

March 27, 1928.

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E. VERLINDEN

COMBINATION STOP ACTION FOR ORGANS

Filed Sept. 25, 1924

4 Sheets-Sheet 1

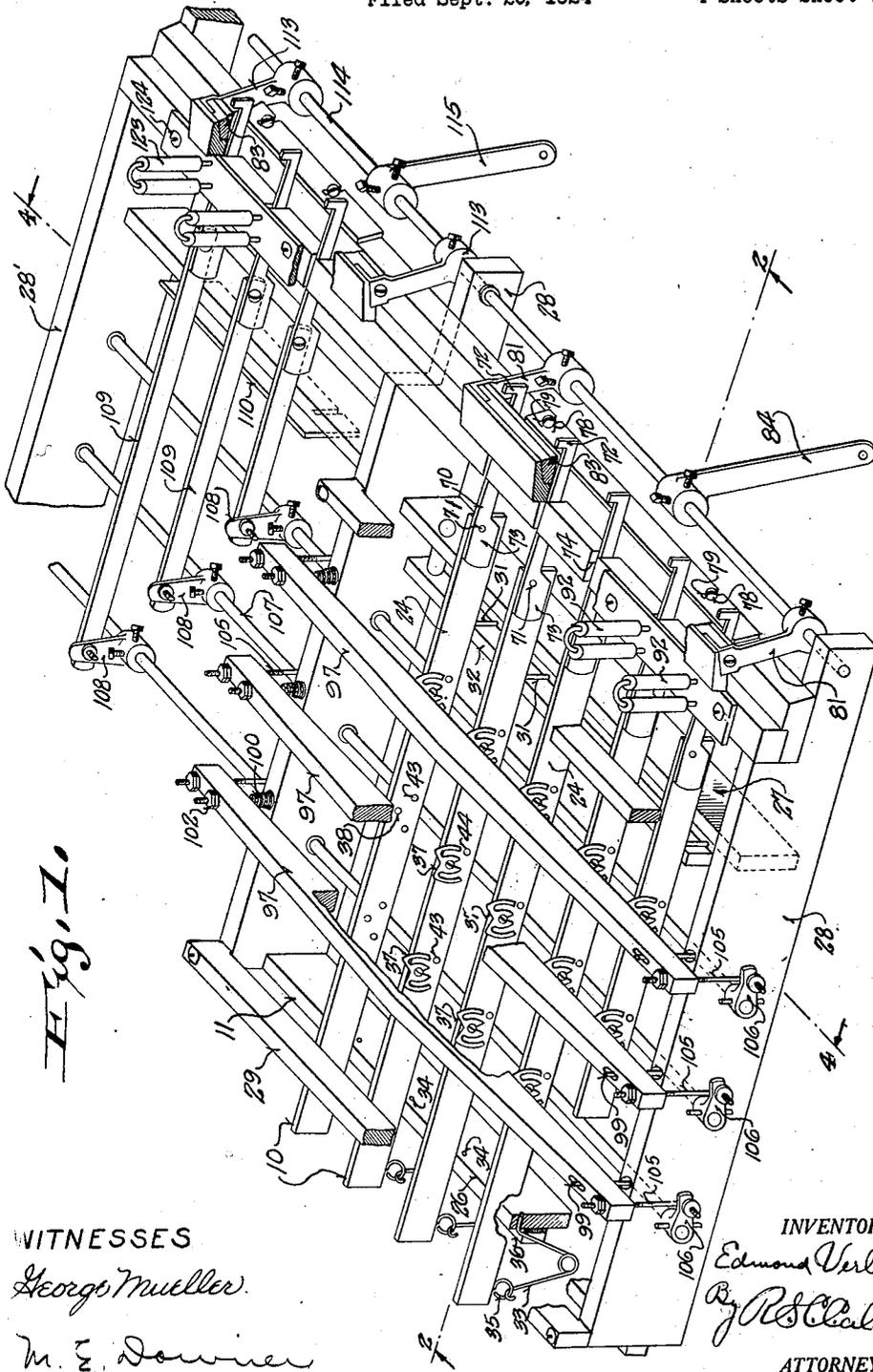


Fig. 1.

