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H. WALLACE
ELECTROMAGNETIC MOTOR

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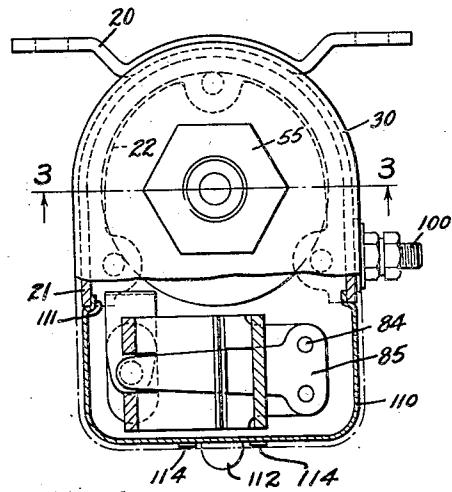


Fig. 1

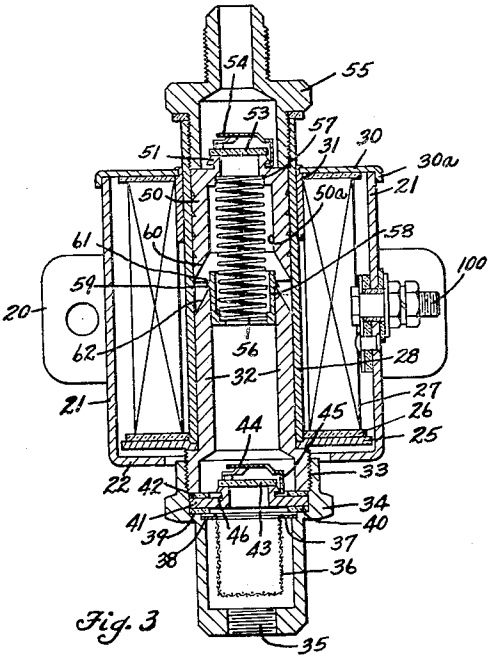


Fig. 3

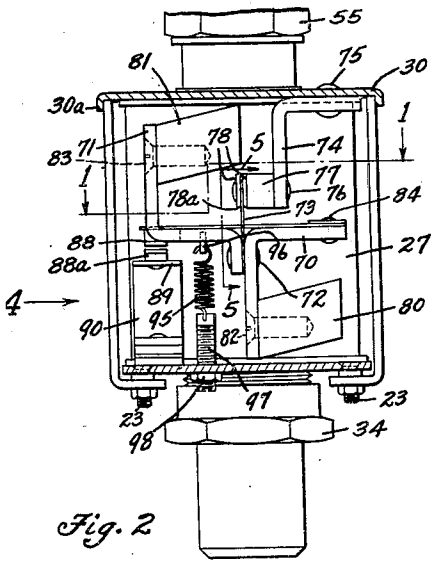


Fig. 2

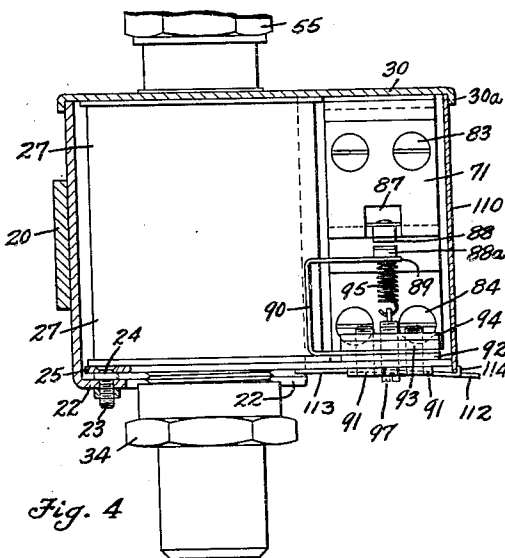


Fig. 4

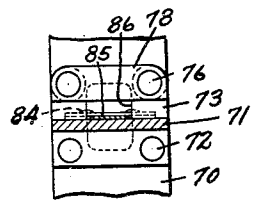


Fig. 5

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ELECTROMAGNETIC MOTOR.

