July 30, 1940. H. A. E. JOHNSEN 2,209,652

IRRIGATION PUMP

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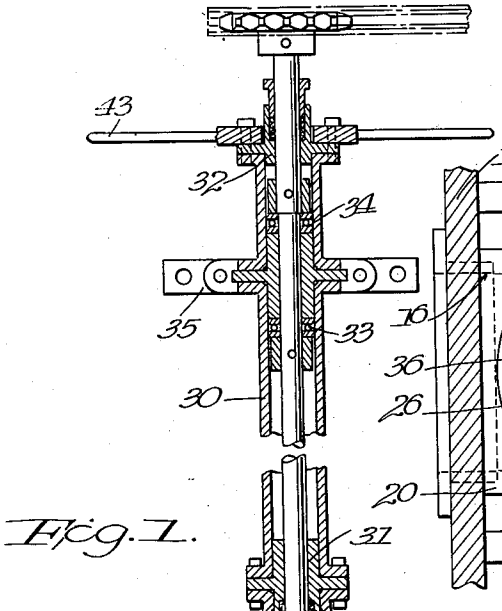


Fig. 1.

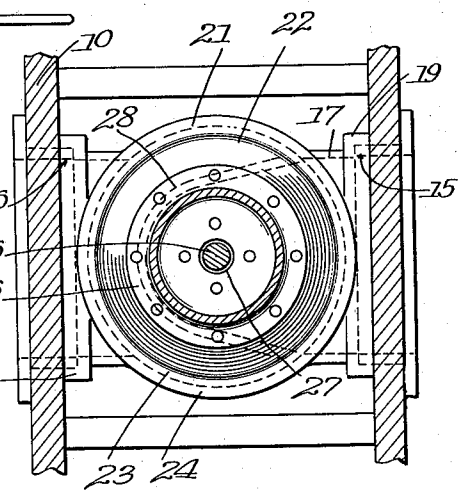
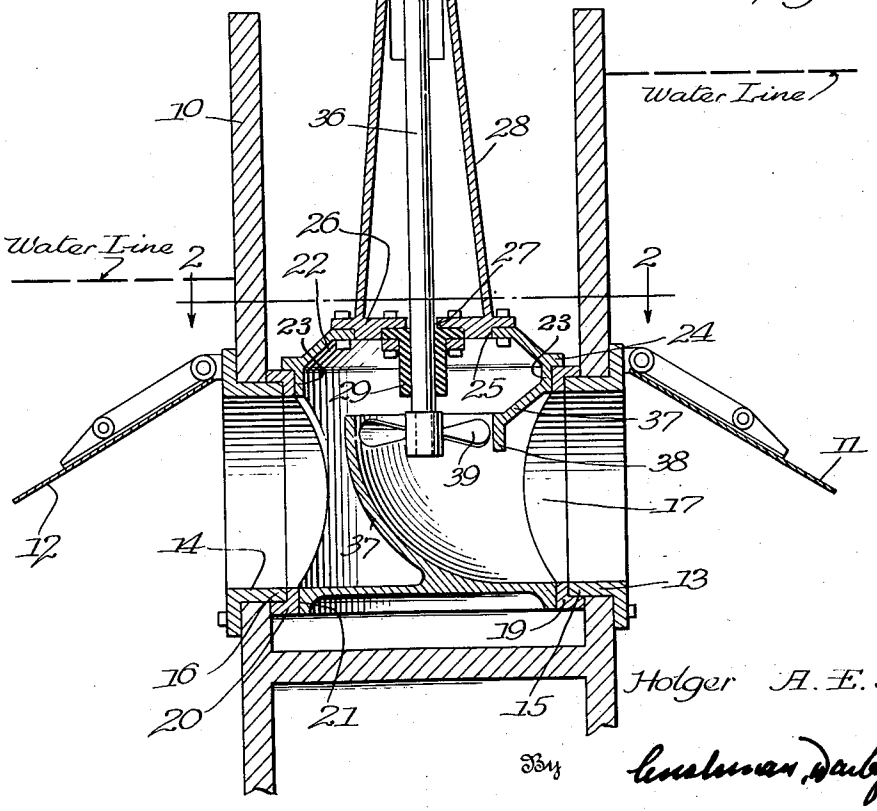


Fig. 2.