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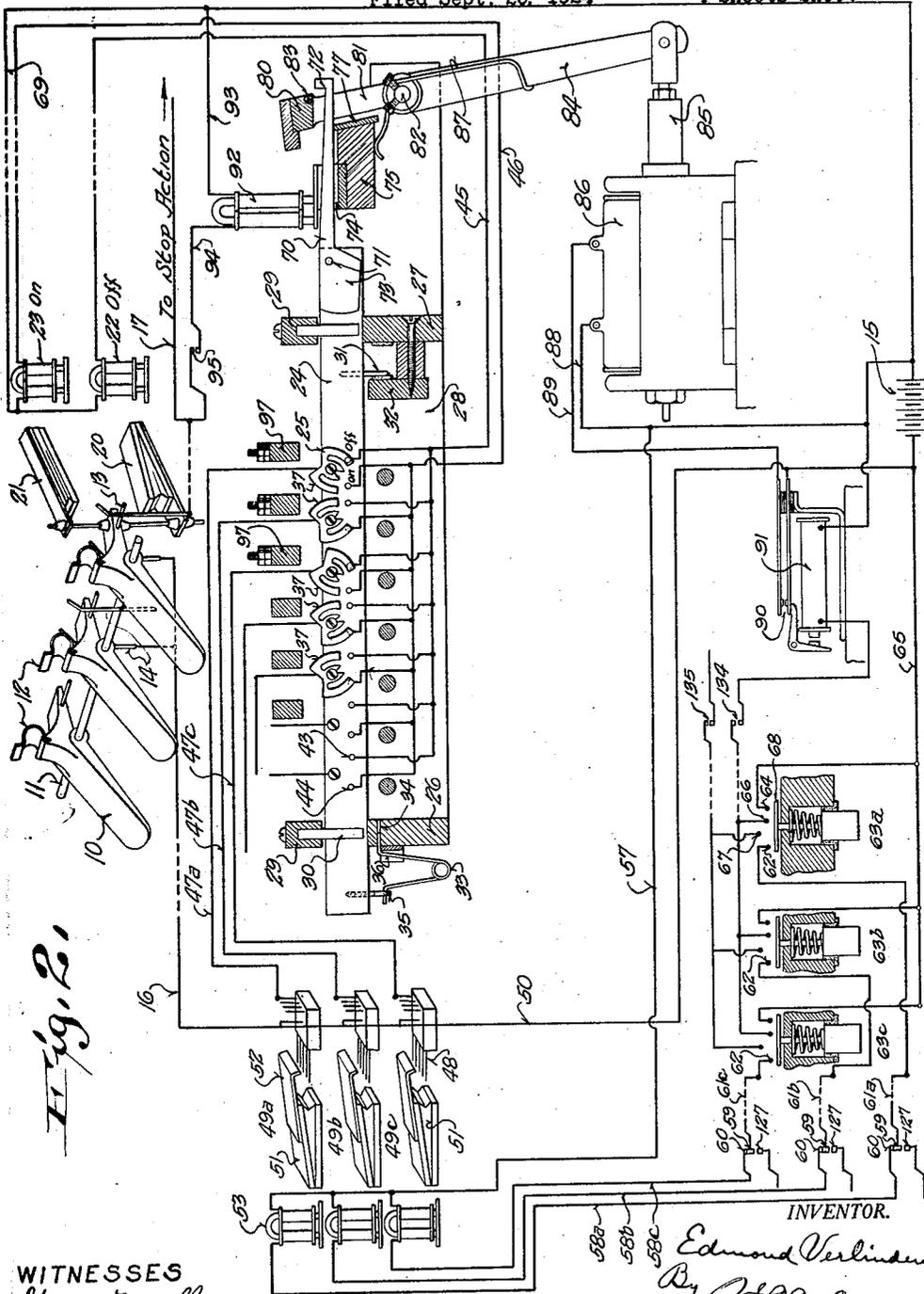
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4 Sheets-Sheet 2



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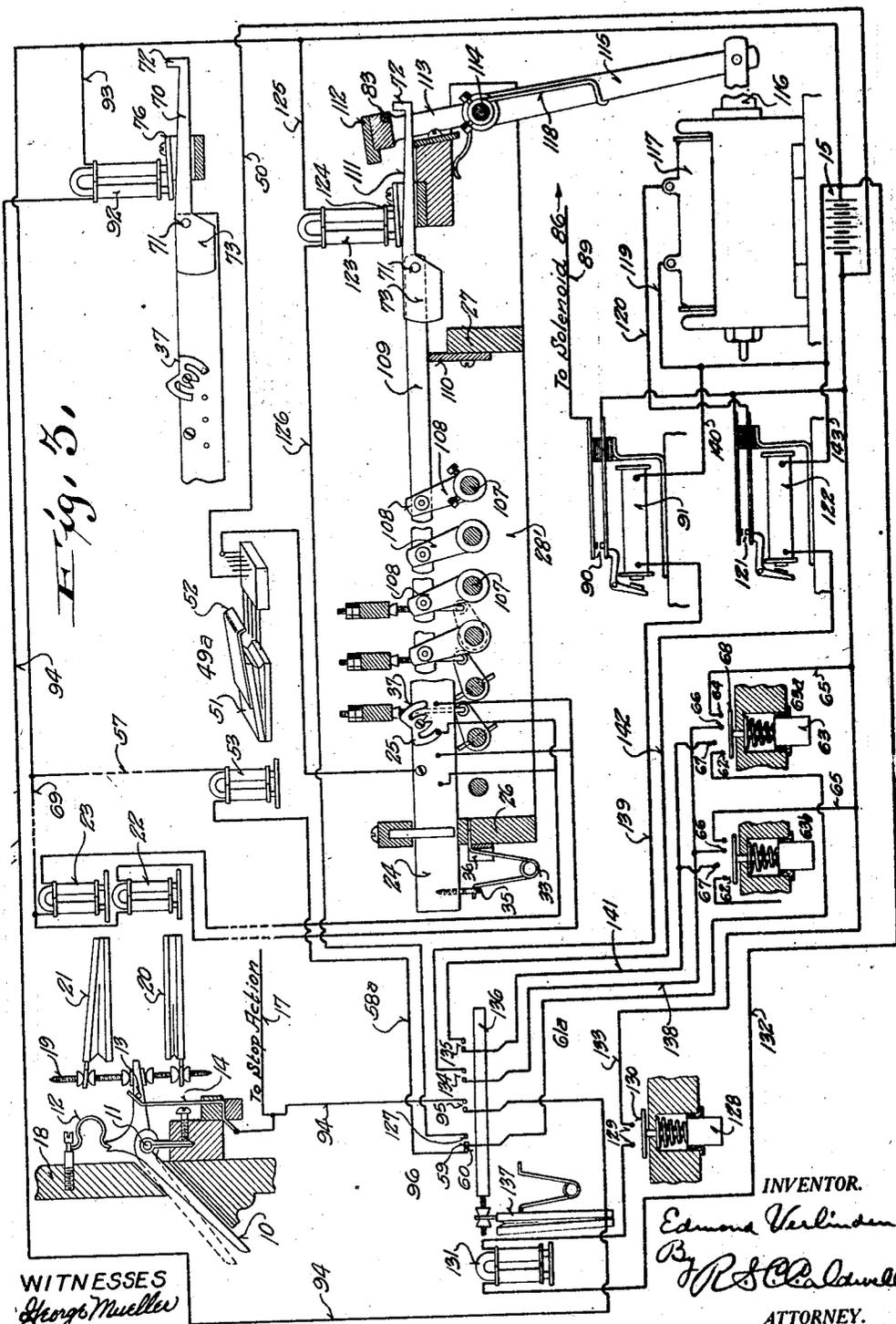
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COMBINATION STOP ACTION FOR ORGANS

