

W. C. REED.
CIRCUIT CONTROLLER.
APPLICATION FILED OCT. 25, 1916.

1,318,178.

Patented Oct. 7, 1919
2 SHEETS—SHEET 1.

FIG-1.

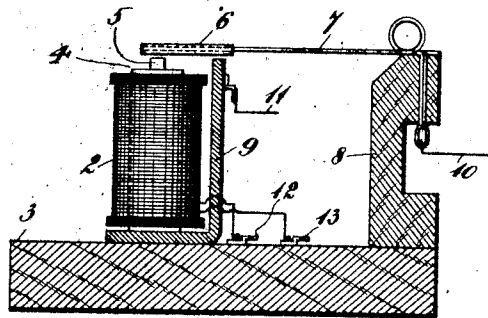
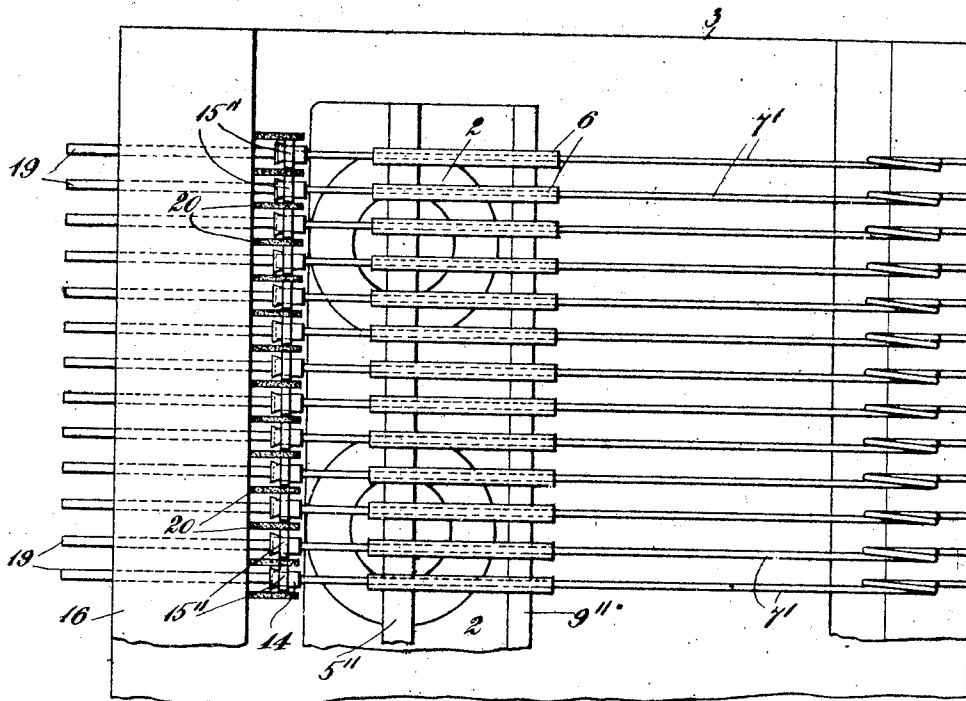


FIG-5.



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2 SHEETS—SHEET 2.

Fig. 2.

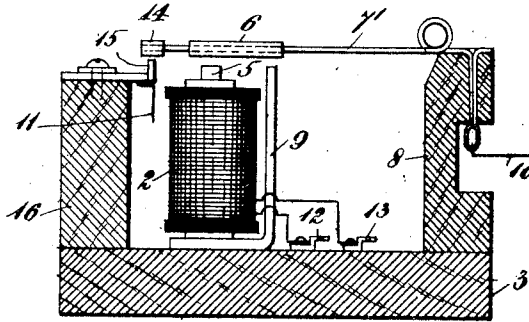


Fig. 3.

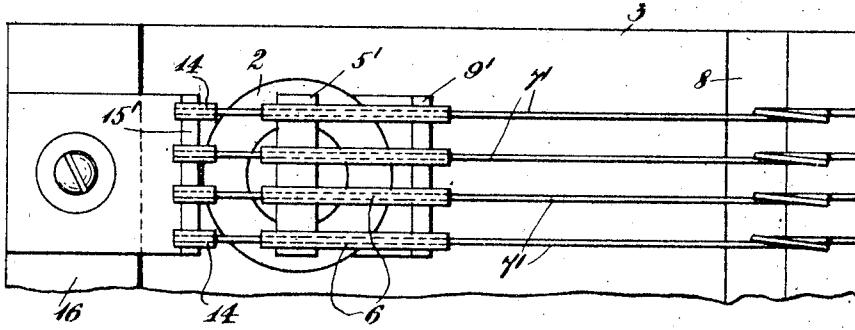
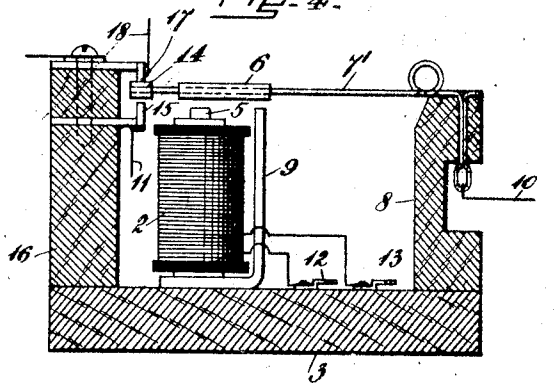


Fig. 4.



