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W. R. WHITEHORNE.

ELECTRIC ORGAN ACTION.

APPLICATION FILED MAY 16, 1907.

Fig. 1.

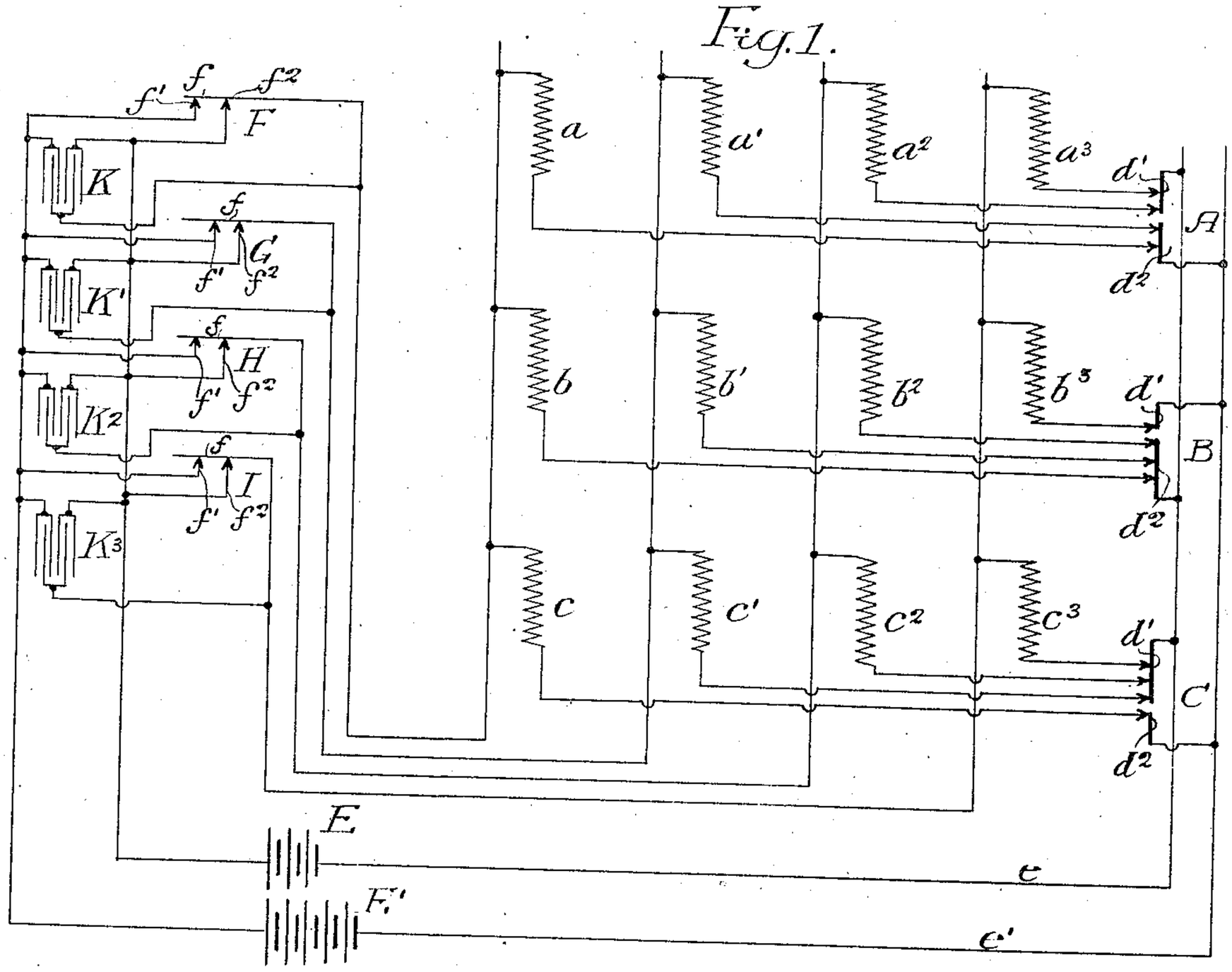


Fig. 2

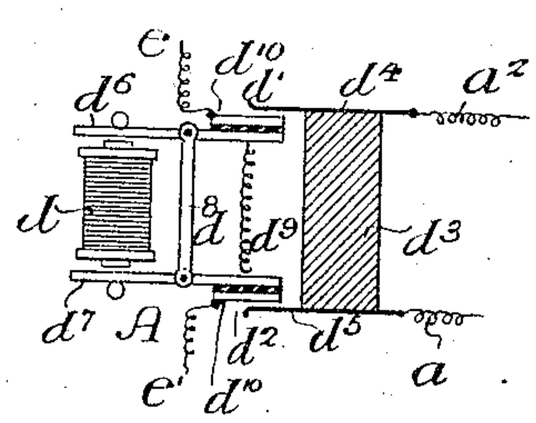
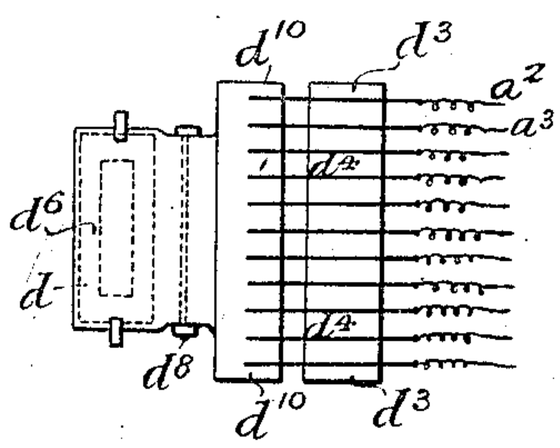


Fig. 3.



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ELECTRIC ORGAN-ACTION.

No. 897,692. Specification of Letters Patent. Patented Sept. 1, 1908

Application filed May 16, 1907. Serial No. 374,041.

To all whom it may concern:

Be it known that I, WILLIAM R. WHITEHORNE, a citizen of the United States, residing in Brooklyn, New York, have invented certain Improvements in Electric Organ-Actions, of which the following is a specification.

One object of my invention is to provide a relatively uncomplicated and inexpensive system of electric apparatus for controlling the operation of an organ, having its various parts so arranged and constructed that each pipe of the organ shall have an independent valve controlling magnet, for which the supply of current is primarily controlled by the keys and stops of the organ.

Another object of the invention is to provide a system of the general character above noted, with a relatively simple and inexpensive device or series of devices for preventing injurious sparking at the key contacts, and also to provide an apparatus of an uncomplicated and reliable nature for satisfactorily closing or making the multiple contacts of the various stops. It is further desired to provide independent sources of current for certain groups of magnets, so that those magnets having small valves to operate shall be supplied with current at a lower voltage than those for operating the larger valves.

These and other advantageous ends I secure as hereinafter set forth, references being had to the accompanying drawings, in which:—

Figure 1, is a diagrammatic view illustrating the arrangement and connections of the apparatus for controlling the operation of a part of an organ, the same being typical of the apparatus and connections required in the construction and operation of an entire organ, irrespective of its size. Fig. 2, is a side elevation, to some extent diagrammatic, illustrating the electro-mechanical device for completing the stop contacts of each stop, and Fig. 3, is a plan, to some extent diagrammatic, further illustrating the device shown in Fig. 2.

In the above drawings a, a', a^2 and a^3 represent the windings of magnets, so placed that each of them when energized, will cause the opening of the valve controlling the admission of air to one of the pipes of a series or set of the same, such for example, as the "flute" pipes of the swell manual. Similarly b, b', b^2 and b^3 represent the windings of magnets for controlling the admission of air to the "diapason" pipes of the same manual, while c, c', c^2 and c^3 are windings of the magnets for the "vox-humana" pipes.