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4 Sheets-Sheet 3



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4 Sheets-Sheet 4

Fig. 4.

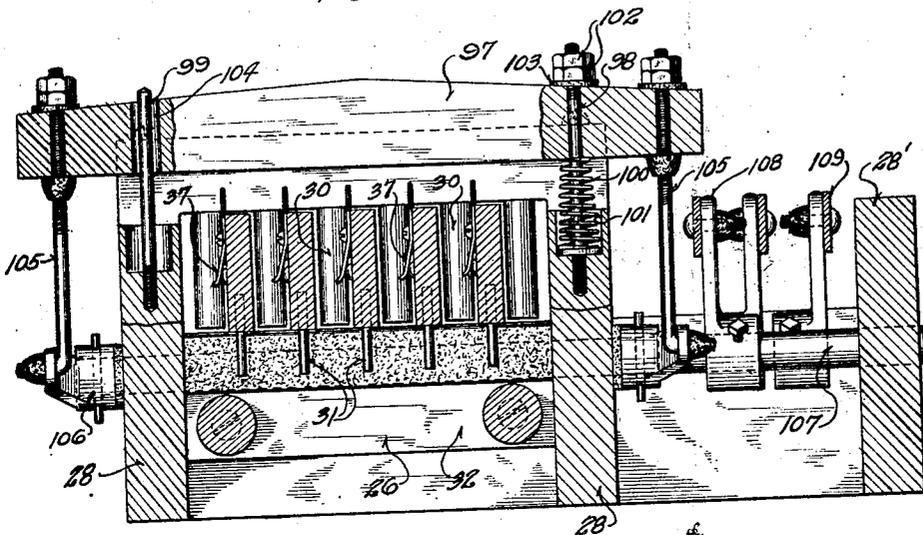


Fig. 5.

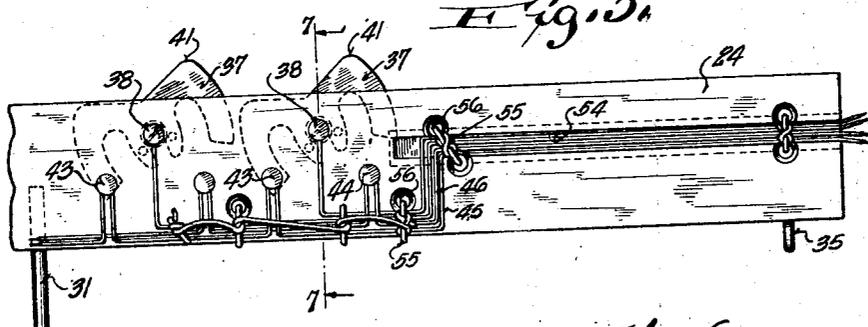


Fig. 7.

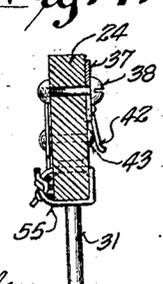


Fig. 6.

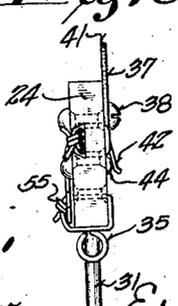


Fig. 8.



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# UNITED STATES PATENT OFFICE.

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## COMBINATION STOP ACTION FOR ORGANS.

Application filed September 25, 1924. Serial No. 739,811.

The invention relates to combination stop actions for organs.

In combination stop actions controlled from the console for both setting and bringing on the various combinations, the mechanism has heretofore been of such construction as to necessitate its disposition within the console, which has limited the number of combinations that could be provided because of the relatively small space available, and has led to difficulties when repairs or adjustments became necessary because of inaccessibility of parts.

An object of the present invention is to provide an electrically controlled mechanism for simultaneously moving a predetermined arrangement of organ stops to either operative or inoperative position, and also to permit independent actuation of any organ stop within or without the desired group without changing the group arrangement, whereby the mechanism can be disposed at any suitable location distant from the console and thereby capable of incorporating any desired number of combinations and permitting flexibility in installation; it being then possible to manufacture consoles in standard sizes regardless of the number of combinations incorporated and to readily install the mechanism in existing organs.

