Aug. 10, 1937. C. P. BONER 2,089,332

ELECTROMAGNETIC DEVICE WITH AUXILIARY CONDUCTOR

Filed June 12, 1936

Fig. 1

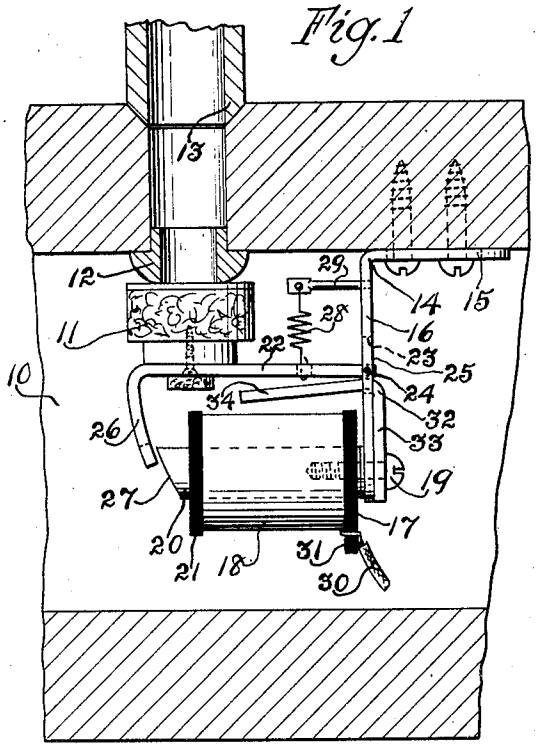


Fig. 2

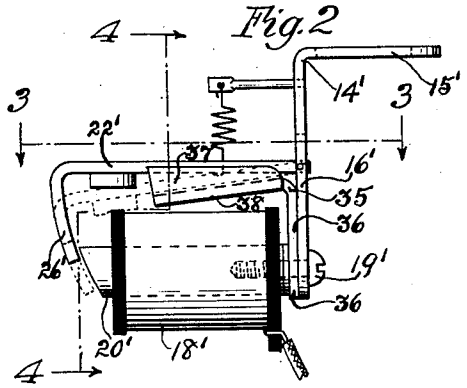


Fig. 3

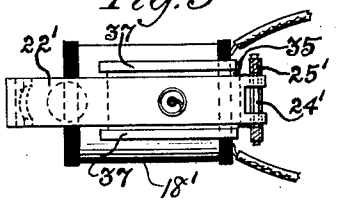


Fig. 4

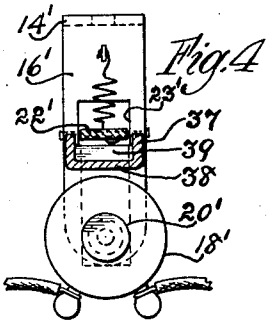


Fig. 5

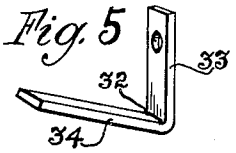


Fig. 7

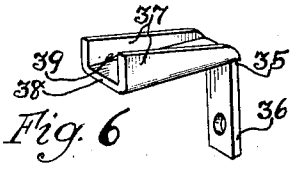


Fig. 6

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ELECTROMAGNETIC DEVICE WITH AUXILIARY CONDUCTOR

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Application June 12, 1936, Serial No. 84,865

6 Claims. (Cl. 84—339)

This invention relates to a novel and improved electromagnetic device with auxiliary conductor, and more particularly to such a device which is especially adapted for actuating a movable part or movable member of a pipe organ.

In the use of electromagnetic devices of the type illustrated in this application, which are especially adapted for actuating various movable members or operating elements of pipe organs, it is convenient to have the device arranged as a unit in which the electromagnet and the armature actuated thereby are both carried on a supporting bracket whereby the device can be readily mounted in the organ or on a part of the organ, adapted to operate said movable member or element of the organ by the action of said armature. By the use of these devices in this manner, it has been found that when a member of paramagnetic material, for example, an iron bar, is properly shaped and advantageously placed alongside the armature and connected with the electromagnet of this device, it will greatly aid the electromagnet in attracting the armature, and will serve as a boosting means in more readily actuating said armature. It becomes effective to such an extent that the reduction in electric current ordinarily required, and the general efficiency of the device, will be enhanced to a substantial degree, over that of the prior constructions of this type which lacked such auxiliary conductor.

