Aug. 20, 1940. R. O. COUCH 2,212,113

REVERSIBLE PUMP FOR FLUMES AND THE LIKE

Filed June 21, 1938

FIG.1.

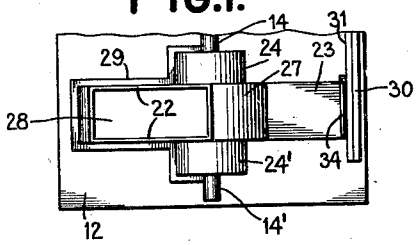


FIG.2.

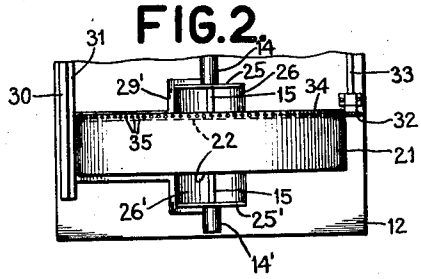


FIG.3.

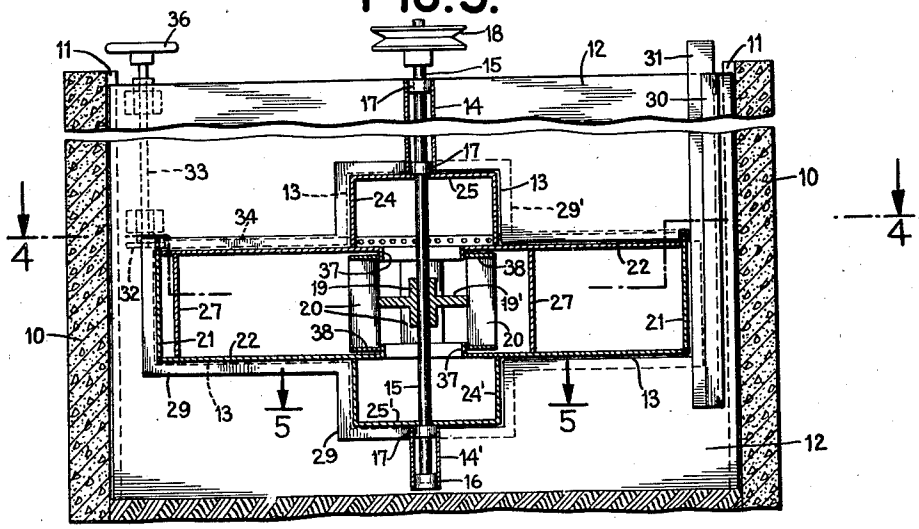


FIG.4.

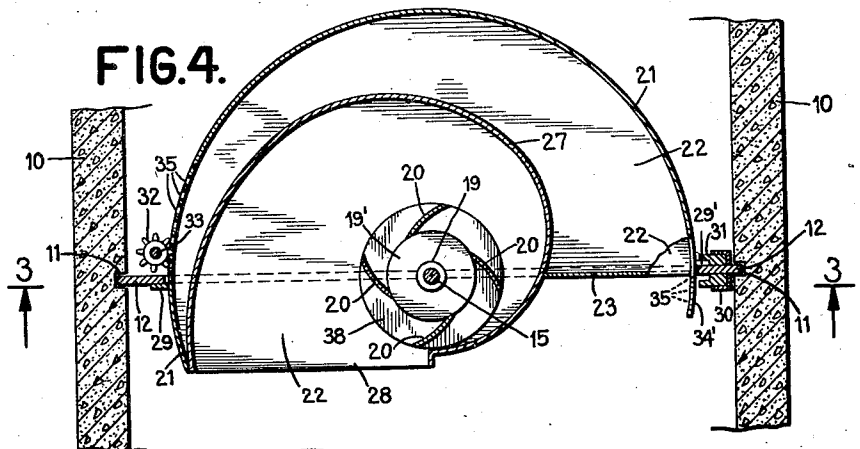
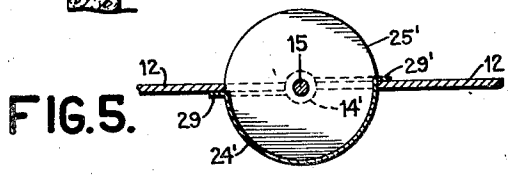


FIG.5.