Another object of the invention is to provide a combination stop action mechanism including movable members carrying two-position switches of a novel design for controlling circuits admitting stops to a combination or excluding them therefrom, and means for simultaneously setting a plurality of switches to either of their desired positions.

A further object of the invention is to provide a combination stop action in which switches on the console under the control of the organist serve both to bring on combinations and to set combinations, an additional common control switch being used in conjunction for performing the latter operation.

A further object of the invention is to perfect details of construction generally to provide for simplicity and compactness.

The invention further consists in the several features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the accompanying drawings: Fig. 1 is a diagrammatic perspective view of a stop

action mechanism embodying the invention, parts being broken away and parts being shown in section;

Fig. 2 is a vertical sectional view taken on the line 2—2 of Fig. 1 and including trace bar actuating mechanism and combination establishing circuits;

Fig. 3 is a view similar to Fig. 2, but parts being broken away to show the setting elements, and combination setting circuits being included;

Fig. 4 is a vertical sectional view taken on the line 4—4 of Fig. 1;

Fig. 5 is a fragmentary detail view of a trace bar and its switch elements;

Fig. 6 is a rear end view of a trace bar;

Fig. 7 is a sectional view taken on the line 7—7 of Fig. 5; and

Fig. 8 is a detail elevation of one of the trace bar switch members.

As is well known, a pipe organ includes a number of stops and means for independently operating the same. The organ stops have not been shown in the drawings, as they are of usual construction, such as the electropneumatically controlled type. Stop operating devices in the console may be of any type, but in the drawings are shown to be stop keys 10 which are pivotally mounted for independent rocking movement on the stationary horizontal shaft 11 in the usual manner, springs 12 serving to retain the stop keys in their "off" and "on" positions and the stop keys being so arranged that they are to be depressed in order to bring them to their "on" position. In the latter position, a bridging contact pin 13 on the stop key engages a pair of relatively stationary spring contact members 14 to establish a circuit rendering effective the corresponding stop. This circuit includes a battery 15, or other suitable source of current, a conductor 16 connecting the battery with one of the stationary contact members 14 associated with each stop key, and a conductor 17 connected to the other of the stationary contact members and leading to the immediate controlling mechanism of the corresponding stop.

In the present instance, the stop keys are utilized as a common means for controlling the stops either manually or through the functioning of a combination-effecting mechanism hereinafter described. Each stop key carries at its rear end within the front wall of the console 18 a vertically extending

rod 19 by which it is moved to its "off" and "on" positions by bellows 20 and 21, respectively, operatively connected to the rod 19 and controlled by electromagnets 22 and 23, respectively. The magnets control the air supply to the bellows in the usual manner of electro-pneumatic devices common in organ construction, so that when either of the electromagnets is energized the stop key will be moved to its respective "off" and "on" positions for controlling the corresponding stop. The construction of this mechanism is, of course, subject to considerable variation according to the type of stop operating device employed. The stop operating device will be hereinafter referred to in general as a stop key.

The mechanism for the production of various combinations is placed distant from the console in any convenient location near or within the organ space and includes movable trace bars 24, there being one for each stop and each carrying a plurality of switch elements 25 equal in number to as many combinations as are desired. The trace bars are preferably disposed horizontally and are slidably mounted on transversely extending supports 26 and 27 secured to longitudinally extending housing members 28 with which they form a trace bar supporting frame. Strips 29 extending transversely above the trace bars are secured at their ends to the housing members 28 and carry depending pins 30 which serve to space and guide the trace bars. The trace bars each carry a depending stop pin 31 engageable with a stop 32 and the forward support 27 in its respective extreme positions. Each trace bar is moved to and retained in its normal rearward position by means of a V-spring 33 having one end disposed in an opening 34 in the rear support 26 and the other end hooked in a screw-eye 35 depending from the rear end of the bar. A slotted strip 36 secured against the rear face of the support 26 serves to maintain the springs in their vertical parallel position.

The switch elements 25 on each trace bar serve to control the "off" and "on" positions of the stop keys through circuits hereinafter described alternatively energizing the stop key control magnets 22 and 23. Each switch element comprises a movable switch member 37 formed of sheet metal and pivoted to rock in a vertical plane on a screw 38 or other suitable fastening device disposed near the upper edge of the trace bar. For this purpose the switch member is provided with downwardly extending spaced tongues 39 which form a fork to be slipped over the screw behind its head. The switch member is then retained on this screw by means of rounded projections 40 struck up on each tongue 39. The upper edge of the switch member is disposed adjacent the upper edge