Application filed May 25, 1925. Serial No. 32,737.

This invention relates to electro-magnetic motors, especially for operating pumps for pumping liquids, such as gasoline fuel for internal-combustion engines.

One of the objects of the invention is to produce a motor which is simple in construction and reliable in operation, and which may be produced at relatively low cost. In carrying out these objects of the invention, the motor is provided with an electromagnet having two movable members in its magnetic circuit. One of these members constitutes the armature of the magnet, and the other member is movable to control a pair of contacts in the electric circuit of the magnet, so that the magnet is energized intermittently to attract the armature. In this way a mechanical connection between the armature and contacts is avoided so that the contacts may be entirely isolated from the armature. This construction is particularly of use in a gasoline pump operated by an electromagnet motor the armature of which provides the pump piston.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a plan view partly in section, of a pump including the present invention, the section being taken on the line 1—1 of Fig. 2;

Fig. 2 is a side view with the cover member removed;

Fig. 3 is a longitudinal sectional view on the line 3—3 of Fig. 1;

Fig. 4 is a side view looking in the direction of the arrow 4 in Fig. 2, certain parts being shown in section for sake of clearness; and

Fig. 5 is a sectional view on the line 5—5 of Fig. 2.

Referring to the drawings, the pump includes a supporting bracket 20, which is attached to a U-shaped frame member 21 of magnetizable material located in the magnetic circuit of the operating magnet of the pump. The U-shaped frame 21 is provided with an inwardly-extending flange 22, which receives the threaded ends 23 of studs 24, which are secured to a magnetizable base plate 25. The plate 25 supports a non-conducting disc 26, which in turn supports a

magnet coil 27, which surrounds a non-magnetic pump cylinder of cylindrical guide 28 also supported by the plate 25. A non-conducting washer 29 rests upon the magnet coil 27, and the upper edge of the frame 21 receives a cover plate 30 of magnetic material, which is attached to a sleeve 31 of magnetic material, which surrounds the non-magnetic cylinder 28. A magnetizable core member 32 is press-fitted within the cylinder 28, and is threaded at 33 to receive a pump-valve-supporting member 34, having a threaded opening 35 for receiving an intake pipe. The member 34 supports a cup-shaped strainer 36 attached to a washer 37 which is supported by a ledge 38. The member 34 is provided also with a ledge 39 for supporting a gasket 40 upon which rests a valve seat 41. A gasket 42 is clamped between the valve seat and the lower end of the core member 32, when the member 34 is screwed upwardly along the lower end of the core member. The valve seat receives a disc valve 43 retained by a valve cage 44, having three legs 45, the lower ends of which are received by a groove 46 provided in the valve seat 41.

The cylinder 28 receives a piston or cylindrical armature 50 of magnetic material, which constitutes one of the movable core members in the magnetic circuit of the magnet. The piston 50 is provided with a valve seat portion 51 supporting a valve 53 retained by a cage 54, corresponding in shape and function to the parts numbered 41, 43 and 44, respectively. The upper end of the cylinder 28 is threaded to receive a coupling member 55. The piston 50 is maintained in the upper position, shown by a string 56 bearing at its upper end against a ledge 57 provided by the piston and at its lower end against a cup-shaped piston stop 58, which is provided with an annular flange 59 resting upon the upper end of the core member 32. The surfaces 60, 61 and 62, of the piston 50, piston stop 58 and core member 32, respectively, are conical and are substantially concentric. The surface 61 is spaced from the surface 62, so as to provide a non-magnetic stop member limiting the approach of the piston to the core 32. The central bore 50^a of the piston 50 is received by the piston stop 58, so that the piston 50 constitutes a dashpot plunger, and the cylinder 28, core 32 and piston stop 58 constitute

a dashpot cylinder. The action of these members is to retard the movement of the piston against the piston stop when attracted by the magnet. In this way the noise of operation of the pump is substantially eliminated.