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REVERSIBLE PUMP FOR FLUMES AND THE LIKE

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Application June 21, 1938, Serial No. 214,877

3 Claims. (Cl. 103—104)

My invention relates to pumps the primary use of which is to control the relative levels of two separated bodies of water, or, in general, to maintain a higher water level on one side of the pump and associated dam than on the other side. My invention is particularly applicable to irrigation or drainage channels or ditches, canals, flumes, sluice-ways, etc.

The main object of my invention is to provide a pump which is simple, inexpensive, and easily installed, and which, nevertheless, can be used to pump water or any other fluid in either direction without reversing the direction of rotation of the pump elements and without removing and resetting the pump.

My improved reversible pump is particularly adapted for use in connection with a portable dam which can easily be placed in the channel at the desired location. It is especially suited for such use where it may be desirable, at times, to reverse the flow of the water. My invention makes it possible to do this without removing either the dam or pump from the channel and the reversal of flow may be accomplished with minimum difficulty and in the minimum time.

Various features and advantages of my invention will appear from the following description of a preferred form of my reversible pump.

In the drawing—

Figure 1 is a side elevation of my reversible pump mounted on a panel, acting as a dam, the view being taken from the discharge side of the panel;

Fig. 2 is a similar side elevation except that the view is taken from the intake side of the panel;

Fig. 3 is a transverse vertical section of my reversible pump taken on the line 3—3 of Fig. 4, looking in the direction of the arrows;

Fig. 4 is a horizontal section taken on the line 4—4 of Fig. 3, looking in the direction of the arrows; and

Fig. 5 is a fragmentary horizontal section taken on the line 5—5 of Fig. 3, looking in the direction of the arrows.

Referring to the drawing, the side walls of the irrigation channel, ditch, or canal, or of the sluice-way or flume, are shown at 10. (For the sake of simplicity, I will hereinafter use the term "channel" as a generic term, meaning to include therein any type of ditch, canal, flume, sluice-way, runway, or other place where fluid may rest or flow.) At the place in the channel where the dam and associated pump are to be located, the side walls thereof are provided with slots 11 to receive the vertical edges of the panel 12, which may be made of steel or any other suitable material. The panel, together with the associated pump elements and casing, when placed in position in the channel, constitutes a removable dam, thereby separating the channel into two parts. It is assumed that it is desired to raise the water or other fluid in the channel on one side of the dam to a higher level than it is on the other side, or to cause it to flow past the dam either in one direction or in the other.

The panel 12 is provided with an aperture 13 adapted to receive the pump elements and the casing therefor. Welded or otherwise affixed to the panel in vertical position at the center thereof are tubes, 14, 14', adapted to receive the shaft 15 of the rotor element of the pump. As indicated at 16, there is provided, at the bottom of the tube 14', a thrust bearing for the shaft. Additional bearings, such as those indicated at 17, may be provided or cylindrical bearings, made of rubber, metal, or other suitable material, may be provided within the tubes 14, 14' for the shaft 15 at suitable places or throughout the lengths of the tubes.

The shaft 15 may be rotated in any desired manner from a suitable source of power. For example, the shaft may be driven from an electric motor (not shown) through a V belt carried by the pulley 18 suitably mounted on the shaft. It will, of course, be understood that the electric motor may be mounted directly on the top of the shaft for direct drive, that a flat belt may be employed, or that the top of the shaft may be provided with a bevel or other gear designed to mesh with a second gear suitably connected to any desired source of power. It will also be understood that a thrust bearing (not shown) will also ordinarily be provided at the top of the shaft, the bearing being supported from the panel, 12, or in other suitable manner.