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IRRIGATION PUMP

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6 Claims. (Cl. 103—89)

This invention relates to a pumping mechanism and more particularly to an irrigation and drainage pump.

It is an object of this invention to provide a pumping structure that may be readily adapted to the varying conditions encountered in the use of such mechanisms.

Another object of this invention is to provide a pumping device that is readily reversible and to provide a driving means that may be quickly adjusted to any desired angle with the horizontal to make the driving shaft available to a convenient source of power.

In the drawing:

Figure 1 is a sectional side elevation through the pump mechanism, showing the pump and drive shaft assembly,

Figure 2 is a plan view taken on line 2—2 of Figure 1.

In the present embodiment of the irrigation and drainage pump of this invention, a sump is located between the field being irrigated and a canal or other supply of water usually located at a lower level than the field. A box 10 of steel, concrete or other suitable material is fixedly positioned within the sump such that its lower end is always below the water level of the canal.

Flap valves 11 and 12 are provided on opposite sides of the box 10 below the water level and these flap valves are hingedly mounted to open outwardly, on the flanges of cylindrical collars 13 and 14 respectively. The collars are rigidly mounted in the walls of box 10 and extend into the box to provide the cylindrical bosses 15 and 16.

A housing 17 is mounted between the bosses 15 and 16 by means of the cylindrical bearings 19 and 20 which cooperate with bosses 15 and 16 respectively to provide a flow passage between the collars 13 and 14. This construction permits the housing to be turned about its longitudinal axis i. e. the axis of the flow passage to any desired position for a purpose to be hereinafter described. The housing is provided with a seat 21 which extends through the housing preferably at right angles to the longitudinal axis of the flow passage. In some uses to which the pump may be put it may be desirable to provide a plurality of flow passages through the housing but for the purposes of the present embodiment only one such passage has been shown.

The pumping mechanism includes a casing 22 which is provided with a cylindrical portion 23 that slidably fits into the seat 21. The cylindrical portion 23 has a longitudinal flow passage therethrough that is adapted to communicate with the longitudinal flow passage of the housing. A flange 24 may be provided at the upper end of the cylindrical portion to form a bearing for the casing and the top side of the casing is open as at 25, the opening being closed by a cover 26 suitably mounted on the casing. The cover has a central aperture 27 and an upstanding drive shaft housing support 28 which may be and preferably is formed integral therewith. The aperture 27 through the cover is sealed by a rubber bearing 29 as will appear below.

A drive shaft housing 30 is rigidly supported on the upper end of the upstanding drive shaft housing support 28. The drive shaft housing encloses shaft bearings 31 and 32 and thrust bearings 33 and 34. The housing is also rotatably supported by any suitable means such as a fixed bearing 35 mounted on a permanent support. A drive shaft 36 extends lengthwise through the bearings and drive shaft housing and the ends of the housing are closed around the shaft by the usual packing glands so that the housing will form a reservoir for a lubricant to insure a supply of oil to the bearings at all times. The lower end of the drive shaft passes through aperture 27 in cover 26 and extends into casing 22 and is supported at the cover by the rubber bearing 29. The bearing 29 engaging the shaft forms an effective seal for opening 27. The upper end of the drive shaft is adapted to be driven by any convenient source of power.

The casing 22 is provided with a partition 37 extending substantially crosswise of the longitudinal flow passage of the casing. The partition 37 supports an open ringlike member 38 which is disposed concentric with the axis of the drive shaft 36. A propeller 39 or other suitable flow producing means is mounted on the lower end of drive shaft 36 and is adapted to be driven within the plane of the ringlike member 38 to force the water downwardly and out the flap valve. (In the view shown in Figure 1, out flap valve 11.)

The operation of this pumping mechanism is as follows:

When the box 10, collars 13 and 14 and housing 17 have been properly installed in the sump, the drive shaft and pump assembly is mounted in operative position. The pump is mounted in such relation to the housing by merely slipping the cylindrical end of the pump casing into the seat 21 in the housing 17. After the pump casing has been slipped into the seat 21, the pump casing and drive shaft housing 39 may be rocked

about the longitudinal axis of the housing 17 on bearings 19 and 20, to any desired position where the bearing 35 is fixed to a permanent support. This adjustability of the drive shaft assembly permits the end of the drive shaft to be conveniently positioned adjacent a suitable source of power.