It has also been observed that when such electromagnetic device is equipped with my auxiliary magnetic flux conducting member, the supporting and mounting bracket of the device may consist of rust-defying metal, which is substantially non-magnetic, without reducing the efficiency of the device.

It is therefore one of the main objects of this invention to provide an electromagnetic device of the type illustrated herein which comprises an auxiliary magnetic flux conductor or booster, whereby the electromagnet will be considerably aided in operating the armature, and the efficiency of the device will be greatly increased.

A further object of this invention is to provide such a device of an improved construction, which is more particularly adapted for operating various kinds of movable members utilized in pipe organs; and which construction is highly efficient, so that the device may be reduced in size, to occupy less valuable space in the organ, and to require less electric current for actuating the associated movable member of the pipe organ.

These and various other objects and advantages are attained with this invention, as will become apparent from the following description, taken in connection with the accompanying drawing wherein the invention is shown in a few of its various forms contemplated, it being understood that other arrangements and forms of construction may be adopted for carrying out the objects and purposes of this invention.

In the drawing:

Fig. 1 is a vertical sectional view thru the air passage of an organ and the organ pipe thereon, showing my invention in one of its forms mounted thereon to operate the stop valve of an organ pipe.

Fig. 2 is an elevational view of my improved electromagnet comprising an auxiliary conductor, which is of a different construction than that shown in Fig. 1.

Fig. 3 is a plan view, partly in section, taken along line 3—3 of Fig. 2.

Fig. 4 is an end view, partly in section, taken along line 4—4 of Fig. 2.

Figs. 5 and 6 are perspective views, respectively, of the two forms of auxiliary conductors applied to the electromagnetic devices illustrated in Figs. 1 and 2.

Fig. 7 is an elevational view of an improved electromagnetic device comprising my auxiliary conductor, and being utilized for actuating a switch-operating member of an organ.

The drawing illustrates this invention in a few of its various forms of construction, and in a few of its various manners of application, to indicate how this invention is adapted to be associated with and to operate different ones of the various movable parts or operable members of a pipe organ.

In Fig. 1 this invention is disclosed in one of its forms, embodied in a unitary electromagnetic device which is mounted in the wind-chest 10 of a pipe organ, arranged to operate a movable member 11, which is shown in the form of a stop valve, adapted to close the valve port in the valve seat 12 of an organ pipe 13 of the organ.

The electromagnetic device shown in Fig. 1, which is equipped with my invention, comprises an angle-shaped bracket 14 including an upper arm 15 whereby the device is mounted in the wind-chest, with suitable securing elements; and a lower arm 16 depending from arm 15, having mounted on its lower end one end 17 of an electromagnet 18, by a securing element 19. Said element 19 preferably extends thru said arm 16 and is secured in a core 20 which extends thru the electromagnet and projects from the end 21

thereof, opposite said end 17. An armature 22 includes a main bar portion which has one end placed in a slot 23 provided in the intermediate part of bracket arm 16, being pivotally mounted therein by a pin 24 extending thru said armature end and thru side portions 25 at the sides of slot 23. The bar portion is thus swingably mounted on bracket arm 16, and it contains at its free end a depending arm 26 which is slightly curved and is movable across the end face 27 of the core, by action of the electromagnet.

In this form of construction and use the armature 22 carries the stop valve or movable member 11 of the organ, which is moved to its open position upon energizing the electromagnet. A spring 28 is connected to the armature and to a post 29 mounted on the arm 16 of the bracket, adapted to return the armature 22 with its stop valve 11 to the valve-closed position, as shown in Fig. 1, when the electromagnet is de-energized, by opening the electric circuit of which the ends 30 are shown fastened on ears 31 extending from the end 17 of the electromagnet, said ends 30 being connected with the windings of the electromagnet.

The electromagnetic device described above is similar to that disclosed and claimed in Patent No. 1,736,684, of L. J. Wick, issued November 19, 1929, for Valve operating mechanism for organs.