Rigidly mounted on the shaft 15, as by keying or otherwise, is the pump or impeller element, preferably composed of a sleeve 19 and web 19', the latter carrying, at its periphery, suitable blades or vanes 20 which, when rotated, act as a centrifugal pump.

All of the pump elements thus far described are preferably mounted rigidly, although rotatably, on the panel 12.

In order to determine the direction of flow of the water or other fluid past the dam, a casing is provided for the pump which, as will be hereinafter explained, can be rotated through approximately 180°, without moving either the

panel of the pump elements, to reverse the direction of flow. This casing comprises a plate 21, generally cylindrical in form but extending throughout more than 180°. Plates 22 are also provided to close the bottom and top of the space defined by the plate 21. Each of the plates 22 has a circular opening, concentric with the shaft 15, thereby providing suction entrances for the pump. The edges of these openings are provided with flanges 37 which project into the runner of the rotary pump and bear against the inner edges of the rings 38 that carry the blades or vanes 20, thereby forming a seal and also providing a bearing upon which the pump casing can be rotated. A plate 23 is also preferably provided so as to exclude water from the space within the semi-cylindrical portion of the casing.

The intake ports for the pump are provided by semi-cylindrical surfaces 24, 24', the upper one of which, 24, is closed at the top by a plate 25 and the lower one of which, 24', is closed at the bottom by a plate 25', the plates 25, 25' preferably being circular. The members 24, 24', are located on the opposite side of the panel 12 from the main body of the casing member 21. In this manner two intake ports are provided for the pump, as indicated at 26, 26' in Fig. 2, the two ports or suction entrances on opposite sides of the impeller operating to balance the thrust.

The discharge orifice for the pump is provided by a spiral plate 27, most clearly indicated in Fig. 4. The discharge passage is closed at top and bottom by the plates 22, described above. The discharge orifice, indicated at 28 in Fig. 1, is arranged to open into the channel on the opposite side of the panel 12 from the intake ports 26, 26'.

The above described casing, including the external member 21, the semi-cylindrical intake port members 24, 24', the spiral discharge member 27, and the associated closure plates 22, 23, 25, 25', is so constructed as to constitute a unitary structure which may be rotated, as a whole, about an axis coincident with that of the pump shaft 15.

To limit the motion of the casing and also to provide a water seal, the casing is provided with flanges 29, 29'. In the event that the panel 12 is thick enough to warrant it, the edges of the aperture 13 therein may be recessed or tapered to permit the flanges 29, 29' to lie snugly against the panel in the two extreme positions of the casing. Means are also preferably provided for locking the casing in desired position. A simple method of accomplishing this is to affix to the panel 12, at one side thereof, vertical channel members 30. Slidably mounted within the members 30 are similar channel members 31 which can be raised to release the flange 29 or 29' on the casing and which, when the desired flange is in position, can be lowered to lock the flange and, therefore, the casing in desired position. Preferably, means (not shown) are provided to limit the upward motion of the channel members 31 so that they cannot be fully withdrawn from the members 30.

Any suitable means may be provided to rotate the casing and thereby to reverse the direction of flow of the fluid past the dam. Simple means to accomplish this rotation may consist of a pinion 32 provided with pin teeth, the pinion being mounted on a shaft 33 suitably affixed to the panel 12. In the particular arrangement shown, the outer casing member 21 carries an upstanding flange 34 which is provided with a series of holes 35 adapted to engage the pin teeth on the pinion 32. The shaft 33 and pinion 32 may then be rotated, as by the hand wheel 36, this in turn rotating the casing of the pump. To make it possible to rotate the casing throughout approximately 180°, the flange 34 should be extended, as indicated at 34' in Fig. 4, so that the series of holes 35 will extend throughout an arc of at least 180°.