of the trace bar and is formed to present upwardly extending projections 41 on either side of pivot fork, so that one or the other of these projections may extend above the upper edge of the trace bar in position to be moved downwardly to effect a rocking or oscillatory movement of the switch member. The switch member is provided with depending arcuate contact fingers 42 at its sides which are adapted to engage one of a pair of contacts 43 and 44, which extend through the trace bar to form wiring terminals on the opposite side, as does the screw 38. The contacts 43 on any one trace rod are all connected together and the contacts 44 are likewise connected, so that there are two sets of contacts, the contacts in each set being connected in parallel. The contacts 43 and 44 are respectively connected by conductors 45 and 46 to the stop key control magnets 22 and 23 in the console, while the screws 38 in any one trace bar are connected by individual conductors 47<sup>a</sup>, 47<sup>b</sup>, 47<sup>c</sup>, etc., to the contact springs 48 of electro-pneumatically controlled combination relays 49<sup>a</sup>, 49<sup>b</sup> and 49<sup>c</sup>, etc., there being one of these relays for each combination to be effected by the mechanism. There are as many contact springs 48 in each relay as there are trace bars, with an additional one or two for receiving a current supply conductor 50, which leads to the battery 15. The contact springs 48 in each relay are connected to the laterally adjacent switch members of the several trace bars, since one transversely extending row of switch members on the several trace bars is present for each combination. The combination relays 49<sup>a</sup>, 49<sup>b</sup>, 49<sup>c</sup>, etc., each include a bellows 51 which carries a bridging contact 52 for simultaneously establishing a connection between the supply conductor 50 and the several conductors 47<sup>a</sup>, 47<sup>b</sup> and 47<sup>c</sup>, the operation of each being controlled by an electromagnet 53. As these relays are of well known construction, they are only illustrated schematically in the drawings.

The wiring on the trace bars is shown in detail in Figs. 5 to 7 wherein the several conductors are connected to the screws 38 and the contacts 43 and 44 by soldering them to the projecting parts of these members on the side of the trace bar opposite the switch members 37. The rear portion of the trace bar is provided with a longitudinally extending dove-tail slot 54 to receive the cable formed by the several conductors, which are held therein and on the side of the bar by tied cords 55 passing through openings 56 in the bar.

The electromagnets 53 of the relays 49<sup>a</sup>, 49<sup>b</sup>, 49<sup>c</sup>, etc., have a common connection through which they are supplied with current from the battery 15 by a conductor 57, and the other sides of the magnets are connected by individual conductors 58<sup>a</sup>, 58<sup>b</sup>, 58<sup>c</sup>,

etc., to normally closed sets of contacts 59, 60, of a relay hereinafter described. The contacts 59 are connected by conductors 61<sup>a</sup>, 61<sup>b</sup>, 61<sup>c</sup>, etc., to respective contacts 62 in combination push button switches 63<sup>a</sup>, 63<sup>b</sup>, 63<sup>c</sup>, etc., which are mounted in the console for operation by the organist. Contacts 64 in each switch are connected to the proper side of the battery by a conductor 65. The switches also include contacts 66 and 67, the latter one being offset back from the contacts 62, 64 and 66 in order to be engaged by a bridging contact member 68 after it has engaged the other contacts. The bridging contact member 68 is mounted on each of the spring-retracted push buttons or pistons 63, which are identified by numbers in the usual manner.

There is a push button for each combination and each serves as the immediate control for one of the combination relays 49<sup>a</sup>, 49<sup>b</sup>, 49<sup>c</sup>, etc. When the combination push button 63<sup>a</sup> is pressed, it establishes a circuit from the battery 15 through conductor 65 to contact 64, through bridging member 68 to contact 62, through conductor 61<sup>a</sup> to the normally closed contacts 59, 60, through conductor 58<sup>a</sup> to the electromagnet 53 of the relay 49<sup>a</sup> and back to the other side of the battery through conductor 57. This serves to operate the relay 49<sup>a</sup>, which then establishes a circuit from the battery 15, through the conductor 50, the bridging contact 52 on the relay, the contact springs 48, and from thence to the series of conductors 47<sup>a</sup> connected to a transversely extending row of switch members 37 on the several trace bars 24 in order to control all the stop keys in the group in which the combination is to be effected. When the switch members 37 rest on the "off" contacts 43, current then flows through conductor 45 to electromagnet 22 and from thence to the battery through conductor 69. If a stop key was previously in the "on" position, it is moved by the bellows 20 to "off" position in accordance with the position of the switch member 25 on the trace bar, while if it is already in "off" position, its condition is not disturbed. For those stop keys which are desired to be brought to the "on" position in order to include them in a desired combination, selected switches on the corresponding trace bars have been previously moved to "on" position by means of setting devices hereinafter described, so that when the combination push button is pressed it will operate the combination relay 49<sup>a</sup>, which will direct a current through the last-named switches to the "on" position electromagnets 23. Since the combination relay 49<sup>a</sup> will only direct current through one transversely extending row of switch members 37 on the trace bars, it will be apparent that the position of the remaining switch members on

the several trace bars will have no effect in bringing on the desired combination, but are only effective when they occur in the row of switch members through which a circuit will be established by the operation of the corresponding combination relay. It will also be noted that no movement of the trace bars occurs when combinations are brought on.

