July 29, 1930. E. J. BUCHHEIM 1,771,841

SETTER MECHANISM FOR STOP COMBINATIONS OF ORGANS

Filed May 28, 1928 3 Sheets-Sheet 1

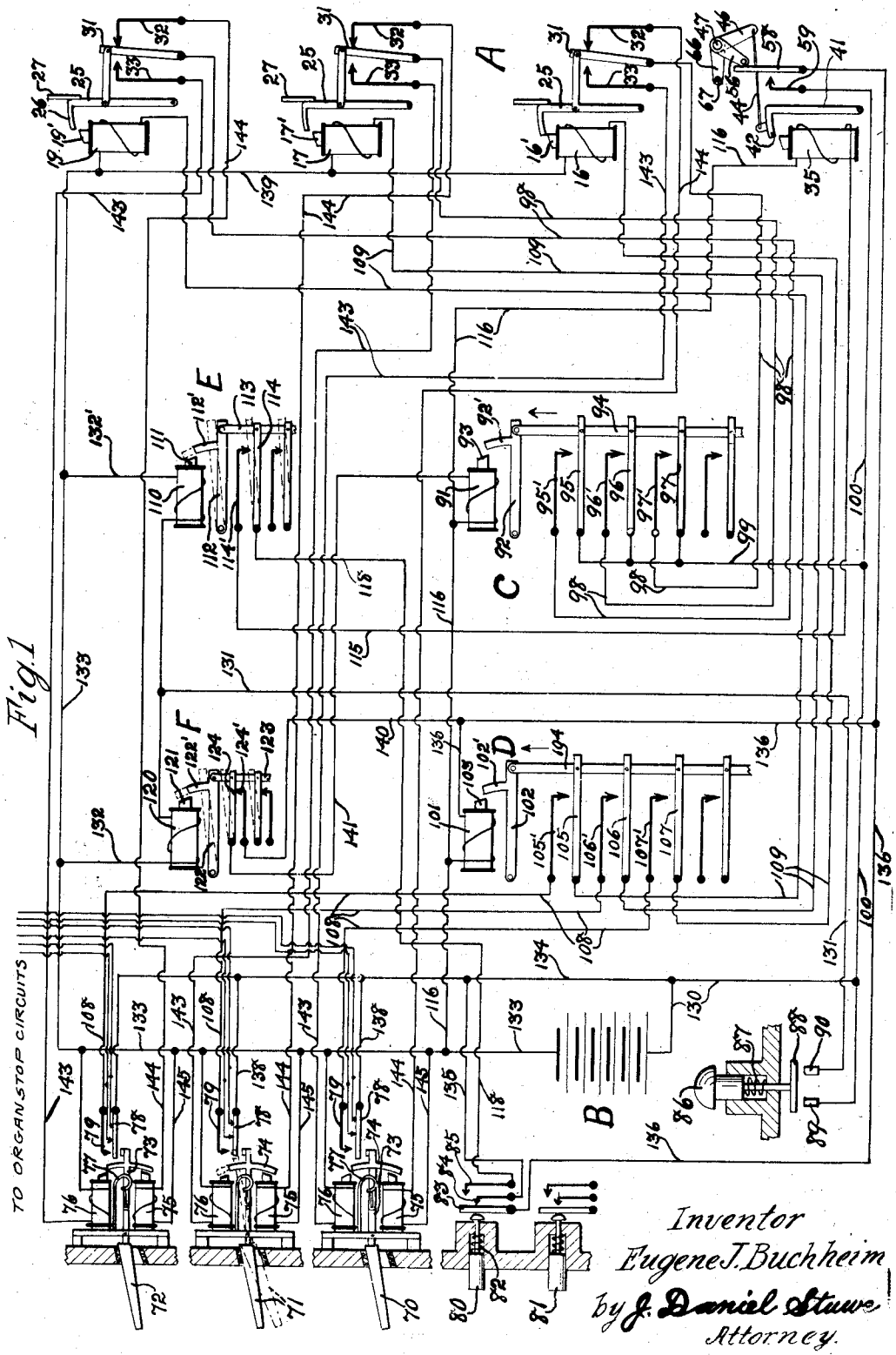


Fig. 1

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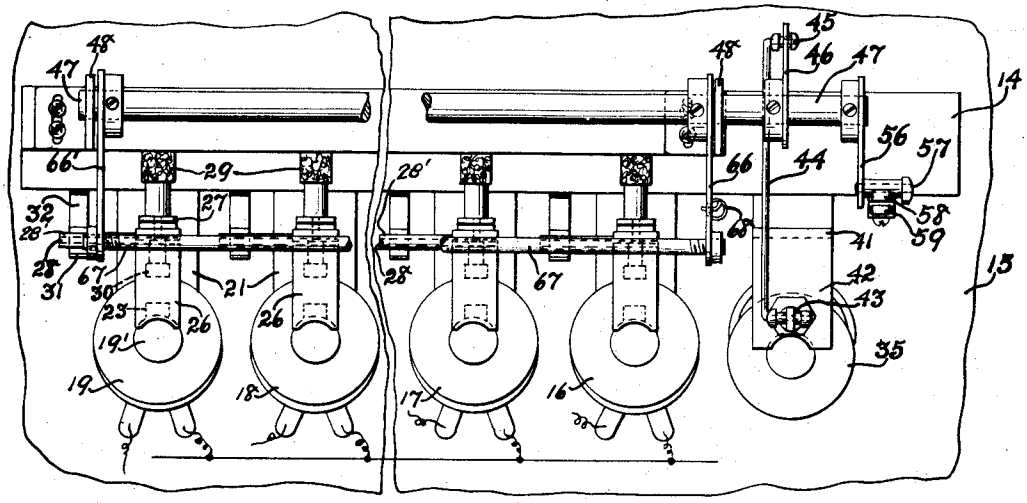