It is obvious that closing the circuit to the coil 27 will cause the plunger 50 to be attracted and the interruption of this circuit will permit the spring 56 to return the piston 50 to the position shown in Fig. 3. The reciprocation of the piston causes fluid to be drawn into the inlet 35 of the pump and forced from the outlet coupling 55.

The mechanism for controlling the circuit of the magnet includes a movable armature constituting a part of the magnetic circuit of the magnet 27. This armature comprises an L-shaped member 70 and an S-shaped member 71, which are attached by rivets 72, there being a spring hinge 73 included between the members 70 and 71 and provided with holes for receiving the rivets 72. A non-magnetic L-shaped hinge bracket 74 is secured by rivets 75 to the cover member 30. Rivets 76 secure to the bracket 74, non-magnetic spacers 77, two fiber blocks 78 and the hinge 73, the upper end of which is located between the blocks 78. The lower edges of these blocks are beveled at 78^a to provide for the bending of the spring hinge 73. The members 70 and 71 are magnetizable and carry, respectively, magnetizable weights 80 and 81, which are secured by screws 82 and 83, respectively. These weights constitute poles for the armature cooperating with the adjacent magnetizable plates 25 and 30.

Rivets 84 secure a leaf spring conductor 85 to the armature member 70. The conductor 85 extends through an opening 86 in the hinge plate 73 and through an opening 87 in the armature member 71. The free end of the leaf spring 85 carries a contact 88, which cooperates with a contact 88^a mounted on the free end 89 of a resilient U-shaped contact bracket 90. The lower leg of this bracket is insulatingly supported by the plate 25. Screws 91 pass through non-conducting washers 92 and 93, and are threaded into a metal plate 94, the screws being maintained out of contact with the bracket 91 through which they pass. The contacts 88 and 88^a are maintained normally in engagement by a spring 95 having one end attached to a point 96 connected with the armature member 71, and the other end attached to an adjusting screw 97 which passes through a hole in the plate 25 and receives a nut 98. By adjusting the nut 98 along the screw 97 the tension of the spring 95 can be regulated.

The pump has but one wire-receiving terminal screw 100, which is insulatingly supported by the U-shaped magnet frame 21. One end of the magnet coil 27 is attached to

the terminal screw 100, and the other end to the insulated contact support 90. Where the pump is used as a fuel pump for an automotive vehicle, the terminal 100 is usually connected with the storage battery by the operation of the ignition switch. The battery is grounded upon the vehicle frame. Therefore, the pump circuit is completed through the metallic path from the contact 88 to the bracket 20, which is attached to a metallic part supported by the vehicle frame. By closing the ignition switch, the electrical circuit of the magnet 27 will be completed and a magnetic circuit will be created in the region of the pump plunger 50 and the contact-controlling armature members 70 and 71. The pump plunger 50 will be attracted downwardly, as viewed in Fig. 3, and the armature members 70 will swing clockwise, as shown in Fig. 2, to interrupt the magnetic circuit by the separation of contacts 88 and 88^a. When this occurs, the spring 56 will be released to return the pump plunger 50 to upper position and the spring 95 will be released to return the armature members 70 and 71 into contact-closing position. Then the cycles of operation will be repeated. The swinging armature and its weight members constitute a pendulum having a definite period of oscillation. Due to the magnetic impulses imparted to the pendulum, it is kept swinging at a constant rate as long as the switch is closed which connects the terminal 100 with a source of current.

By the mechanism described, the contacts 88 and 88^a are operated free of any mechanical connection with the moving plunger. Therefore, the contacts have been isolated from the liquid duct in a very simple manner. This is considered an extra precaution in case the pump is used to pump a readily combustible liquid. The movement of the armature members 70 and 71 causes the contact 88 to wipe across the contact 88^a, thereby tending to keep the contact surfaces of the contacts clean and tending to prevent sticking of the contacts.