As is well understood in this art, the trace bars are moved to a setting position either pneumatically or electrically, and in the present instance I have accomplished this operation electrically. A hook bar 70 is pivoted to the forward end of each trace bar by a screw 71 and is movable in a vertical plane from a substantially horizontal position. The forward end of the hook bar has an upwardly extending projection 72 and a counter weight 73 is provided at the rear which partially offsets the weight at the front portion, in order that the hook bar may be raised with very little effort. The hook bars are guided in vertical slots 74 in the upper part of a transversely extending frame member 75 at the forward end of the frame, and are limited in their upward movement by a covering strip 76, which closes the upper openings of the slots. At their forward portions the hook bars 70 rest at a suitable elevation on the upper edge of strip 77, secured to the forward face of the frame member 75 by screws 78 which pass through slots 79 in the strip to permit up-and-down adjustment. When the hook bars are lifted, they reach a position to be engaged by a bar 80 carried by arms 81 which have their lower ends secured to a rock-shaft 82 journaled in the housing members 28. The swinging bar 80 is provided with a strip of raw-hide 83 or other suitable material at the edge where it engages the hook bars in order to deaden sound and insure long wear. The rock-shaft 82 carries a lever 84, which is operatively connected to the core 85 of a solenoid 86, and is held in its normally inactive position by a spring 87. The solenoid is connected to the battery 15 by conductors 88 and 89 through a normally open set of contacts 90 included in conductor 89 and disposed on a relay 91 which is controlled by circuits hereinafter described. The closing of the relay contacts serves to energize the solenoid, which moves its core to produce a movement of the swinging bar 80 and with it the forward movement of any one of the trace bars whose hook bar 70 is in position to be engaged by the bar.

The movement of each hook bar 70 to actuating position is produced by an electromagnet 92 having its core ends mounted in the non-magnetic covering strip 76 above the hook bar, which is of iron to form an armature. Each electromagnet 92 is connected to one side of the battery by conductor

93 and has the other end of its winding connected by a conductor 94 leading to the conductor 17, the latter conductor joining the stop key switch and the stop action proper.

5 A set of normally open contacts 95, being included in conductor 94, are incorporated in a relay 96 which also includes the contacts 59, 60, the latter being included in the immediate circuits for the combination push 10 buttons. The hook bar lifting magnet 92, being connected in parallel with the circuit operating the stop action, is controlled by the stop key when the relay contacts 95 are closed as hereinafter set forth.

15 As previously stated the switch members 37 on the trace bars are movable to "on" or "off" positions by means of parts of their upper edges projecting above the upper edge of the trace bar. A switch actuator 97 extends transversely above the trace bars in position to simultaneously rock a transversely extending row of switch members when it is moved downwardly against the upper edge of the trace bars. There is one 25 actuator for each transversely extending row of switch members, and accordingly for each combination. The actuator is vertically movable on guide pins 98 and 99 secured into the upper edge of the housing members 28 on either side of the group of trace bars and is retained in its normal upper position by a spring 100 surrounding the guide pin 98 and having its lower end disposed in a recess 101 in the housing member 28. The upper end 35 of the pin 98 is provided with nuts 102 which retain a cushion-washer 103 for limiting the upward movement of the switch actuator. The pin 99 guides the other side of the switch actuator by passing through a slot 104 therein. Each switch actuator carries depending 40 adjustable links 105 near its ends which are connected by arms 106 secured to one of several transversely extending rock-shafts 107 journaled in the housing members 28 below the trace bars. A housing member 28' is disposed in spaced parallel relation to the housing member 28 at one side of the frame and receives the extended ends of the shafts 107. At the forward portion of the frame 50 the strip 75 continues across to the housing member 28', and the cross members 26 and 27 are likewise extended to this member. The shafts 107 each carry a lever 108 in laterally spaced relation to one another, and the upper 55 ends of these levers carry forwardly extending links 109, which are adapted to slide at their forward portions on a vertically adjustable supporting strip 110. The forward ends of the links 109 carry hook bars 111 similar to hook bars 70 and are supported and mounted in a similar manner. The forward ends of the hook bars when raised are adapted to be engaged and moved by a swinging bar 112, which is mounted on arms 60 113 secured to rock-shaft 114 journaled in the housing members 28 and 28'. Rock-shaft 114 carries a lever 115 which is operatively connected to the core 116 of the solenoid 117, the lever 115 being held in its normal inactive position by spring 118. The 70 solenoid 117 is connected to the battery by conductors 119 and 120 through a normally open set of contacts 121 included in conductor 120 and disposed on a relay 122, which is controlled by circuits hereinafter described. The closing of the relay contacts 75 serves to energize the solenoid, which moves its core to produce a movement of the swinging bar 112 and with it the movement of one of the links 109 whose hook bar 111 is in 80 position to be engaged by the swinging bar 112.

The movement of each hook bar 111 to actuating position is produced by an electromagnet 123 having its core ends mounted in 85 a non-magnetic strip 124 above the hook bar, which is of iron to form an armature. Each electromagnet 123 is connected to one side of the battery by conductor 125 and has the other end of its winding connected by a 90 conductor 126 to a contact 127 on the relay 96.

A combination control push button 128 is mounted in the console for operation by the organist and is used in conjunction with the 95 combination push buttons when it is desired to set combinations. The combination control push button includes contacts 129 which are adapted to be connected by a movable bridging contact 130. The relay 96 is 100 of usual construction including an electromagnet 131, which is supplied by current from the battery 15 through conductors 132 and 133, the contacts 129 of the combination control push button being included in the 105 latter conductor. The relay 96 includes the normally closed contacts 59, 60, and the normally open sets of contacts 95, 134 and 135. The contact 127 is adapted to co-operate with contact 59 when the relay is actuated. 110 The movable contacts of the relay are mounted on a movable member 136 actuated by a bellows 137. On this relay there is one set of contacts 59, 60, 127, for each combination, one set of contacts 95 for each stop 115 key and one set of contacts 134 and 135. The contacts 66 on the combination push buttons are connected by a common conductor 138 to one of the pair of contacts 134, the other of these latter contacts being connected by a conductor 139 with the winding 120 of the relay 91, which has a connection to the battery 15 by a conductor 140. The contacts 67 of the combination push buttons are connected by a common conductor 141 to one 125 of the pair of contacts 135, the other of the latter contacts being connected by a conductor 142 with the windings of the relay 122, which has a connection to the battery 130 by a conductor 143.