Fig. 2

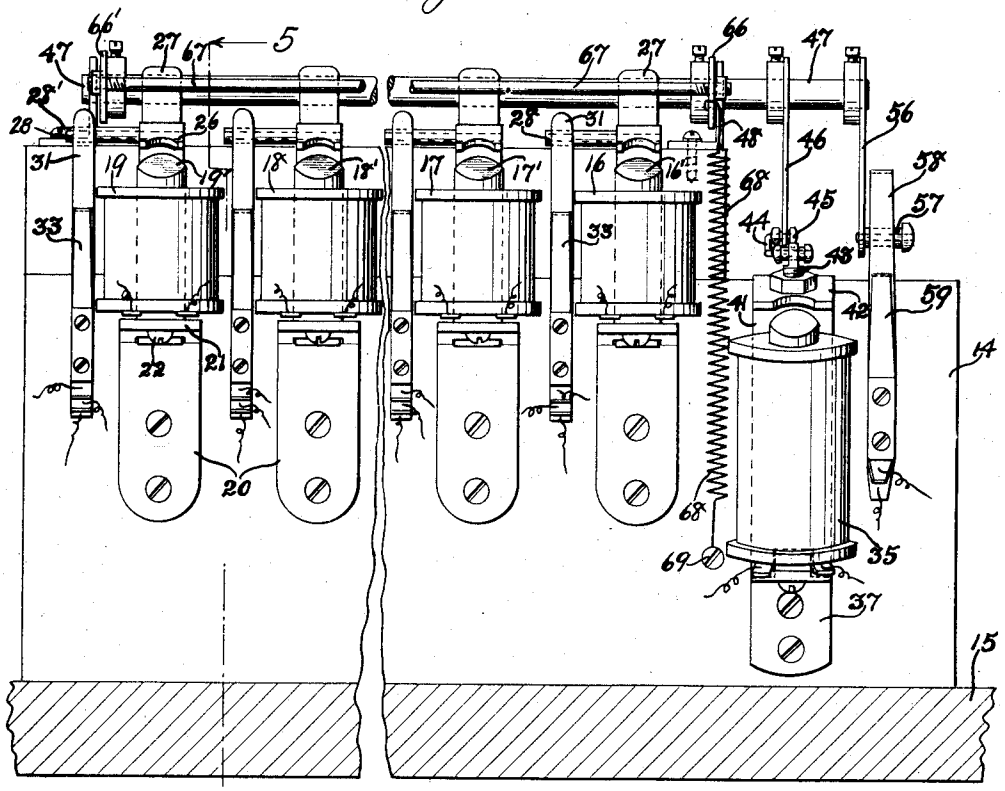


Fig. 3

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SETTER MECHANISM FOR STOP COMBINATIONS OF ORGANS

Filed May 28, 1928 3 Sheets-Sheet 3

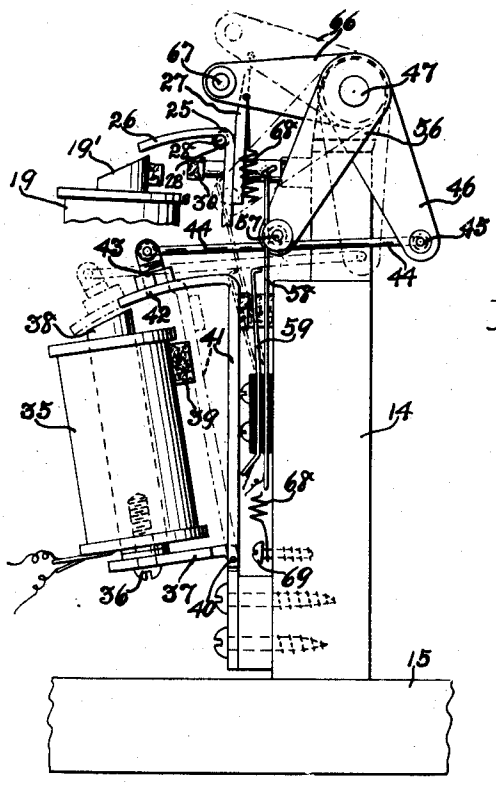


Fig. 4

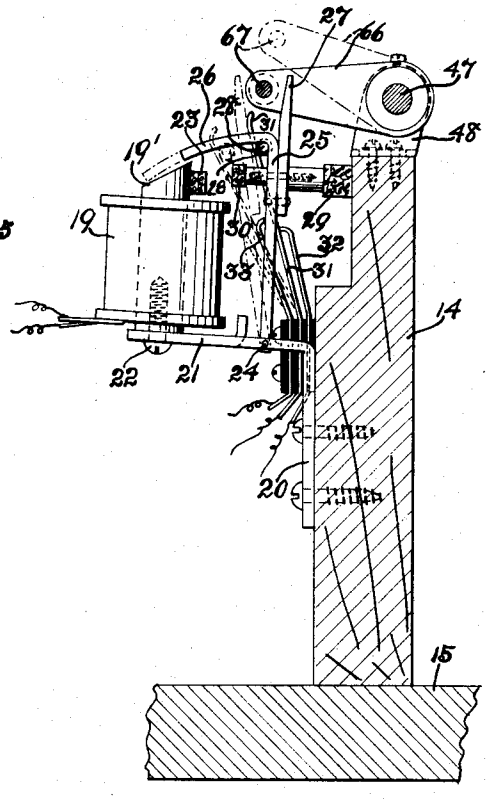


Fig. 5

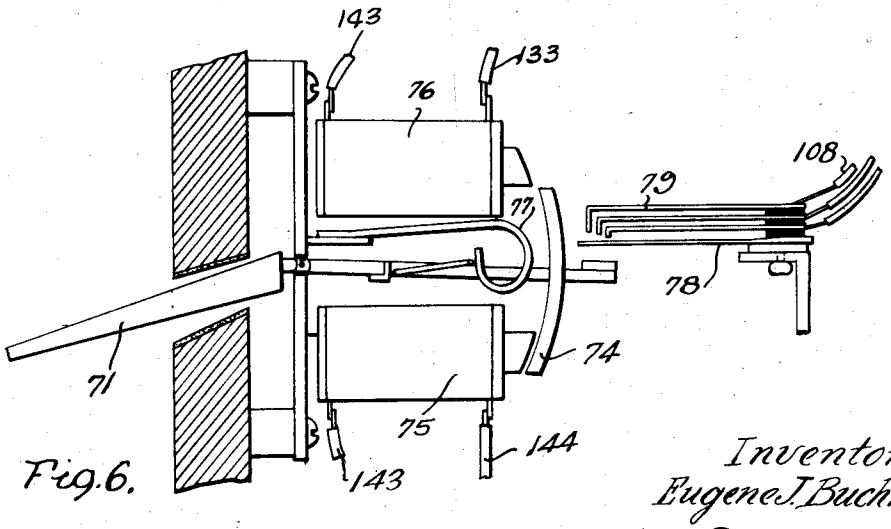


Fig. 6.

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UNITED STATES PATENT OFFICE

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SETTER MECHANISM FOR STOP COMBINATIONS OF ORGANS

Application filed May 28, 1928. Serial No. 281,179.

My invention relates to setter mechanism for stop combinations of organs, and more particularly to mechanism for conveniently and rapidly setting-up or locking one or a number of organ stop keys in combination, during the playing of the organ.

The main object of this invention is to provide a setter mechanism which will enable the organist of any type of console, whether equipped with curved or straight stop key board, to conveniently and quickly set-up the desired stop key combination from the organ bench, and while the organ is being played, just as well as when it is at rest. A further object of the invention is to provide a setter mechanism whereby the organist can set up as well as bring into service repeatedly and alternately various stop key combinations without leaving his bench and while playing the organ. Another object is to provide a setter mechanism which is especially adapted for a direct electric organ, and which comprises a setter bar unit operated entirely by electricity, for setting-up and also for operating the stop key combinations, in contradistinction from the mechanisms which have mechanical or manual control, or electro-pneumatic control as used on the electro-pneumatically operated pipe organs. A still further object is to provide a setter bar unit and