

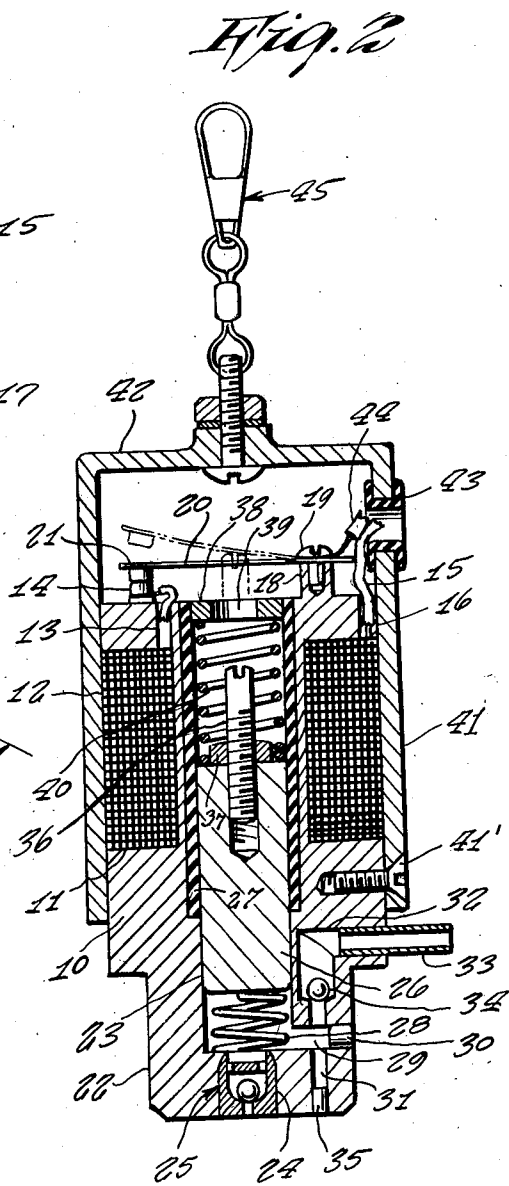
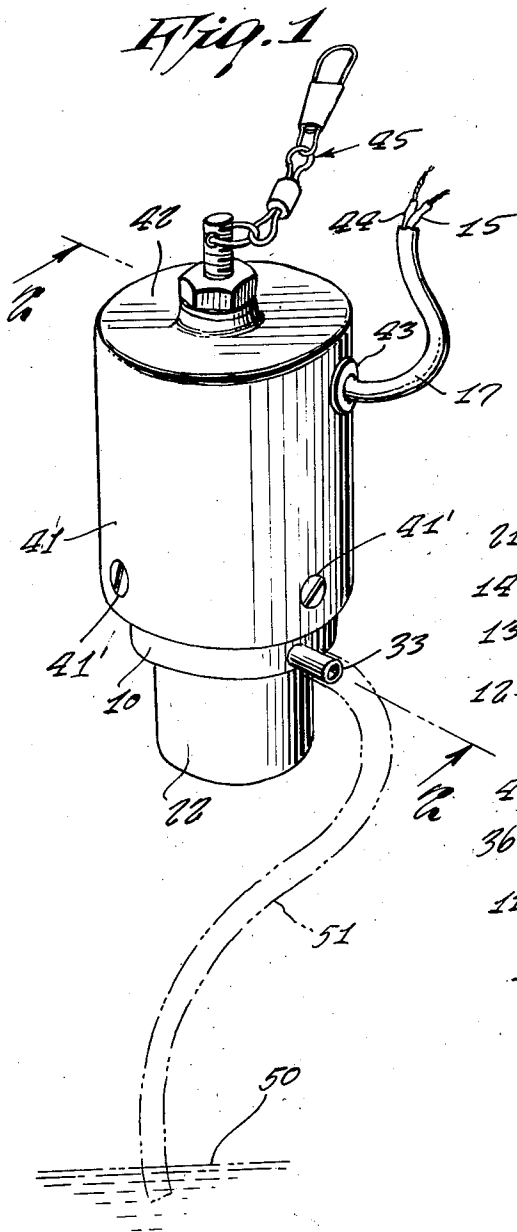
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SOLENOID PUMP.