While I have shown but four magnet windings in each of the above mentioned series, it will be understood that each series, as a matter of fact, contains as many pipes with their appropriate valve-controlling magnets as may be required and as is well known in the organ art. Similarly, while I have shown but three series or sets of pipes, it will be understood that these are typical of the different sets of pipes of a complete organ irrespective of their number. As part of the controlling means for these valve controlling magnets, I provide a number of stop switches A, B and C, each of which is preferably made as shown in Figs. 2 and 3, so that it may be operated by a magnet d. I preferably so construct these stop switches that each of them in fact consists of two switches d' and d^2, which, as shown in Figs. 2 and 3, are designed to be simultaneously operated by the magnet d, it being seen that the switch d' of the stop-switch A has one of its contacts in connection with one pole of the source of current E and its other contact connected with one end of the magnet windings a^2 and a^3 respectively, belonging to magnets for controlling the flow of air to the smaller pipes of the series. On the other hand, the switch d^2 of this same stop switch has one of its contacts connected to one pole of the source of current E′ while its other contacts are connected respectively to the magnet coils a and a', which are designed to operate the relatively large valves of the larger pipes of the series. In the case of the stop switch B and of the other similarly connected stop switches of the organ, the switch d' has one contact in circuit with the current source E and its other contact connected to the magnet coil b^3, while the switch d^2 is connected to the source E′ and to the magnet coils b, b' and b^2. Similarly, the stop switch C has its contact d' connected to the magnet windings c', c^2 and c^3, while its contact d^2 is connected to the winding c. Of these two sources of current E and E′, the latter has the higher voltage, so that when the stop switch A and certain of the key switches are operated, the coils a^2 and a^3 receive from the source E sufficient current to operate their relatively small valves, while the windings a

and a' receive from the high voltage source of current E' a larger amount of current to properly actuate their relatively large valves.

Each of the stop switches A, B and C above referred to consists, in the preferred form of my invention, of a block d^3 of insulating material, upon opposite edges of which are suitably mounted a series of metallic strips or wires d^4 and d^5, all projecting beyond said edge and all more or less springy or resilient. The magnet d is provided with armatures d^6 and d^7, each pivoted to a supporting structure d^8, and normally pulled away from the core of the magnet by a common spring d^9. Each armature carries on its end farthest from the magnet d elongated contact plates d^{10} extending under the contact strips d^4 or d^5 as the case may be, in such manner that when the armature is attracted toward the magnet core, said plate will be raised so as to simultaneously engage all of said spring strips or wires of one set of the same. These plates d^{10} are preferably insulated from the armatures upon which they are carried, while each of the strips or wires d^4 is connected to one of the magnet windings a^2, a^3, etc. On the other hand, the strips or wires d^5 are each connected to one of the magnet windings a, a', etc., it being understood that the stop switches B and C as well as any other stop switches required, are preferably of the construction shown and described in connection with the stop switch A, though as before noted those of the magnets requiring but a feeble current for their energization are, through their switches d', connected to the current source E, while those magnets which operate on large valves or have a heavy load are, through their switches d^2, connected to the source E'.

The stop-switch-operating magnets d may be controlled in any desired manner, such as described for instance in my pending application for Patent No. 333,590, filed September 7, 1906, though if desired, such magnet may be replaced by some mechanical or pneumatic device whereby the plates d^{10}, which are respectively connected to the wires e and e', may be made to simultaneously engage all the strips or wires d^4 and d^5 respectively.

F, G, H and I represent key switches designed to be closed when the corresponding keys are depressed, and each is provided with three contacts, one of which, indicated at f in the case of the switch F, is connected to one end of each of the windings a, b and c belonging to the valve controlling magnets of three pipes each in a separate series of pipes. The second contact f', designed to be engaged by the contact f, is connected to the second terminal of the high voltage source of current E'; while the third contact f^2 of the switch F is similarly connected to the second terminal of the low voltage current source E. In a similar manner the movable contacts of switches G, H and I are respectively connected to the second ends of the valve controlling magnet windings a', b', c', a^2, b^2, c^2 and a^3 b^3 and c^3. In each instance, the second contact of each switch is connected to the second terminal of the high voltage source of current E' while the third contact is similarly connected to the second terminal of the low voltage source of current.