When the pump has been thus installed and the power means connected to the drive shaft, the pump is ready to operate. In Figure 1 it may be assumed that the mechanism is shown as pumping water from a canal into the irrigation ditches of the field.

In this instance before starting the pump it will be necessary to manually open flap valve 12 by any suitable means. When this has been done the pump may be started and water will be forced out flap valve 11 which is opened by the pressure of the water behind it, to the higher water level of the irrigation ditch.

Sometimes, however, after several days of steady rain the field may become flooded in which case it is desirable to remove the excess water from the field before the crops are destroyed. In such an event it is desirable to pump the water off of the field and this may be accomplished with the present structure by a reversal of the pumping means. In order to reverse the pump herein shown it is necessary to turn the casing 22 through 180° in seat 21, so that the pump will force water out through flap valve 12. The casing 22 is turned by any suitable means such as handles 43 which cooperate with the drive shaft housing 30. The drive shaft housing is rotatably mounted in bearing 35 and is rigidly connected to casing 22 through support 28. Upon reversal of the pump it will be necessary to manually open flap valve 11 while flap valve 12 will be opened by the flow pressure. The only operation necessary to accomplish the reversal of flow is the turning of the pump casing and the opening of the flap valve. It will be noted that in no matter which direction the water is driven, the propeller and motor continue to drive in the same direction.

In the present construction the propeller forces the water downwardly and there will be an upward reaction against the propeller. This upward reaction will tend to lift the drive shaft off the thrust bearings thus minimizing wear. It is contemplated that the weight of the drive shaft, the power applied, and the pitch of the propeller may be so proportioned that substantially no load will be carried by the thrust bearings.

The bearing structure herein disclosed is particularly adapted to irrigation and drainage pumps. The rubber bearing 29 located on the drive shaft at the aperture 27 in cover 26 is lubricated by the water in which the casing 22 is always submerged. This rubber bearing is not injuriously affected by the gritty particles suspended in the water being pumped. The shaft bearings 31 and 32 and thrust bearings 33 and 34 are enclosed in a bath of lubricant maintained in the drive shaft housing 30. These shaft and thrust bearings are removed from contact with the gritty water by being elevated on the support 28 above the water level. This provides a structure wherein the drive shaft is supported at its upper end by bearings lubricated by a bath of oil and at its lower end by a rubber, wear resilient, water lubricated bearing.

Another feature of this construction is that the rubber bearing 29 tends to seal the aperture 27 against undue leakage. While it is not essential that the parts fit in absolute water tight relation because of the large volumes handled, it is desirable that the mechanism be reasonably water tight. The bearing 29, being on the low pressure side of the pump, will not be required to seal the aperture 27 against a very high pressure, either while the pump is operating or not, and therefore it is effective to seal aperture 27 with a reasonably water tight fit.

If for any reason the pump should fail, the flap valve on the output side being freely hinged to the box 10, it will immediately close when the water attempts to flow back. Another and positive means for cutting off flow through the sump is provided by the present construction. The casing 22 is freely rotatable in seat 21 and if the casing is disposed so that its flow passage is crosswise of the longitudinal passage of the housing 17, the walls of the pump casing will seal the flow passage of the housing. This action is exactly similar to a plug valve construction, i. e. the pump casing 22 forms the plug element and housing 17 the body of the valve.

In this disclosure of the invention, for the purposes of illustration, the pump has been described as an irrigation and drainage pump. However the invention may have many other uses where a quick reversible pump is needed, e. g. in the paper industry for pumping pulp, etc., sewage, dyeing, brine circulation, etc. All such uses as will occur to those skilled in the art are comprehended within the scope of the following claims.