electric switch means and circuit means for combining said setter bar unit with a combination piston, a unit for each piston, for electrically setting-up as well as operating a combination of stop keys by the depression of said combination piston. Another object is to provide such a mechanism which includes a toe piston or master piston combined with the combination piston and the setter bar unit to enable the setting-up of the stop key combination from the organ bench, and during the time that the organ is being played.

The above objects and other objects and advantages are attained with this invention, as will become apparent from the following description, taken in connection with the accompanying drawings.

With my improved mechanism installed in the organ, the organist can, while playing the organ, and whenever he has observed a desirable tone effect by the use of several stop keys depressed in combination, retain this combination of stop keys and lock the same together in combination with any selected piston, by depressing first the toe piston and then depressing also the combination piston, while said desired stop keys are depressed, thus enabling him to at any time and immediately set-up a combination of these particular stop keys, without leaving the organ bench, and even while he is in the act of playing the organ.

Referring to the drawings:

Fig. 1 is an electric wiring diagram illustrating my invention in its preferred form as applied to a pipe organ; Fig. 2 is a top plan view of the setter bar unit or setter device, as mounted in position in an organ; Fig. 3 is a front elevation thereof; Fig. 4 is an end elevation thereof; Fig. 5 is a vertical section along line 5—5 of Fig. 3; and Fig. 6 is a detail view illustrating the organ stop magnets and armature with the electrical connections thereof indicated as connected with the organ stop circuits.