The switches 25, on any trace rod, may be set in their "off" position when the trace rod is in its normal position, and to the "on" position when the trace rod is moved to its forward position. When it is desired to set a combination, assuming that all the switch members 37 of the switches 25 are in their "off" position, the trace bars corresponding to the stops which are to be included in the combination, are moved forward so that the upwardly projecting parts of the switch members 37 are in position to be depressed by the switch actuator 97. Setting is accomplished by moving the desired stop keys 10 to the "on" position, then depressing the combination control button 128, and while this is held depressed, operating the combination push button 63<sup>a</sup>, the latter push button being used for the first combination to be set. The action taking place is then as follows: When the relay 96 is operated by pressing the combination control button 128, the relay contacts 95 are closed, which permits current to flow from the battery through the conductor 16, through the bridging contacts of the stop keys which are in the "on" position, through the conductor 17, through conductor 94 including the then closed relay contacts 95, through the hook bar lifting magnet 92 and the conductor 93 back to the battery. This energizes the electromagnets 92 corresponding to the stop keys in the "on" position, which lifts the hook bars 70 of the corresponding trace rods 24. The relay 96 when operated also opens the contacts 59 and 60 and closes the contacts 59 and 127, and also the sets of contacts 134 and 135. The opening of contacts 59, 60, and the closing of contacts 59 and 127 serves to remove the relay 49<sup>a</sup> from the control of the combination push button and to substitute the control of the electromagnet 123 of the setting mechanism. A circuit is then established from the battery 15 through conductor 65 to the contact 64 of the then closed combination push button switch 63<sup>a</sup>, from the contact 62 of the push button switch through conductor 61<sup>a</sup> to the contact 59, from the co-operating contact 127 through the conductor 126 to the electromagnet 123, and back to the battery through conductor 125. Simultaneously a circuit is established from contact 66 of the push button, through conductor 138 to the contacts 134, through conductor 139 to the relay 91 and back to the battery through conductor 140. The relay 91 is then energized, which closes its contacts 90 for supplying current to the solenoid 86 through conductors 88 and 89. The swinging bar 80 is moved forward by the solenoid 86 to effect a forward movement of the several trace bars 24 the hook bars 70 of which have been raised by the electromagnets 92. The further forward movement of the combination push button effects the engagement of the contact member 68 with the contact member 67, which establishes a circuit through conductor 141, contact 135, conductor 142, relay 122, and conductor 143 back to the battery. When the relay 122 is thus energized it closes contacts 121, which permits current to flow from the battery to solenoid 117 through conductors 119 and 120. The solenoid 117 when energized attracts its core 116 which effects the forward movement of the swinging bar 112 and with it one of the hook bars 111 lifted by the electromagnet 123. This moves the link 109 attached to the hook bar, rocking the shaft 107 through the arm 108 to move the switch actuator 27 downwardly against the upper edge of the trace bars through the levers 106 and the links 105 at each end of the switch actuator. The switch actuator 97 then moves to the "on" position any of the switch members 37 which have been moved forward with their trace bars. On trace bars which have not been moved to their forward position, the switch actuator will move to "off" position any switch members which may have been in their "on" position. The combination control button 128 and the combination push button 63<sup>a</sup> are then released and further combinations may be set in the same manner, after moving on the desired stops, by successively depressing the combination push buttons 63<sup>b</sup>, 63<sup>c</sup>, etc., in conjunction with the combination control push button 128. It is, of course, obvious that two of the combination push buttons, or equivalent devices, may respectively control the all "off" or all "on" position of the stops.

When the stop keys 10 have all been placed in their "off" position, a combination may then be brought on by pressing one of the combination push buttons. When a combination of stop keys controlled by any other push button is to be effected, the manipulation of such button will eliminate from or add to the previously set stop keys according to the selection set. If the organist desires to temporarily include or exclude one or more stop keys while the organ is being played, this may be done manually without affecting the previously set combination, since the position of the switch members on the trace rods is not affected by so doing.

When a new series of combinations is to be established, this may be done regardless of the existence of previously set combinations, as the latter lose their identity when the new combinations are set in the manner above described. The several combinations may be canceled by bringing all the stop keys to "off" position, and then, while holding the combination control button depressed, successively operating the several combination push buttons. By this manipulation the

switch actuators 97 move all of the switch members 37 to "off" position. If the hook bars 111 are lifted simultaneously instead of successively, as by simultaneously energizing the electromagnets 123, the cancellation may be effected with less manipulation, since all the switch actuators 97 then descend at the same time to move the switch members 37.

In the sequence of operations at the mechanism including the trace bars for setting the switch members into their desired positions, it is preferred to move the trace bars before moving the switch actuator, as above described, but these events may be transposed. In the latter case, the switch members in a group are first all moved to "off" position by the actuator, and the forward movement of selected trace rods will then cause a rocking of the switch members thereon to "on" position by their cam action on the depressed actuator.