For the purpose of reducing sparking at the contacts of the key switches, F, G etc., I provide multiple condensers K, K', K² and K³ and connect one terminal of each condenser to each of the three contacts of each switch F, G, H and I. Under operating conditions therefore, a certain stop switch or switches may be closed by the energization of its particular magnet d or by any equivalent means; for example, in the present instance, let it be considered that stop switches A and B are so closed. If now, key switches F and H be closed by the depression of their corresponding keys, the pipes controlled by the windings a, b and a^2 and b^2 will be sounded, for it will be seen that when the switch F is closed, the current is free to flow from the high voltage current source E' through the switch d^2 of the stop switch A, through winding a, contacts f and f' of the switch F to the second terminal of the high voltage generator E'; the pipe controlled by said windings a being of a large size. The current is also free to flow from the high voltage source of current E' through the switch d^2 of stop switch B, winding b, contacts f and f' of key switch F and back to the second terminal of the high voltage source of current.

The closed key switch H similarly permits the current to flow from the low voltage generator E to stop switch A, through switch d' of the said stop switch, to the valve controlling windings a^2, through the contacts f, f^2 of the key switch H and back to the second terminal of the generator E. Current also flows from the high voltage source of current E' to the switch d^2 of the stop switch B, valve-controlling windings b^2, contacts f, f' of key switch H and back to the second terminal of the high voltage source of current E'.

By the use of a plurality of sources of current of different voltages I am enabled to satisfactorily operate the different sized pipe valves without the necessity for providing on one hand, resistance coils to cut down the current flow to the valve magnets of the small pipes, or on the other hand, wasting the current by permitting an undue flow thereof when it is not required, as would be the case if the resistance coils were omitted. By providing connections from each key switch to the two sources of current, it is possible to supply a large current to the

windings of those pipes which are designed to require it, while the windings for the smaller pipes controlled from the same key have supplied to them a small current from the low voltage source. Moreover, the three-way condensers shown, very effectively prevent sparking at the key switches, while the stop switches are of such a nature as to be certain in operation and yet of the simplest and most inexpensive construction. Further, all stop switches are, by virtue of their construction, particularly adapted for the work described, in view of the fact that they satisfactorily operate even with the very large number of contacts employed in organ construction.

While I have illustrated and preferably employ three-way condensers to diminish or prevent sparking at the switch contacts, it will be understood that other forms of single or multiple condensers may be employed for this purpose without departing from my invention.

I claim as my invention:—

1. An electric organ having a series of keys each provided with a switch, stop mechanism including a plurality of switches, a valve controlling magnet winding for each pipe, each winding having in series with it a key controlled switch and a switch belonging to the stop mechanism, with a source of current for energizing the windings, substantially as described.

2. An electric organ having a series of keys each provided with a key switch, a series of magnets each controlling the valve of a single pipe, and each having one of the key switches in series with it, with stop mechanism including a number of multiple contact switches also in circuit with the magnets.

3. An electric organ having a series of magnets each controlling the admission of air to a single pipe, a series of keys, a switch controlled by each key and in circuit with one of said magnets, and stop mechanism including a switch having a plurality of contacts each connected to one of said magnets substantially as described.

4. An electric organ having a series of valve controlling magnets for the valves of a series of pipes, a series of key switches respectively connected to said magnets, and a stop switch device also connected with the magnets, said stop switch device including a plurality of separate switches, of which one is connected to one group of magnet windings and another is connected to another group of said windings, with sources of current of different voltages respectively connected to the various switches of said stop switch, substantially as described.

5. An organ having a magnet winding for controlling the sounding of each of its pipes, stop switch mechanism including a switch having a plurality of sets of contacts, the contacts of one set being connected with certain of the magnets and the contacts of another set being independently connected to others of said magnets, and key switches respectively in circuit with said magnets, substantially as described.