In Figs. 2 to 5 of the drawings, I have illustrated a setter bar unit or setter device specifically, which forms the essential feature of my novel setter mechanism, being driven entirely by electricity and especially adapted for a direct electric organ, without the interposition of pneumatics; and this setter bar unit comprises a board or frame bar 14 supported on a suitable member 15 in the organ. Upon said bar 14 are mounted a plurality of electromagnets 16, 17, 18 and 19, by the use of angle-brackets 20 which are secured to said bar and have the electromagnets attached thereto on bracket arms 21, by a screw 22. These magnets are provided with cores 16′, 17′, 18′ and 19′, each of which carries a cushioning pad 23. Pivotally connected also to arm 21, by a pin 24, is an armature 25, having a curved end 26 adapted to be attracted by the magnet core, as shown in dot-and-dash lines in Fig. 5. Each of said armatures carries a vertical plate or arm 27, and a laterally extending pin 28 with an insulating sleeve 28′ thereon; while cushioning

pads 29 and 30 are mounted on either side of the armature to limit the movement thereof. Spring contact members 31, 32 and 33 are mounted, with insulation therebetween, on bar 14, said member 31 being in engagement with pin 28, and being normally held in engagement with spring contact 32, and being adapted to be moved into engagement with spring contact 33 when the armature is moved to the "on" position.

A master magnet 35 is secured with a screw 36 to angle-bracket 37 mounted on bar 14, said magnet having an iron core 38 and carrying a pad 39. Pivoted by a pin 40 upon bracket 37 is an armature 41, which has a curved end 42 movable across the end of core 38 when the magnet is energized. Pivotally mounted on a bracket-lug 43 on curved end 42 of the armature is a connecting rod 44 pivoted by a pin 45 to an arm 46 which is secured to a shaft 47 held by brackets 48 at the top of bar 14. An arm 56 is secured to the end of shaft 47, near arm 46, and carries a pin 57 with an insulating sleeve thereon for engaging and moving a spring contact member 58 into engagement with a companion spring contact member 59. Arms or links 66 and 66′ are also secured to said shaft 47, and at their outer ends carry the setter bar or setter rod 67. A spring 68 has one end connected to link 66 and the opposite end connected at 69 to frame bar 14, for normally holding the setter rod 67 and the associated mechanism in the set or locking position.

It is to be noted that when the electromagnet 35 is energized, the curved end 42 of armature 41 is drawn across the end face of core 38, and thereby the shaft 47 is rotated and links 46, 56 and 66 are moved to release position, as shown in dot-and-dash lines, in Fig. 4. When the setter rod 67 and setter bar unit is in that position, the armatures 25 may be actuated by their magnets 19 and the position of the armatures will be as shown in dot-and-dash lines, in Fig. 5. This causes the spring member 31 to be moved out of contact with member 32, but to engage spring contact member 33. Breaking of the circuit which energized master magnet 35 will cause shaft 47 and setter rod 67 to be returned to the original position, and as seen from Fig. 5, this setter rod 67 will be below the top of arm 27, then if the circuit of magnet 19 is broken, the armature and arm 27 will be held in that position by rod 67, as shown in dot-and-dash lines in said Fig. 5.

The above described elements form the setter bar device, or the setter bar unit "A", which is the main and essential feature of my invention. Besides this unit "A", which is connected in circuit with a suitable electric source of supply, as a battery "B", I furthermore employ other switch units, as indicated in Fig. 1, including a switch unit "C", which is effective only during operation of a combination of stop keys; and a switch unit "D", which is effective during the setting-up and during the use of a combination. These two units are both active in operating a combination of stop keys, and may thus be termed operating switch units. The switch unit "C" is furthermore effective in returning to the "off" position or excluding any depressed stop key not desired in the involved combination, and thus also functions as a selecting unit or an excluding unit. One unit "C" and one unit "D" is used in conjunction with each unit "A". In addition to said units I also employ switch units "E" and "F", one of each being used in an organ, and these two constitute setter switch units, being chiefly active when the combination is being set-up.

In Fig. 1 I have illustrated diagrammatically my entire invention or entire setter mechanism, and as applied to electrically operated organs, but this invention may likewise be applied to other types of organs. In this diagram my invention is illustrated in conjunction with 3 stop keys, 70, 71 and 72, and with 3 control magnets, 16, 17 and 19, of the setter bar unit "A", one control magnet for each stop key; and it may here be noted that setter bar unit "A" has a control magnet or means for each stop key which is under control of the associated combination piston. Each stop key has means for actuating it, which is preferably in the form of a switch closely associated with the key and which includes an armature bar 73 attached to the stop key and bearing the curved arms 74 at the outer end, and each stop key is provided with a pair of electric magnets 75 and 76, between which the armature bar 73 is mounted, a retaining spring 77 being provided to hold each stop key and its armature in its "on" or its "off" position. Provided with each key is a switch comprising two spring contact members 78 and 79, which are mounted with proper insulation on a suitably supported bracket, indicated in Fig. 6; and by moving the stop key from "off" to "on" position, or from full line to dot-and-dash line as indicated in Fig. 1, either by hand or by magnet 76, the switch member 78 is brought into contact with its companion member 79. In such "on" position said switch member 78 also closes an electric circuit through elements *c* in Fig. 6, which operates the stop mechanism that the stop key controls in the usual way.

In the drawings I have illustrated two combination pistons 80 and 81, the piston 80 being illustrated herein as fully connected or set-up, and being shown in conjunction with the other operating elements and means of the setter mechanism, one setter bar unit "A" being provided for each piston. The other pistons, as 81, are similarly connected

and equipped in the organ. This piston 80 is normally held out of operation by a spring 82. Depressing the pistons moves contact member 83, and thereby first making a contact with the spring contact member 84, and thereafter with the spring contact member 85.

My setter mechanism comprises a master piston or combination setter, which is preferably in the form of a toe piston 86, and is operated in setting each of the various stop key combinations, being connected with all the various combination pistons, for conjoint action with any one thereof in setting up a combination on that combination piston. This toe piston 86 is normally held inoperative by a spring 87, and when depressed moves a contact bar 88 for closing the circuit between the companion contact members 89 and 90.