In view of the fact that the only openings which exist in the dam, when the pump and casing are mounted thereon and the casing is in either one of the two extreme positions, are the intake ports 26, 26' and the discharge orifice 28, and in view of the further fact that the intake ports communicate with that portion of the channel which is on one side of the dam and the discharge orifice communicates with that portion of the channel which is on the opposite side of the dam, it will be evident that the direction of flow of the water, when the pump is in operation, can be reversed merely by turning the hand wheel 36, thereby rotating the pump casing. Thus, with the arrangement of my invention, the direction of flow can be reversed with a minimum of difficulty and without removing from the channel the panel on which the pump is mounted and without disconnecting from the pump or halting the operation of the source of power that drives the pump elements.

In the event that gravity flow is desired rather than forced flow, this can be accomplished either by permitting the pump rotor to remain stationary or, preferably, by turning the casing through approximately 90°, in which case nearly one-half of the aperture 13 in the panel 12 will be open to gravity flow of the water.

If desired, the discharge orifice 28 may be provided with a suitable rectangular flap gate (not shown), fitted with a rubber gasket, so that when the pump is stopped, the gate will swing closed and prevent back-flow through the pump.

It will at once be evident to those skilled in the art that many modifications may be made in the construction and arrangement of various parts of my reversible pump. For example, without attempting to suggest all variations or modifications, it will be evident that a portion of the panel 12 may be so arranged as to rotate with the pump casing; also, that the arrangement described is applicable to types of pump other than a centrifugal pump—such, for example, as a vertical axial flow pump. I therefore do not wish to be limited to the particular arrangement or details shown and described herein, but wish to cover all variations or modifications that may come within the scope of the appended claims.

Having described the preferred form of my invention, I claim:

1. A combined dam and reversible pump comprising in combination an apertured panel, bearings carried by said panel, a shaft mounted in said bearings, means for rotating the shaft, fluid-impelling blades carried by the shaft and located within the aperture in the panel, an independently rotatable casing substantially co-extensive with the aperture in the panel, the said casing being provided with intake ports permitting the flow of fluid from one side of the panel to said blades and being also provided with a discharge orifice permitting the flow of fluid from said blades to the opposite side of said panel, means carried by the panel and engaging the casing whereby the latter may be rotated through approximately 180° about an axis lying substantially in the plane of the panel, means for limiting the

rotation of the casing, and means for locking the casing in either extreme position.

2. A reversible pump comprising in combination a panel adapted to act as a dam, an aperture in the panel, a vertical-axis, horizontal-flow, rotary pump comprising a runner located in said aperture and having its axis substantially in the plane of the panel, a casing for said pump, the casing being substantially co-extensive with the aperture in the panel and being provided with suction entrances for said pump communicating with one side of said panel and also being provided with a discharge orifice for said pump communicating with the opposite side of said panel, said suction entrances being located respectively above and below said runner, means for rotating said casing to reverse the direction of flow of fluid moved by said pump, and means for locking said casing at desired positions.

3. The combination comprising a panel constituting a dam and having an aperture therein; a rotary pump associated therewith, the axis of rotation thereof lying in the plane of the panel and being stationary with respect to said panel; a casing enclosing said pump and substantially co-extensive with the aperture in the panel, said casing being substantially semi-cylindrical and having a diameter substantially the same as the extreme width of the said aperture in the panel and being rotatable about the same axis as the pump; said casing being provided with intake and discharge passages therein for the pump, and being movable with respect to said pump and cooperating with the aperture in the panel to provide, in the extreme positions of the casing, an intake port for said pump communicating with one side of said panel and a discharge orifice for said pump communicating with the opposite side of said panel and said casing, in intermediate positions, providing a by-pass around said pump permitting the flow of fluid from either side of the panel to the other through a portion of the aperture therein; and means for rotating said casing.

ROYDEN O. COUCH.