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CIRCUIT-CONTROLLER.

1,318,178.

Specification of Letters Patent.

Patented Oct. 7, 1919.

Application filed October 25, 1916. Serial No. 127,570.

To all whom it may concern:

Be it known that I, WALTER C. REED, a citizen of the United States, residing at Dalton, in the county of Berkshire and State of Massachusetts, have invented certain new and useful Improvements in Circuit-Controllers, of which the following is a specification.

The object of this invention is to provide an electro-magnetic circuit controller which will be suitable for use with relatively light currents in situations where sensitiveness and very rapid action are important, as in the case of various circuit controllers employed in electrically-operated piano players and pipe organs. My invention provides a circuit controller which has in a marked degree the characteristics above referred to and is also simple and inexpensive in construction and not likely to get out of order, and resides in certain features of construction and arrangement hereinafter described in connection with the accompanying drawings, in which—

Figure 1 is a side elevation of one form of my circuit controller;

Fig. 2 is a similar view showing a somewhat modified form;

Fig. 3 shows in plan view a construction similar to that illustrated in Fig. 2;

Fig. 4 is an elevation showing another modification; and

Fig. 5 is a plan view showing still another modification.

An elementary form of my circuit controller is represented in Fig. 1, in which 2 indicates a cylindrical coil standing on end on a supporting base 3 and containing a soft iron core 4 the upper pole 5 of which projects slightly above the coil and is shown as having its transverse dimensions reduced as compared with those of the core 4, in order to concentrate the magnetic flux at this point. The armature of the magnet consists of a small soft-iron tube 6 carried by a spring wire 7 which passes through the tube and is fixed at one end to a suitable support such as a wooden block 8 in such position that the tube 6, which is located at or near the free end of the wire 7, is held slightly above and out of contact with the pole 5 by the spring action of the wire under normal conditions, or when the coil 2 is not energized. Preferably, in order that

the magnetic circuit may be practically complete, the magnet includes a soft iron bar 9 extending from the lower end of the core 4 around the outside of the coil to a point level with the top of the projecting pole 5, the tube 6 being arranged to bridge the space between the parts 5 and 9. The circuit to be controlled is indicated by the circuit wires 10 and 11 connected respectively to the fixed part of the wire 7 and to one of the fixed soft iron parts of the magnet, such as the bar 9, and the coil 2 is energized through circuit wires (not shown) leading respectively to terminals 12 and 13 carried by the base 3 and having the ends of the coil 2 connected thereto. So long as this coil is not energized the armature of the magnet is held at a short distance above the parts 5 and 9 by the spring wire 7, so that the circuit to be controlled is open, but whenever the coil 2 is energized the tube 6 is attracted and drawn into contact with one or both of said parts 5 and 9, thereby closing the circuit through the wire 7.

Another form of my circuit controller is shown in Fig. 2, in which the various parts are constructed and arranged as already described except that the spring wire 7' is extended slightly beyond the magnet and provided at its free end with a small silver tip 14 which is normally held out of contact with a metallic contact bar 15 located beneath the tip and secured to an upright 16 carried by the base 3, the circuit wire 11 being connected to the contact bar 15 instead of to the bar 9 as in Fig. 1. In this form of the device the contact bar 15 is located at such an elevation that when the tip 14 is drawn into contact with said bar by the energizing of the magnet the soft iron tube 6 is out of contact with the parts 5 and 9, but in either case a firm contact results from the attraction of said tube 6, due to the increasing force of the magnet as the tube approaches its poles. The employment of the contact bar, arranged as above described, is preferable for the reason that if the tube 6 moves into actual contact with the poles of the magnet when the latter is energized it is liable to "stick" or be retained against the poles by residual magnetism after the magnet has been deenergized, whereas if a slight gap is left between

said tube and poles such sticking is effectively prevented and certainty of action of the controller is insured.

Fig. 3 shows a form of my circuit controller in which several of the spring wires 7' are employed in connection with a single magnet by which they are all attracted or released simultaneously, the construction being otherwise the same as that illustrated in Fig. 2 except that the pole 5', the bar 9' and the contact bar 15' are given such dimensions that they extend beneath and are common to all the spring wires. This form of the device is particularly adapted for use in pipe organs for the purpose of controlling the circuits through the agency of which the respective pipes are sounded, since the several spring wires 7' can be independently connected through their respective circuit wires to corresponding pipe-sounding devices. In such case, when the magnet is energized current will be fed from the contact bar to all the pipe-sounding devices controlled by that magnet, subject to such control of the individual circuit wires as may be provided elsewhere.