The switch unit "C" comprises an electromagnet 91 and a pivoted armature 92 having its curved arm 92′ movable across the end of magnet core 93. The armature operates a bar or member 94 which moves pivoted contact members 95, 96 and 97 into engagement with their resilient contact members 95′, 96′ and 97′, one pair of these contact members being provided for each stop key which is combinable with a combination piston and its associated setter bar unit. The resilient contact members 95′, 96′ and 97′ are connected through wires 98, to the middle contact members 31 of the setter bar unit; while the pivoted contact members 95, 96 and 97 are connected through wires 99, 100 and 130 to the battery.

It may be noted briefly that switch unit "C", through its connection with contact member 31 of unit "A", and the wires leading therefrom to the stop key magnets 75 and 76, will operate either magnets 75 or 76, for moving the stop key either to its "off" or to its "on" position, depending on the location of contact member 31 in reference to members 32 and 33; and thus functioning as a switch unit for excluding the depressed stop keys not desired in a combination, and also functioning for including or moving to the "on" position all the stop keys which have been set and are desired to be included in the particular combination, as will be more fully described hereafter, in connection with the operation of the mechanism.

The switch unit "D" comprises an electromagnet 101 with a pivoted armature 102, having its curved end 102′ movable across the core 103 of the armature. A member or bar 104 is connected to said armature and to the pivoted contact members 105, 106, and 107, to move them into contact with their companion resilient contact members 105′, 106′ and 107′, one pair of contact members being provided for each stop key. The resilient contact members 105′, 106′ and 107′ are connected by wires 108 to contacts 79 of the stop key switches; while members 105, 106 and 107 are connected by wires 109 to the electromagnets 16, 17 and 19 of setter bar unit "A", to energize the same and to operate their armatures, for moving contact members 31 into engagement with contact members 33. This unit is active in setting-up a combination of stop keys, as well as in operating or using said combination, as will become apparent from the following description.

These switch units "C" and "D", also "E" and "F", may be of any suitable construction, and are preferably like that disclosed in U. S. Patent 1,589,031, granted to Louis J. Wick, June 15, 1926, for switch mechanism.

Switch unit "E" comprises an electromagnet 110 with a core 111 and a pivoted armature 112 with its curved end 112′ to cooperate with the end of core 111. A member or bar 113 is attached to the armature and operates the pivoted contact member 114 to move it into engagement with the resilient contact member 114′, one set of contact members being used in conjunction with each setter bar unit "A". The resilient contact member 114′ is connected by a wire 115 with the master magnet 35 of the master switch, to energize it, and therefrom continues a wire 116 to the return wire 133, leading to the battery. The pivoted contact 114 is connected through a wire 118 to contact member 85 of the switch of combination piston 80. One such unit "E" is used in an organ, and one pair of such contact members is used in conjunction with each setter bar unit "A". This unit is operative, in setting a combination, for energizing master magnet 35.

The switch unit "F" comprises an electromagnet 120 with its core 121, and the armature 122, with its curved end 122′ cooperating with the end of core 121. A member or bar 123 is connected to the armature and is adapted to move the pivoted contact member 124 out of contact with its companion contact member 124′, when the electromagnet is energized. One such unit "F" is used in an organ, and one pair of these contact members is used in conjunction with each setter bar unit "A". This unit is operative only during setting-up a combination, and then functions expressly to place the switch unit "C" inoperative during such setting-up of the stop keys in the combination, as will be more fully apparent from the disclosure hereafter.

These two switch units "E" and "F" provide setter units, being effective during the setting-up of stop keys in the combination.

The operation of the setter mechanism is as follows:

In setting-up a combination of stop keys by the use of my improved setter mechanism, the toe piston 86 is depressed, thereby clos-

ing the circuit through contacts 89 and 90, by bar 88, thus establishing an electric circuit from battery "B" through wire 130, through contacts 89 and 90, through wire 131, through both of the electromagnets 120 and 110 of unit "F" and unit "E", and from them through the wires 132 and 132', respectively, to the return wire 133, and back to the battery; thereby energizing cores 121 and 111, and operating the armatures 122 and 112, therewith separating the contact member 124 from member 124' of unit "F", and at the same time engaging contact member 114 with 114' of unit "E". In the meantime, and in conjunction herewith, the combination piston 80 is depressed and contact member 83 first comes in contact with member 84, thereby closing the circuit from the battery through wires 130, 134 and 135, through contact members 84 and 83, through wire 136, through magnet 101, through wires 116 and 133, back to the battery. Thereafter, by the further movement of contact member 83 it is also brought in contact with member 85, whereby another circuit is closed from battery "B" through wires 130, 134 and 135, switch contacts 84, 83 and 85, through wire 118, through contact member 114 and 114', through wire 115, through the master magnet 35, therefrom through wires 116 and 133 back to the battery. This action also moves the armature 41 of the master magnet 35, as previously described, and as better illustrated in Fig. 4, and at the same time rotates shaft 47 and raises arms 66 and 66' with setter rod 67. This action releases vertical arms 27 of armatures 25 to permit movement thereof, as previously described. The armature also closes the circuit through contact members 58 and 59. Hereupon the particular or selected stop keys, which are to be included in the particular combination with the selected combination piston, are depressed into the "on" position. This depression of each of these stop keys moves the contact member 78 of its switch into engagement with contact member 79, thereby closing the associated circuit. With the stop key, as 71, thus depressed, an electric circuit is closed from the battery through wires 130, 134 and 138, through contact 78 and 79, through wire 108, contact 106', and 106, through wire 109 to magnet 17, and therefrom through wires 139 and 133 back to the battery. Closing of said circuits moves armature 25, into the position shown in dot-and-dash lines in Fig. 5, which also moves contact member 31 out of contact with member 32 and into contact with member 33, thereby advancing arm 27 of said armature into position to be held set by the setter rod 67. The setting and including of other stop keys in this combination is similarly produced.