Alongside of and closely adjacent to the electromagnet and the armature I position my auxiliary conductor 32, in operative connection with the electromagnet, and preferably in intimate connection with the core of the latter. The conductor consists of paramagnetic material, such as iron or the like, and it is preferably made in the shape of an angular bar including an angle portion or arm 33 which is mounted against the side of bracket arm 16 and is connected with core 20, preferably by extending the securing element 19 thru arm 33, whereby the electromagnet is mounted on the bracket, as indicated in the drawing. Another angle portion or arm 34 extends from arm 33 into the space between the electromagnet and its armature, and substantially in the same general direction as the two, being closely adjacent both of them and in such position that when armature 22 is moved to the end of its attracted position it will be substantially in contact with conductor arm 34.

The vertical arm 33 of the conductor may be placed at the outer side of the bracket arm 16, and its arm 34 extended thru slot 23, as shown in Fig. 1; or arm 33 may be placed on the inner side of arm 16, near the electromagnet and its core, as shown in Figs. 2 and 7 of the drawing. In each case the element which mounts the electromagnet on the bracket is also utilized for readily mounting conductor arm 33 in place and in intimate connection with the core of the magnet.

In Fig. 2 my auxiliary conductor is illustrated in a different form of construction than that shown in Fig. 1, but in connection with the same form of electromagnetic device comprised of the same parts and members; these corresponding parts and members being designated by the corresponding numerals used in Fig. 1, plus the prime mark (') added thereto.

In this form of construction the auxiliary conductor 35 comprises a vertical arm 36 which is mounted against the inner side of bracket arm 16' and is secured by a securing element 19' to the core 20' of the electromagnet 18'. An arm 38 extends from arm 36, between electromagnet 18' and its armature 22', like in the preceding form; and wings 37 are provided on the two sides of said arm 38, extending up to the sides of the main bar part of armature 22' forming a trough or channel into which said armature bar is adapted to be drawn.

It is found that this form of auxiliary conductor enhances the efficiency of the connected electromagnetic device to a greater extent than does the form of conductor shown in Fig. 1.

In Fig. 7 the invention is shown in association with a different type of movable organ member than that shown in Fig. 1. The electromagnetic device is herein shown connected with and adapted to operate a roller 40, which is pivotally mounted on bracket means 41 arising from supporting means 42 of an organ. Said roller 40 is the movable member of the organ actuated by this device, and is provided with a metal contact bar 43 adapted to engage and move a switch element 44 into contact with its companion element 45, thereby closing the switch and the circuit connected to the end wires 46 shown.

In this form the electromagnetic device comprises an angular supporting bracket 54 including an arm 55 whereby the device is mounted on supporting means 42, and an arm 56 extends therefrom whereon is mounted one end 57 of an electromagnet 58, by a securing element 59. A core 60 extends thru the magnet and from the end opposite end 57, and element 59 is preferably threaded in the core for mounting the magnet on the bracket. An armature 62 has one end placed in a slot in bracket arm 56 and is pivoted to the arm by a pin 64, and has a curved arm 66 at its free end adapted to move across the end face 67 of core 60 when the electromagnet is energized. A spring 68 is connected to the armature and to a post 69 extending from bracket 64, to retract the armature when the electromagnet is de-energized. The circuit wires are connected to the windings of the electromagnet as explained above; and a pin 70 on the side of armature 62 engages between spaced fingers of an arm 71 extending from roller 40, to rotate said roller and operate the switch.

The auxiliary conductor 72 is of paramagnetic material and angle-shaped, as in the preceding forms, and may be of either form of construction. It is shown like conductor 32 of Fig. 1, but has its angle portion or arm 73 mounted at the inner side of bracket arm 56, instead of at the outer side as shown in Fig. 1. The other angle portion or arm 74 extends from arm 73 in the same direction substantially as the armature 62 and the core of the electromagnet, being positioned near to the armature and the electromagnet and preferably between the same, substantially as indicated in the drawing. The arm 73 is secured to the bracket by means of the securing element 59, and is intimately connected with the core 60 of the electromagnet, as in the preceding forms and as described above.