I claim:

1. In an irrigation pump the combination of a box-like support member; cylindrical collars disposed in opposite walls of said support, said collars having bosses extending past the inside plane of said walls; a housing rotatably mounted between said bosses, said housing having a longitudinal passage therethrough and a seat therein across said longitudinal passage; a pump casing having an inlet and an outlet adapted to cooperate with said passage, said casing being rotatably disposed in said seat and enclosing a driven flow-producing means, said casing having an open side, said open side being closed by an apertured cover having an upstanding support rigid therewith; a drive shaft housing rigidly fixed to said support; a drive shaft extending through said drive shaft housing and into said casing; rotation of said casing in said seat being effective to cause a reversal of the flow direction and a partial rotation of said casing within said seat being effective to cut off flow through said housing; and the rocking of said housing on said bosses being effective to adjust said drive shaft.

2. In an irrigation pump the combination of a box-like support member; cylindrical collars disposed in opposite walls of said support, flap valves hingedly mounted on said collars, and said collars having bosses extending past the inside plane of said walls; a housing rotatably mounted between said bosses, said housing having a longitudinal passage therethrough and a seat therein across said longitudinal passage; a pump casing having an inlet and an outlet adapted to cooperate with said passage, said casing being rotatably disposed in said seat, said casing enclosing a driven flow producing means; a drive shaft for said flow producing means extending outwardly from said casing; the rocking of said housing on said bosses being effective to adjust said drive shaft; and rotation of said casing in said seat

being effective to reverse the direction of flow of the pump.

3. In an irrigation pump, a pump housing, said housing being of cylindrical form and having a plurality of openings therein to permit flow therethrough, cylindrical bearings formed around diametrically opposed openings, supporting means for said housing comprising a pair of ported collars adapted to form bearing supports for said housing when brought into contact with said cylindrical bearings and said collars forming flow orifices communicating with said diametrically opposed openings, said collars being adapted to be rigidly secured to a supporting structure with said housing between them and to then remain stationary during any turning movement of said housing with respect thereto, pump means in said housing, a drive shaft for said pump means extending substantially perpendicularly to the axis of said collars and supported from said housing, said drive shaft and housing being adapted to be turned upon said collars and to be permanently connected to a source of power.

4. A reversible irrigation pump including a fixed housing having a longitudinal flow passage therethrough, a seat formed in said housing and being disposed across said flow passage, a pump casing rotatably mounted in said seat and being positioned substantially wholly within said housing, said casing having inlet and outlet ports communicating with said passage, said ports being moved from one position of communication with said passage to another position of communication upon rotation of said casing, said change of position being effective to cause a reversal of fluid flow in said passage, a driven flow producing means in said casing between said ports, an upwardly extending drive shaft for said flow producing means, supporting means for said shaft on said casing which closely surrounds said shaft, and said supporting means including means by which rotation of said casing within said housing may be effected.

5. A reversible irrigation pump including a fixed housing having a longitudinal flow passage therethrough, a seat formed in said housing and being disposed across said flow passage, a pump casing rotatably mounted in said seat and being positioned substantially wholly within said housing, said casing having inlet and outlet ports communicating with said passage, said ports being moved from one position of communication with said passage to another position of communication upon rotation of said casing, said change of position being effective to cause a reversal of fluid flow in said passage, a driven flow producing means in said casing between said ports, a partition in said casing having an aperture therein, said flow producing means being mounted to operate within the aperture, an upwardly extending drive shaft for said flow producing means, support-means for said shaft on said casing which closely surrounds said shaft, and said supporting means including means by which rotation of said casing within said housing may be effected.

6. A reversible irrigation pump including a fixed housing having a longitudinal flow passage therethrough, a seat formed in said housing and being disposed across said flow passage, a pump casing rotatably mounted in said seat and being positioned substantially wholly within said housing, said casing having inlet and outlet ports communicating with said passage, said ports being moved from one position of communication with said passage to another position of communication upon rotation of said casing, said change of position being effective to cause a reversal of fluid flow in said passage, a driven flow producing means in said casing between said ports, an apertured partition in said casing, the aperture being in a plane parallel with the longitudinal axis of the flow passage, said flow producing means being mounted to operate within the aperture, said partition being shaped to direct the fluid flow toward said outlet port, and upwardly extending drive shaft for said flow producing means, supporting means for said shaft on said casing which closely surrounds said shaft, and said supporting means including means by which rotation of said casing within said housing may be effected.

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