After all the desired stop keys have been set or combined with the selected combination piston 80, in the desired combination, this piston is then released, thereby first breaking the circuit between contact members 85, 83 and 84, and therewith breaking the circuit which was established from the battery through the master magnet 35, said circuit being fully described in the preceding paragraph, consequently disenergizing said master magnet, then the armature 41 is free to swing back into its original inoperative position. A quick and positive return movement of said armature and the associated parts is assured by the action of spring 68. It should be observed that the setter rod 67 is thereby returned to its holding or locking position, to retain arms 27 and armatures 25 of the desired stop keys in their set positions, as shown in Figs. 4 and 5, and described in connection therewith.

The further releasing movement of combination piston 80 then also breaks the electric circuit through magnet 101 of switch unit "D", thereby opening the switches 105, 105', etc., which control the magnet 16, 17, etc., of setter bar unit "A".

Hereafter the toe piston 86 is released, whereby the circuits through magnet 120 of switch unit "F", and through magnet 110 of switch unit "E", are opened and their armatures are permitted to return to their original positions, as shown in full lines in Fig. 1.

It may be observed from the above description, that this setting-up of the combination of stop keys may be accomplished by the organist from the organ bench, and during the playing operation of the organ, since the setting operation requires only the operating of the combination piston and the toe piston, controllable from the organ bench, in conjunction with the stop keys to be included in the combination.

Now, whenever it is desired to use this combination of stop keys connected with this piston 80, it is merely necessary to depress this piston 80 which closes the plurality of circuits, one of which is from the battery "B" to the wires 130, 134, and 135, through contacts 84 and 83, through wires 136 and 140, through members 124' and 124, through wire 141, through magnet 91 of switch unit "C", through wires 116 and 133, and back to the battery. This circuit operates the armature 92 which closes the plurality of circuits included in switch unit "C", one circuit for each stop key. One of the circuits, through stop key 71, is herewith described. This circuit is established from battery "B" through wires 130, 100 and 99, through contact members 96 and 96', through wire 98, through contact members 31 and 33, through wire 143, through magnet 76, provided with stop key 71, through the wire 133

and back to the battery. This circuit will throw the armature 73 of stop key 71, into the position shown in dot-and-dash lines. The depression of piston 80 also brings switch unit "D" into action, by closing a circuit from the battery through wires 130, 134 and 135, through contact members 84 and 83, through wire 136, through electro-magnet 101 of switch unit "D", through wires 116 and 133, back to the battery. This circuit energizes magnet 101, which causes its armature 102 to swing in the direction of the arrow, thereby closing a plurality of circuits through its pairs of contacts, as 106 and 106', which operates the electro-magnet 17, as previously described. All other closed circuits of switch unit "C", which are associated with stop keys not included in the present combination, operate the electro-magnets 75 of the other stop keys, the circuit of one being from battery "B" through wires 130, 100, and 99, through contacts 97 and 97', through wire 98, through contacts 31 and 32, through wire 144, through magnet 75 of stop key 70, and through wires 145 and 133, back to the battery. This functioning of unit "C" and its energizing of magnets 75 of those stop keys which are not included in the present combination, but having remained in the "on" position, from previous individual use or from a different combination with one of the other pistons, as piston 81, causes these keys to be returned thereby into their "off" position and held therein by means of their retaining spring 77. This unit "C" thus provides means to positively exclude all other stop keys which are not included or desired in the present combination.

To release or return to unset position any combination of stop keys which has been set-up with a certain combination piston 80, the toe piston or master piston 86 is depressed, and the particular combination piston which is combined with this stop key combination is also depressed, thereby energizing the master magnet 35, which through its armature actuates shaft 47, thereby raising setter rod 67 to clear vertical arms 27, in order that the armatures 25 may be returned to the original released positions, by means of the resiliency or spring action of contact spring members 31.