Fig. 4 illustrates a modification in which a second contact bar 17 having a circuit wire 18 connected thereto is located above the tip 14 on the spring wire 7' and is normally in contact with said tip, this contact being broken when the magnet is energized. This form of the device is thus adapted to open a normally-closed circuit by including the wires 10 and 18 in such circuit, in which case the lower contact bar 15 may be thrown out of circuit and used merely as a stop to limit the downward movement of the tip 14. If both of the circuit wires 11 and 18 are connected to different branch circuits the device may be used as a transfer switch, since the circuits through said wires 11 and 18 will be opened and closed respectively so long as the magnet is deenergized but will be closed and opened respectively so long as the magnet is energized.

Instead of employing a metallic contact bar which is common to all of the spring wires in case several such wires are combined with a single magnet, as in Fig. 3, individual contact bars for the several wires may be used instead, thereby preserving the complete independence of all the circuits in which said wires are included. Such an arrangement is illustrated in Fig. 5, in which each of the wires 7' is shown as having its tip 14' located beneath and normally in contact with an individual contact bar 15'' mounted on one end of a supporting wire 19 which is carried by and passes through the upright 16, the several contact bars 15'' being arranged in line and laterally insulated from one another by thin fiber partitions 20 interposed between them. This figure also shows the arrangement em-

ployed when it is desired to open or close a large number of circuits simultaneously, in which case two or more of the coils 2 are located side by side and included in a single energizing circuit, with their upper ends having the same polarity, and their cores are surmounted by a continuous soft-iron bar 5'' which serves as a single pole for the combined magnets. A single bar 9'' of the same length as the bar 5'' provides the other pole for the combined magnets, and the wires 7' are arranged side by side above the parts 5'' and 9''. In other respects the construction is the same as that illustrated in Fig. 4.

It will be observed that in each form of my circuit controller above described the armature is carried by and moves with a spring wire which also serves as a conductor forming a part of the circuit to be controlled thereby, and since these parts can be made very light and move without friction they are capable of operating with extreme rapidity and require but little current to operate them. These characteristics of my controller, as well as its simplicity, its freedom from pivotally-mounted parts and its compactness when constructed to control a considerable number of circuits, render it particularly serviceable for use in electrically-operated pipe organs, in which a large number of circuit controllers are ordinarily required.

I claim:

1. A circuit controller comprising a spring wire adapted to be included in an electric circuit and to open and close the same, and an electro-magnet having a tubular armature mounted on said spring wire and normally held away from the magnet by the spring action of the wire.

2. A circuit controller comprising a spring wire adapted to be included in an electric circuit and to open and close the same, an electro-magnet having its poles arranged side by side, and a tubular armature mounted on said spring wire in position to bridge the poles of the magnet and normally held away from said poles by the spring action of the wire.

3. A circuit controller comprising a spring wire adapted to be included in one branch of the circuit to be controlled and provided with a conducting tip, an electro-magnet having a tubular armature mounted on said spring wire and normally held away from a pole of the magnet by the spring action of the wire, and a contact bar adapted to be connected to the other branch of the circuit to be controlled and located beneath said conducting tip and at one side of the magnet in position to hold said armature closely adjacent to but out of contact with the pole of the magnet when attracted thereby.

4. A circuit controller comprising a plu-

ality of spring wires each adapted to be included in an electric circuit and to open and close the same, and an electro-magnet having a plurality of tubular armatures located side by side over a pole of the magnet and each mounted on one of said wires, each armature being normally held away from the magnet pole by the spring action of the corresponding wire.

5. A circuit controller comprising a plurality of spring wires each adapted to be included in an electric circuit and to open and close the same, an electro-magnet having its poles arranged side by side and severally located beneath the collective spring wires, and a plurality of tubular armatures each mounted on one of the spring wires in position to bridge the poles of the magnet and normally held away from said poles by the spring action of the corresponding wire.

6. A circuit controller comprising a plurality of spring wires each provided with a conducting tip, an electro-magnet having its poles arranged side by side and severally located beneath the collective spring wires, a plurality of tubular armatures each mounted on one of the spring wires in position to bridge the poles of the magnet and normally held away from said poles by the spring action of the wire, and a contact bar located

beneath the collective conducting tips and at one side of the magnet in position to hold the collective armatures closely adjacent to but out of contact with the poles of the magnet when attracted thereby.

7. A circuit controller comprising a plurality of electro-magnets, a soft-iron bar extending across like poles of said magnets and constituting a single pole piece therefor, a plurality of spring wires each adapted to be included in an electric circuit and to open and close the same, and a plurality of armatures each carried by one of the spring wires and normally held away from the said pole piece by the spring action of the wire.

8. A circuit controller comprising a plurality of electro-magnets having their like poles connected by pole pieces which are common to all the magnets and are arranged side by side, a plurality of spring wires each adapted to be included in an electric circuit and to open and close the same, and a plurality of armatures each carried by one of the spring wires in position to bridge said pole pieces and normally held away from the latter by the spring action of the wire.

Signed by me at Boston, Massachusetts,
this seventeenth day of October, 1916.

WALTER C. REED.