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SOLENOID PUMP

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4 Claims. (Cl. 103—38)

This invention relates to pumps.

It is an object of the present invention to provide an electric pump operating on the solenoid principle and which is designed primarily as an air pump, although with a small attachment will pump a considerable amount of water.

It is another object of the present invention to provide a solenoid pump of the above type which is particularly adapted for use in the sporting goods field, being sufficiently small and operable from a car battery or a battery in a boat and which may be hung on the side of a minnow bucket or bait tank to pump air into the water through a small hose, thereby keeping alive and frisky the bait which often dies while en route to the lake or other body of water.

Other objects of the invention are to provide a solenoid pump bearing the above objects in mind which is of simple construction, has a minimum number of parts, is inexpensive to manufacture and efficient in operation.

For other objects and for a better understanding of the invention, reference may be had to the following detailed description taken in connection with the accompanying drawing, in which:

Figure 1 is a perspective view of a preferred embodiment of the present invention; and

Fig. 2 is a vertical sectional view thereof taken along the line 2—2 of Fig. 1.

Referring now more in detail to the drawing, 10 represents a cylindrical soft iron core having an annular recess 11 within which is wound the wire coil 12, substantially as illustrated.

One end of the wire 12 extends outwardly through the opening 13 provided in the upper end of the core and is connected to a terminal post 14 which also serves as a contact. The other end of the wire extends upwardly as at 15 through the opening 16 where it forms a part of the electrical cord 17 adapted to be connected to a suitable source of voltage, not shown. The upper end of the core 10 on the side opposite from the terminal 14 is provided with the post 18 and to which is screw threaded the screw 19, the latter serving to mount the resilient conductor strip 20 fixedly carrying at the free end thereof the contact 21 which is normally in contact with the terminal 14 whereby to create a magnetic flux when the electrical cord 17 is connected to a source of voltage.

The lower end of the core 10 is integrally formed with the reduced cylindrical extension 22 and is provided with a downwardly extending longitudinal bore 23 which continues downwardly through the bottom of the extension 22 in a reduced bore 24.

A ball check valve assembly indicated generally at 25 is positioned within the bore 24 and is adapted to permit the entrance of air when vacuum exists thereabove in the bore 23.

A soft iron piston 26 is slidably positioned within the bore 23, this sliding movement being facilitated by the bushing 27 embedded in the core surrounding the bore 23. A coil spring 28 is positioned intermediate the lower end

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of the piston 26 and the lower end of the bore 23. The extension 22 at the lower end of the bore 23 is provided with the laterally extending reduced bore 29, the outer end of which is closed by the closure plug 30. The extension 22 is also provided with the reduced bore 31, which extends upwardly from the lower end thereof and intersects the bore 30 and continues above the same where it connects with the enlarged bell shaped bore 32 which opens onto the side of the core 10 and within which is positioned the outlet tube 33. A ball check valve 34 rests on the shoulder intermediate the bore 31 and bore 32. A lower end of the bore 31 is closed by the closure plug 35.

An adjustable externally threaded stud 36 is screw threaded in the upper end of the piston 26 being locked at any adjustment by means of the lock nut 37. The upper end of the stud 36 is slotted to facilitate the adjustment of the same. A closure 38 is positioned within the upper end of the bore 23 and has a reduced central opening 39 which permits the movement upwardly there-through of the stud 36 while retaining the lock nut 37 and piston. A coil spring 40 surrounds the stud 36, the lower end thereof resting on the upper end of the piston 26 and the upper end thereof abutting the undersurface of the closure 38.

A hollow cylindrical casing 41 fits downwardly onto the core 10 being secured thereat by means of the screw 41' the casing 41 being open at the bottom and having a top wall 42 vertically spaced above the conductor strip 20. A grommet 43 is provided at one side of the casing above the strip 20 and receives outwardly therethrough the electrical cord 17 which is made up of the conductor 15 and the conductor 44 which is connected to the strip 20.