It will be apparent from the above disclosure that the toe piston or master piston 86 is used only during setting-up of a combination of stop keys, and that the combination piston 80 is used during the operation or playing of the combination as well as during the setting-up thereof. It is also apparent that switch units "C" and "D" have their magnets 91 and 101 actuated by the depression of pistons 80, and are thus operative during the operations or use of a combination piston and the connected stop keys; also that the switch elements of unit "C" are connected with switch elements 31 of setter bar unit "A" and through its elements 32 and 33 are connected with magnets 75 and 76 of the stop keys for operating same; and that the switch elements of unit "D" are connected with the coils of the magnets 16, 17 etc., of unit "A", and therefrom connected with magnets 75 and 76; also that through this connection the units "C" and "D" are included in the circuits through said magnets 75 and 76. These two units "C" and "D" thus constitute operating units, being effective during the operation or use of a combination of stop keys operated by combination piston 80. It is also evident that switch units "E" and "F" have their magnets 110 and 120 actuated by the depression of toe piston 86, and are operative only during the setting-up of a combination of stop keys; and that unit "E" has its switch elements connected with master magnet 35 of unit "A" for operating the setter bar elements and setter rod 67 for setting-up or locking a combination of stop keys; while unit "F" has its switch elements connected with magnet 91 of unit "C", and by operating the magnet of unit "F" its switch elements are separated thereby dis-energizing magnet 91 of unit "C" to open the switches of said unit "C". Switch unit "F" thus only functions as a cut-out unit, to cut-out unit "C" and prevent said unit "C" from actuating the magnets 75 and 76 during the setting-up operation, so as to leave the stop keys to be initially set-up by hand only. It is further apparent that switch unit "C" is adapted to operate only during the use or operation of a combination of stop keys, and that during such use its switch elements are connected through elements 31 of unit "A" either with elements 32 for actuation of stop key magnets 75, or with elements 33 for actuation of stop key magnets 76, according to the position of elements 31 and their connected armatures 25 and arms 27, according to whether included in the combination or excluded therefrom, thus constituting of switch unit "C" also a unit for operating the stop keys which have been included in the present combination, and for excluding the stop keys which are not desired in the combination but have remained depressed. It is also apparent from the above that I have provided a setter mechanism which is operated entirely by electricity, and includes the setter bar unit for setting or locking the stop keys in combination, and that said combination can be set-up from the organ bench, during the playing, and immediately and conveniently, whenever the use of a group of stop keys is observed to have produced a pleasing tonal effect.

What I claim as my invention and desire to secure by Letters Patent is:

1. In an organ, the combination with stop keys and means for actuating the same, a combination setter mechanism including a

setter bar unit having a swingable setter rod and electric control means to operate it for locking desired stop keys in combination, a selecting switch unit connected with said setter bar unit and through it with said actuating means for selectively operating stop keys desired in the combination and for excluding depressed stop keys not desired in the combination, a circuit including a piston and both of said units for actuating said mechanism to operate the stop key combination, a master control means operable from the organ bench, and a circuit connecting said master control means and the setter bar unit, for setting-up a combination of stop keys on said piston from the organ bench.

2. In an organ, the combination with stop keys and means for actuating the same, a combination piston for said stop keys, a setter mechanism including a setter bar unit having switches and an operating magnet for each switch, a switch being connected with each stop key actuating means, each magnet having an armature with an arm thereon, a setter rod for engaging and holding all of the arms selected, thereby controlling their switches and stop key actuating means, and electric means associated with said switches and with said piston and being controlled from the organ bench, whereby to set-up and to use a combination of stop keys from said bench.

3. In an organ, the combination with stop keys and means for actuating the same, a piston for said stop keys, a setter bar unit including switches connected with said actuating means, a magnet and an armature for operating each switch, a stop arm extending from each armature, a setter rod extending over said setter bar unit, means for swingably mounting said rod on said unit, a master magnet having an armature connected with said mounting means for swinging said rod upwardly out of the paths of movement of said arms during the setting-up operation, to drop back into said paths and hold said arms and armatures thereafter, and circuit and switch means connected with said master magnet and with said setter bar unit, and including master control means operated from the organ bench, for setting-up the combination of stop keys from said bench.

4. In an organ, the combination with stop keys and actuating means therefor, a piston for said stop keys, a setter bar unit having a setter member and several switches, one for each stop key, magnet for controlling said switches, each magnet having an armature with an arm thereon engageable and controllable by said setter number, a master switch and master magnet for operating the setter member, an operating switch unit connected with said several switches, and a master piston and switch units connected with the first said switch unit and with the setter bar unit, for setting-up a combination of stop keys by actuating them while operating both of said pistons from the organ bench.

5. In a direct electric organ, the combination with stop keys and means for actuating the same, a combination piston for said stop keys, a setter device connected with said piston and including control switch means connected with the actuating means for operating the same, there being one control switch means for an actuating means of a stop key, operating switch units connected with the control switch means on said device and therethrough operating said actuating means by the depression of said piston, setter switch units connected with said setter device and one of said units being effective for cutting-out one of said operating switch units, during setting-up of a combination of stop keys, and a master control member operated from the organ bench and connected with said setter switch units for controlling them and thereby said setter device, for setting-up a stop key combination, on said piston, from the organ bench.

6. In a direct electric organ, the combination with stop keys and a plurality of actuating means for moving them to the "on" and "off" positions; a combination piston for said stop keys; a setter bar unit connected with said piston and including magnet controlled switches for said actuating means, one switch for each stop key, said unit also including a single swingable setter member and master control means for swinging the setter member upwardly; switch means electrically connected with said master control means; a master control member operable from the organ bench, for operating said unit switches and said master control means to move the setter member first to its released and then to locking position for setting-up a combination of stop keys on said piston from the organ bench; and operating switch units electrically connected with said unit switches and their magnets for operating said stop key combination by said combination piston.