In either of these forms and manners of application of my invention, as indicated in the drawing, the auxiliary conductor is closely connected with the electromagnet, and preferably by being intimately connected with the magnet core; and the conductor has an arm or bar portion extending closely adjacent to the electromagnet and at the end of the path of inward travel of the armature, so as to conduct the magnetic flux and to aid the electromagnet, when energized, in attracting and operating the armature, and increase the efficiency of this device.

I claim:

1. An electromagnetic device adapted to operate a movable member of a pipe organ, said device comprising a bracket of paramagnetic material whereby it is mountable as a unit on a part of the organ, an electromagnet mounted on the bracket, an armature including a bar portion pivoted on the bracket, at one end of the magnet, adapted to be connected operatively to said organ member, and having an arm overhanging and movable across the magnet core, at the opposite end of the magnet, and an auxiliary conductor of paramagnetic material mounted against the bracket and having a bar portion extending therefrom in the direction of and adjacent to said bar portion of the armature, for aiding the electromagnet in operating the armature.

2. A device adapted to operate a movable member of a pipe organ, said device comprising a bracket, an electromagnet mounted on the bracket to have its core extend normally from the bracket, an armature mounted swingably on the bracket, at one end of the magnet, including an arm overhanging and movable across the extending end of said core, at the other end of the magnet, and an auxiliary member of paramagnetic material connected with the electromagnet and the bracket and having a bar portion extending alongside of and adjacent to the armature, for conducting magnetic flux outside of the electromagnet and aiding the latter in attracting the armature.

3. A device adapted to operate a movable member of a pipe organ, said device comprising a bracket having means thereon whereby it is mountable as a unit on a part of an organ for operating said member, an electromagnet including a core having one end projecting therefrom, means engaging the opposite end of the core for mounting the electromagnet on the bracket, an armature having at one end a pivotal mounting on the bracket, at one end of the magnet, and having at its opposite end an arm overhanging and swingable across said projecting core end, at the opposite end of the magnet, when the electromagnet is energized, and an angle-shaped auxiliary conductor having an attaching portion connected with the bracket and the core, by said electromagnet mounting means, and having a main portion extending therefrom alongside of and adjacent to the electromagnet and the armature, whereby to aid the electromagnet in attracting the armature.

4. A device adapted to operate a movable member of a pipe organ, said device comprising a bracket whereby it is mountable on a part of an organ for operating said member, an electromagnet having a core part extending from one end and having means at its other end whereby it is mounted on the bracket, an armature including a bar portion having at one end a pivotal mounting on the bracket, at one end of the magnet, and having an arm at its opposite end overhanging and swingable across said extending core part, at the opposite end of the magnet, when the electromagnet is energized, and an auxiliary member of paramagnetic material having an attaching portion mounted on the bracket by means of said electromagnet mounting means and including a bar portion extending between said electromagnet and said armature and provided with side wings extending toward the sides of said armature bar portion, thereby forming a channel wherein the last said bar portion is drawn to aid the electromagnet in operating the armature.

5. An electromagnetic device of the character described, comprising a bracket whereby it is mountable as a unit, an electromagnet mounted at one end on the bracket and having a protruding core part at its opposite end, an armature including a bar portion having at one end a pivotal mounting on the bracket, at one end of the magnet, and having at the other end an arm movable across said core part, at the other end of the magnet, and an auxiliary conductor having an attaching portion connected with the bracket and having operative connection with the electromagnet, said conductor including a bar portion extending between the electromagnet and the bar portion of the armature and provided with wing means movable toward and alongside said bar portion of the armature, whereby to aid the former in attracting the latter.

6. An electromagnetic device arranged and mountable as a unit for initiating movement of movable member, said device comprising a supporting and mounting bracket, an electromagnet having one end mounted on the bracket and having a core part extending from its opposite end, an armature including a bar portion having at one end a pivotal mounting on the bracket, at one end of the magnet, and having an arm at its opposite end overhanging and swingable across said extending core part, at the opposite end of the magnet, when the electromagnet is energized to initiate the movement of the armature, a spring connected with the armature and the bracket for returning the armature to its position of rest when the electromagnet is de-energized, and an angle-shaped auxiliary conductor of paramagnetic material having one angle portion connected with the bracket and with the electromagnet and having its other angle portion extending therefrom between the electromagnet and the bar portion of the armature, to aid the electromagnet in attracting the armature.

CHARLES P. BONER.