members 21 and 22 are formed with extensions 30 and 31 which, on their inner sides, are of concave formation complementary to the channels 26, resulting in the semi-circular contour seen in Fig. 3. The upper and lower sides of the intermediate impeller member 23 are formed with grooves 27 adapted to register wth the channeled portions of the upper and lower impeller members 21 and 22 and their associated extensions 30 and 31, as seen in Fig. 3.

The peripheral portions of the impeller, in accordance with the present invention, consist of helical spring members, designated at 28 in the upper portion of the pump body and at 29 in the lower portion thereof. As seen in Figs. 4 and 6, the upper and lower spring members may each comprise two independent springs disposed in the channels 26 of the impeller members 21 and 22, respectively, and having their ends brought into juxtaposition and secured between the extensions 30 and 31 of the upper and lower impeller members and the grooves 27 of the intermediate impeller member 23 (Figs. 3, 4 and 6). The several sections of spring, in being so positioned, are somewhat compressed so that the springs of the upper and lower impeller members converge somewhat toward one another whereby, as seen in Figs. 4 and 5, the coils interengage, as seen particularly at 32 (Fig. 5). This forms, as it were, a centrally extending shelf along these adjacent portions of the upper and lower spring units. The threaded bolts 24 (Fig. 3) secure the whole impeller into one unitary member. It will be seen in Fig. 3 that the outer edges of the extensions 30 and 31 (see Fig. 3) are adapted to seat flat against the outer edge portions of the intermediate member 23, as at 33.

The impeller so formed is adapted to have secured centrally thereof a drive shaft 34 which projects through the journal 18 and has its lower end seated within the journal 19. The securing together of the impeller and the shaft 34 may be effected by a pin 35 (Fig. 3) which extends transversely through the shaft and has its projecting ends clamped between a groove 36 (Fig. 6) provided in the upper face of the intermediate impeller member 23 and a corresponding groove formed in the under face of the upper impeller member 21. The lower end of the shaft in its journal 19 may be surrounded by a suitable roller bearing 37 and the portion of the drive shaft passing through the journal 18 may similarly be surrounded by a roller bearing 38. Suitable liners 39 for these parts may likewise be provided.

As shown in Fig. 1, the top face of the upper journal 18 may have secured thereto the attachment flange 40 of a tubular housing 41 and the upper end of said housing 41 may have associated therewith a shelf 42 adapted to have a motor 43 positioned thereon for driving the shaft 34, which passes through the tubular housing 41.

As shown in Figs. 4 and 6, the semi-elliptical outline of the pump casing results, in accordance with the present invention, in enlarged spaces 44 and 45 adjacent the inlet and outlet 14 and 15. The enlarged spaces, thus provided between the impeller and the casing wall, gradually taper inwardly of the casing to achieve what may be described as a "squeezing" action on the propelled fluid, but at no point does the impeller approach the casing wall closely enough to render possible an injury to any of the parts by passage of foreign particles through the pump. The result of the double taper thus described is, first, to admit a large volume of fluid into the casing, then to compress and accelerate passage of the fluid through the more restricted portions of the casing, and finally, to cause a swift, unimpeded and uniform expulsion of the fluid through the enlarged outlet space 45 and the more restricted outlet proper seen at 15.

The extensions 30 and 31 and the associated portions of the intermediate member 23 of the impeller and likewise the shelf-like interengaged portions of the spring coils, indicated at 32 (Fig. 5), all cooperate in increasing the impelling action and eliminate the possibility of any mere churning or turbulence of the fluid in the casing. The internal shoulder 16 (Figs. 3 and 4) of the lower casing member 10 is so formed as to somewhat closely approach the outside lower edge of the said impeller member 10 so that a return flow of fluid between the inlet and outlet ports 14 and 15 is substantially precluded.

Modifications may be resorted to in the construction of this invention without departing from its scope. For example, the spring members of the impeller need not be necessarily helical, that is, rounded, but may be of another shape, and the cross-section of the wire forming the springs may likewise be modified, if desired. For example, the cross-sectional shape might be square rather than round, as shown. These and other modifications that may suggest themselves are, however, believed to be included within the present invention.

What is claimed is:

1. A centrifugal pump comprising a casing provided with an inlet and an outlet port, an impeller in the casing and comprising a body member, a helical spring positioned on the body member and forming impelling means thereon, and means for driving the impeller.

2. A centrifugal pump comprising a casing provided with an inlet and an outlet port, an impeller in the casing and comprising a body member, a helical spring positioned about the body member and forming peripheral impelling portions thereon, and means for rotating the impeller.

3. A centrifugal pump comprising a casing provided with an inlet and an outlet port, an impeller in the casing and comprising a body member, a helical spring positioned about the body member and forming peripheral impelling portions thereon, a laterally-extending portion on the impeller body and cooperating with said spring to increase the impelling action, and means for rotating the impeller.

4. A centrifugal pump comprising a casing provided with an inlet and an outlet port, an impeller in the casing and comprising a body member, a helical spring positioned about the body member and forming peripheral impelling

portions thereon, laterally-extending portions on the impeller body to increase the impelling action and further serving to give balance and impetus to the impeller during rotation, and means for rotating the impeller.

5. A centrifugal pump comprising a casing provided with an inlet and an outlet port, an impeller in the casing and comprising a body member, a pair of helical spring units positioned one above the other about the body member and forming impelling means thereon, and means for driving the impeller.

6. A centrifugal pump comprising a casing provided with an inlet and an outlet port, an impeller in the casing and comprising a body member, a pair of helical spring units positioned one above the other about the body member and forming impelling means thereon, said spring units having adjacent portions of their helices interengaged and providing a relatively solid section to increase impelling action, and means for driving the impeller.

7. A centrifugal pump comprising a casing provided with an inlet and an outlet port, an impeller in the casing and comprising a body member, a pair of helical spring units positioned one above the other about the body member and forming impelling means thereon, a laterally-extending portion on the impeller body to increase the impelling action, and means for driving the impeller.

8. A centrifugal pump comprising a casing provided with an inlet and an outlet port, an impeller in the casing and comprising a body member, a pair of helical spring units positioned one above the other about the body member and forming impelling means thereon, laterally-extending portions on the impeller body to increase the impelling action and further serving to give balance and impetus to the impeller during rotation, and means for driving the impeller.

ELI M. GREENLEE.
JOSEPH S. KNITTEL.