7. In a direct electric organ, the combination with stop keys and actuating means therefor including swtich means with members for moving said keys to their "on" and "off" positions; a combination piston for said stop keys; a setter bar unit comprising magnet controlled switch means, one means for each stop key, also comprising a setter member and a master magnet and means for actuating the setter member to move said member to its released and to its locking positions; an operating switch unit connected with the control magnets of said switch means and with said piston; a second operating switch unit connected with said piston and with said switches and through them with the actuating means switches, for including

the selected stop keys and excluding the other stop keys; setter switch units connected with the piston, and one thereof being connected with the master magnet to actuate it and operate the setter bar unit, the second setter switch unit controlling the second operating switch unit to exclude it during the setting-up of a combination; and a master piston with circuits connected with said setter bar unit and both setter switch units for operating the mechanism in setting-up a combination from the organ bench.

8. In an organ, the combination with stop keys and actuating members therefor, each key having a pair of members to move it to "on" or "off" position; a setter bar unit comprising several operating means, one for each pair of said actuating members, and each operating means including a double switch with branch contacts connected with the pair of said members, also including a control member for each double switch to move it to its "on" or "off" position, said unit also comprising an upwardly swingable setter member and a master magnet for raising said setter member which descends when said magnet is de-energized, and retaining means on each operating means to be engaged by the descended setter member and to be held in its "on" position; a selecting switch unit including switches connected each with a common contact member of one of said double switches for operating through it and through its branch contact upon the particular actuating member, for including the desired stop keys and excluding the other stop keys; and means combined with said units for operating them from the organ bench to control a combination of stop keys.

9. In an organ, the combination with stop keys and magnets for actuating same, there being a pair of actuating members for each stop key, also a switch and an armature for said pair of magnets for operating said switch; a setter bar unit comprising several operating means, one for each pair of said magnets, and each operating means including a double switch connected with a pair of said magnets, also a control magnet for moving the double switch to "on" position, said unit also comprising a setter member and master control means for moving it, and retaining means on each operating means to engage the setter member for selectively holding said operating means either in its "on" or its "off" position; an operating switch unit including several switches, each one being connected with one of said stop key switches and with a control magnet on the setter bar unit; a setter switch unit connected with said control magnets and with the operating switch unit; and circuit means and piston means operable from the organ bench for setting-up and using a stop key combination from said bench.

10. In a direct electric organ, the combination with stop keys and pairs of magnets for operating same, and a combination piston for said stop keys; a setter mechanism comprising a setter bar unit including a plurality of double switches, each double switch being connected to a pair of said stop key magnets, a magnet and an armature for each of said double switches to set the latter in the "on" or the "off" position, an arm extending from each of said armatures, a setter rod extending along said setter bar unit, a master magnet having an armature and means connecting the latter to said rod for swinging the rod out of the paths of movement of said arms during the setting-up operation, said rod dropping into said paths of said arms when said master magnet is de-energized thereby holding the arms and their armatures and double switches in the set-up positions; and means connected with said master magnet and said piston, for operating the selected stop keys and double switches by said piston.

11. In a direct electric organ, the combination with stop keys and pairs of magnets therefor, and an armature for each pair to move the associated stop key to its "on" or its "off" position; a setter mechanism comprising a setter bar unit including a frame member having a plurality of double contact switches thereon, the double contacts of a switch being connected to a pair of said magnets, for moving the armature and stop key to the "on" or the "off" position, magnet and an armature on said frame member for each of said double switches, an arm extending upwards from each of said armatures of these double switches, a setter rod and means for swingably mounting it on said frame member to extend the length thereof, for engaging a plurality of said arms and holding them with their connected armatures and double switches in the "on" positions, a master magnet and an armature therefor mounted on said frame member to swing said rod upwardly while said arms and connected armatures and switches are moved to "on" positions, said rod descending to hold said arms and armatures and switches in the set-up positions when said master magnet is de-energized; and a master piston and combination piston and electric means connected with said setter bar unit, whereby to set-up and to operate a stop key combination from the organ bench.

12. In a direct electric organ, the combination with stop keys and actuating means therefor including electro-magnets for moving said keys to the "on" and "off" positions, and switches actuated by the armatures of said magnets; a setter mechanism comprising a setter bar unit including a plurality of double switches and a magnet with an armature for controlling each double switch, each double switch being connected with the electro-magnets of one of said stop keys for posi-

tively moving it to either its "on" or its "off" position, there being a stop arm on each armature of said setter bar unit, a setter rod for holding the arms and armatures selected to include the selected stop keys in a combination, a master magnet and means to swing said rod out of the paths of said arms for including the selected stop keys; a combination piston connected with said stop key switches; an operating switch unit having switches connected with the magnets which control said double switches, and having an operating magnet connected with and operated by the actuation of said piston; a second operating switch unit having switches connected with said double switches and with said piston, and through said double switches being connected with said electro-magnets of said stop keys, whereby to include the selected stop keys and to exclude all other stop keys from the desired combination; setter switch units connected with and actuated by said piston, the first thereof being connected with the master magnet to operate it for swinging said setter rod during the setting-up operation, and the second setter switch unit controlling the second operating switch unit for excluding it during a setting-up operation, whereby only those stop keys are included in the combination which have been positively actuated during the setting-up operation and all other stop keys are excluded whether they were previously moved into the "on" or into the "off" positions; and a master piston and circuits connecting it with said setter bar unit and with both of said setter switch units and with said stop key switches, for setting-up and operating in a combination only such stop keys as are positively selected and for excluding all other stop keys from said combination.

In testimony whereof I have signed my name to this specification.

EUGENE J. BUCHHEIM.