A swivel assembly indicated generally at 45 is connected to the top of the top wall 42 and supports the unit in a vertical position necessary for proper operation.

In operation, when the electrical cord 17 is connected to a suitable source of voltage, the magnetic flux created by the coil 12 will draw the piston 26 upwardly and to open the normally closed switch 20 for the intake stroke, the stud 36 raising the strip 20 to break contact against the action of the spring 40 for an interval sufficient to allow the electromagnetic field to break down and the spring 40 to force the piston 26 to the lower end of the bore 23 for the exhaust stroke. The ball check valve assembly 25 opens on the intake stroke, and the ball check valve 34 opens on the exhaust stroke. The vacuum draws the air upwardly through the ball check valve assembly 25 and on the exhaust stroke the air is forced outwardly through the tube 33. The output may be controlled by adjusting the stud 36 since if the amount of screw protruding from the piston is lengthened, it comes in contact with the strip 20 sooner, breaks the contact sooner and shortens the stroke. Threading the screw into the piston achieves the opposite results.

The pump is designed primarily as an air pump although with a small attachment it will pump a considerable amount of water. The device will operate on a 12 volt, D. C. current, and its greatest potentiality lies in the sporting goods field. The pump is small, and its great simplicity lends itself easily to mass production methods. It runs very well from either a car battery (it will be an ideal unit to plug into a cigarette lighter in the car) or from a boat battery, and when hung on the side of a minnow bucket or bait tank will pump air into the water 50 through the hose 51, thereby keeping alive and frisky the bait which often dies while en route to the lake.

While various changes may be made in the detail construction, it shall be understood that such changes shall be within the spirit and scope of the present invention as defined by the appended claims.

What I claim as new and desire to protect by Letters Patent of the United States is:

1. A solenoid pump comprising a soft iron core, said core having an annular recess, a wire coil positioned within said recess, said core having a longitudinally extending bore extending downwardly from the upper end thereof, ball check valve means at the lower end of said core communicating with the lower end of said bore, a soft iron piston slidably mounted within said bore, an outlet in said core, second ball check valve means connecting the lower end of said bore with said outlet, a first spring positioned intermediate the lower end of said piston and ball check valve means, striker means extending upwardly from the top of said piston, a closure at the upper end of said bore having a reduced central opening adapted to permit the passage therethrough of said striker means, a second spring within said bore intermediate said closure and said piston and surrounding said striker means, a terminal at the upper end of said core at one side of said bore, a post at the other side of said bore on the upper end of said core, a resilient conductor strip connected to said post at one end and contacting said terminal at the other to form a normally closed switch, one end of said wire coil being connected to said terminal, the other end of said wire coil and a second wire connected to said conductor strip being connected to a suitable source of voltage whereby to create a magnetic flux to draw said piston upwardly and to open the circuit when said striker means contacts said conductor strip with said second spring returning said piston to its original lower position when the flux is broken and to again close the circuit for the next cycle, said striker means comprising an externally threaded stud screw threaded into the upper end of said piston, a lock nut for locking said stud within said piston at any desired adjustment, whereby to vary the output of

the pump, said spring resting on the upper end of said piston at its lower end and contacting said closure at its upper end.

2. A solenoid pump according to claim 1, said second check valve means comprising a laterally extending bore at the lower end of said longitudinal bore, said core having an L-shaped bore extending inwardly from said outlet and downwardly towards said transverse bore, said core having a reduced bore connecting said L-shaped bore with said transverse bore, the outer ends of said transverse bore and the lower end of said reduced bore being closed and a ball positioned on the shoulder intermediate said reduced bore and said L-shaped bore.

3. A solenoid pump according to claim 2, including a hollow cylindrical casing adapted to fit downwardly onto said core to enclose said coil, said casing being open at the bottom and having a top wall freely spaced from said resilient conductor strip, fastening means securing said casing to said core, said casing having an opening receiving said electrical cord outwardly therethrough.

4. A solenoid pump according to claim 3, including a swivel assembly means connected to said top wall whereby to support the unit in the vertical position necessary for proper operation.

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