6. An electric organ consisting of a number of series of magnet windings, each magnet controlling the sounding of a single pipe, a series of key switches, each connected to certain of the windings for controlling the sounding of the same note in each series, and a stop switch for each series of windings, each of said stop switches having a plurality of contacts respectively connected to certain groups of windings of its particular series, with current generators of different voltages respectively connected to the stop switches to supply current at different voltage to the different groups of windings, substantially as described.

7. An electric organ having a series of magnet windings, each connected to control the sounding of a single pipe, a stop switch having a plurality of terminals respectively connected to different groups of the magnet windings of the series, a plurality of current generators of different voltages respectively connected to the parts of the stop switch, a series of multiple contact key switches, and a series of multiple condensers each having its terminals respectively connected to the terminals of one of the switches, substantially as described.

8. An electric organ having a number of series of magnet windings, each of said windings controlling the sounding of a single pipe, a series of key switches, means for connecting each key switch with one winding of each series, stop mechanism including multiple contact stop switches of which there is one for each series of magnet windings, and a source of current for said magnets, substantially as described.

9. An electric organ having a number of series of magnet windings, each of said windings controlling the sounding of a single pipe, a series of key switches, means for connecting each key switch with one winding of each series, a multiple contact stop switch for each series of magnet windings, each stop switch having independent contacts, with two sources of current each connected to the key switches and to one of the independent contacts of each stop switch, substantially as described.

10. An electric organ having a series of magnet windings for controlling the sounding of its pipes, key switches for said windings, and a stop switch, said stop switch including a plurality of terminals connected respectively to the different magnet windings, and a single contact capable of simultaneously engaging all of said terminals, substantially as described.

11. An electric organ having a series of magnet windings for controlling the sounding of its pipes, key switches for said windings and a stop switch, said stop switch including a plurality of terminals connected respectively to the different magnet windings, a single contact capable of simultaneously engaging all of said terminals, and means for actuating said single contact, substantially as described.

12. An electric organ having a series of magnet windings for controlling the sounding of its pipes, key switches for the supply of current to said windings, and a stop switch, said stop switch having two series of terminal contacts, each series respectively connected to a group of magnet windings of the series of magnets, and two separate contacts for simultaneously engaging the terminal contacts respectively of the two sets of the same, substantially as described.

13. An electric organ having a series of magnet windings for controlling the sounding of its pipes, key switches for the supply of current to said windings, and a stop switch, said stop switch having two series of terminal contacts, each series connected to a group of magnet windings of the series of magnets, and two separate contacts for simultaneously engaging the terminal contacts respectively of the two sets of the same, with a single device for simultaneously actuating said two contacts, substantially as described.

14. An electric organ having multiple point key switches, two sources of current of different voltage respectively connected to two contacts of each key switch, a number of series of magnet windings for causing sounding of the organ pipes, one winding of each series being connected to a third contact of each switch, and a stop switch for each series of windings, said stop switches each being connected to both sources of current, substantially as described.

15. An electric organ having multiple point key switches, two sources of current of different voltages respectively connected to two contacts of each key switch, a number of series of magnet windings for causing sounding of the organ pipes, one winding of each series being connected to a third contact of each switch, and a stop switch device for each series of windings, each stop switch device including two auxiliary switches, one connected to part of the windings of its series and to one of the sources of current and the other connected to the remainder of said windings and to the other source of current, substantially as described.

16. An electric organ having multiple point key switches, two sources of current of different voltage respectively connected to two contacts of each key switch, a number of series of magnet windings for causing sounding of the organ pipes, one winding of each series being connected to a third contact of each switch, and a stop switch for each series of windings, said stop switches each being connected to both sources of current, with multiple condensers connected to each key switch, each of said switches having its terminals respectively connected to the terminals of the condenser, substantially as described.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

WILLIAM R. WHITEHORNE.

Witnesses:

EVA L. MILLARD,

FRANK V. GRINDEN.