The contacts and controlling mechanism are enclosed by a non-conducting U-shaped cover 110 having flanges 111 for receiving the edges of the frame 21. The cover 110 is retained in the position shown, by a spring member 112 which is fixed at 113 to the lower side of the plate 25. The spring 112 carries projections 114 for engaging the outside of the cover 110. By pushing the retaining spring 112 downwardly, the upper edge of a cover 110 may be moved downwardly to clear the flange 30^a of the plate 30, and the spring 112 can be moved still further so that the cover 110 may be lifted above the projections 114 and then slipped out of place.

While the form of embodiment of the in-

vention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

5 What is claimed is as follows:

1. An electro-magnetic motor comprising, in combination, a non-magnetizable cylindrical guide, a magnetizable stationary core extending within the guide, a magnetizable
10 cylindrical armature slidable within the guide, a magnet coil surrounding the guide, means for intermittently connecting the coil with a current source, and a non-magnetic tubular member located between the arma-
15 ture and core to limit movement of the armature toward the core and having a portion telescopically engaged by the armature thereby providing a dashpot comprising a fluid filled chamber formed by the ends of
20 the core and piston and the cylinder and tubular member for retarding the movement of the armature into engagement with the member.

2. An electro-magnetic motor comprising, in combination, a non-magnetizable cylindrical guide, a magnetizable cylindrical armature slidable within the guide, a magnet coil surrounding the guide and armature, a
25 magnetic circuit for the coil including the armature, two magnetizable plates located adjacent the ends of the coil and extending beyond the side of the coil, and a vibratory member supported between its ends and having poles arranged to swing toward and
30 away from the plates as the coil is energized or de-energized, contacts located in the magnet coil circuit and separated by movement of said poles toward said plates, and a spring tending to maintain the vibratory
35 member in contact-closing position.

3. An electro-magnetic motor comprising in combination, a non-magnetizable cylindrical guide, a magnetizable cylindrical armature slidable within the guide, a magnet coil
40 surrounding the guide and armature, a magnetic circuit for the coil including the armature, two magnetizable plates located adjacent the ends of the coil and extending beyond the side of the coil, and a vibratory member
45 having poles arranged to move toward and away from the plates as the coil is energized or de-energized, means supporting the member for a swinging movement and a bodily movement thereof, contacts having the plane
50 of their meeting surfaces arranged substan-

tially parallel to the direction of bodily movement of the vibratory member, said contacts being in the circuit of the magnet coil and one of them supported by the vibratory member and separated from the
60 other by movement of said member toward said plates, and a spring tending to maintain the vibratory member in contact-closing position.

4. An electro-magnetic motor comprising, in combination, a magnetizable, cylindrical guide, a magnetizable cylindrical armature slidable within the guide, a magnet coil surrounding the guide and armature, a mag-
65 netic circuit for the coil including the armature, two magnetizable plates located adjacent the end of the coil and extending beyond the side of the coil and a vibratory member having poles arranged to move toward and away from the plates as the coil
70 is energized or de-energized, a leaf spring hinge supporting the member intermediate its ends and permitting a swinging movement and a bodily movement of the vibra-
75 tory member toward the plates, contacts having the plane of their meeting surfaces arranged substantially parallel to the direction of bodily movement of the vibratory member, said contacts being in the circuit of the magnet coil, and a leaf spring attached
80 to the vibratory member and located transversely to the spring hinge and carrying one of the contacts, and a spring tending to maintain the vibratory member in contact-closing position and biasing the leaf spring
85 to maintain the contacts in engagement during a portion of the movement of the vibratory member.

5. An electromagnetic motor comprising, a non-magnetizable cylindrical guide, a mag-
90 netic coil surrounding the guide, a stationary magnet core extending into said guide, a cylindrical armature slidable in said guide toward and away from said core, a non-magnetizable member attached to the core
100 and located concentric with said guide and co-operating telescopically with the armature to provide a dash pot cushioning the movement of the armature toward the core, and a spring seated against said member for
105 urging the armature away from the core.

In testimony whereof I hereto affix my signature.

HUGH WALLACE.