While I have shown the stop keys for securing the functioning of the stops either manually or by the mechanism, this is only for the purpose of providing an indicating means, and to permit stops to be temporarily included in or excluded from the combination. In some instances, other indicating means may be employed instead in which the stop keys are not moved when a combination is brought on. Since the mechanism of the stop action of the present invention may be placed in any suitable location, it is possible to provide any desired number of combinations and the console may be made in standard sizes according to the number of manuals employed, because its size is not determined by the number of combinations desired. By suitable minor changes, it is also possible to incorporate the mechanism in existing organs of any type, as the mechanism on the whole is mechanically independent of the stop keys.

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

1. In a combination stop action for organs, the combination of a series of bars mounted for longitudinal movement, a plurality of switch members pivotally mounted on each bar and having parts projecting laterally beyond the bar, a pair of stop-controlling contacts co-operating with each switch member and being alternatively engageable with said switch member for controlling the "off" and "on" positions of a stop, a switch actuator extending transversely of the bars adjacent the projecting parts of said switch members for simultaneously moving a group of switch members into alternative engagement with their "off" and "on" contacts, said group including a switch member on each bar for controlling corresponding stops, and means for selectively moving one or more of said bars, whereby the switch members thereon are moved by said actuator to

"on" position if not already in "on" position and switches on the remaining bars are moved to "off" position if not already in that position.

2. In a combination stop action for organs, the combination of a series of bars mounted for longitudinal movement, a plurality of switch members pivotally mounted on each bar and each having a pair of projections alternatively extending laterally above the bar, a pair of stop-controlling contacts co-operating with each switch member and alternatively engageable with said switch member for controlling the "off" and "on" positions of a stop, a switch actuator extending transversely above the bars adjacent the projecting parts of said switch members for simultaneously moving a group of switch members into alternative engagement with their "off" and "on" contacts, said group including a switch member on each bar for controlling corresponding stops, and means for selectively moving one or more of said bars to bring projecting parts of a group of said switch members into the path of said actuator, whereby said switch members are moved by said actuator to "on" position if not already in "on" position, and switches on the remaining bars are moved to "off" position if not already in that position.

3. In a combination stop action for organs, the combination of a series of trace bars mounted for longitudinal movement, hook bars pivotally mounted at adjacent ends of said trace bars for partially offsetting the weight of the forwardly-projecting hooked portion, stop key-controlled electromagnetic means for selectively lifting one or more of said hook bars, a plurality of switch members pivotally mounted on each trace bar and each having parts projecting laterally beyond the trace bar, a pair of stop-controlling contacts co-operating with each switch member and being alternatively engageable with said switch member for controlling the "off" and "on" positions of a stop, a switch actuator extending transversely of the bars adjacent the projecting parts for simultaneously moving a group of switch members into alternative engagement with their "off" and "on" contacts, said group including a switch member on each trace bar for controlling corresponding stops, and means for moving one or more of said trace bars when their corresponding hook bars have been selectively lifted, whereby the switch members on said displaced trace bars are moved by said actuator to "on" position if not already in "on" position and switches on the remaining bars are moved to "off" position if not already in that position.

4. In a combination stop action for organs, the combination of a series of trace bars mounted for longitudinal movement, a plurality of switch members pivotally mounted

on each trace bar and each having a pair of projections alternatively extending laterally above the trace bar, a pair of stop-controlling contacts co-operating with each switch member and being alternatively engageable with said switch member for controlling the "off" and "on" positions of a stop, a switch actuator extending transversely above the bars adjacent the projecting parts of said switch members, a rock shaft extending transversely below said trace bars and operatively connected to said switch actuator for moving the latter against said switch members, hook bars operatively connected to said rock shafts, means for selectively moving said hook bars, and means for selectively moving one or more of said trace bars to bring projecting parts of said switch members into the path of said actuator, whereby said switch members are moved by said actuator to "on" position if not already in "on" position, and switches on the remaining bars are moved to "off" position if not already in that position.

5. A stop-controlling switch for combination-controlling switch mechanism, comprising a supporting member, a shouldered pivot member disposed on said supporting member and forming a contact, a rocking switch member having a centrally disposed fork engaging said pivot member, and a pair of stop-controlling contacts co-operating with each switch member and being alternatively engageable by said switch member for controlling the "off" and "on" positions of a stop, said switch member having spaced projecting actuating parts in alternative operative position for displacement of said switch member to selective stop-controlling positions.

6. In a combination stop action for organs, the combination of a plurality of supports each movable to alternative spaced positions, stop key controlled means for selectively placing said supports in their alternative positions, a plurality of circuit closers mounted on each support and each including a switch member movable to alternative positions for controlling the "off" and "on" positions of a stop, the circuit closers on any one support controlling the same stop in different combinations, and means for simultaneously setting a group of said switch members into alternative stop-controlling positions determined and selected by the alternative placement of the several supports, said group including a switch member on each support.

7. In a combination stop action for organs, the combination of a series of supports mounted for movement to alternative spaced positions, means for selectively placing said supports in their alternative positions, a plurality of circuit closers mounted on each support and each including a movable switch member alternatively engageable with a pair

of contacts for controlling the "off" and "on" positions of a stop, the circuit closers on any one support controlling the same stop in different combinations, and a switch actuator disposed transversely of said supports for selectively moving said switch members to alternative "off" and "on" positions determined and selected by the alternative placement of said supports.

8. In a combination stop action for organs, the combination of a series of bars mounted for longitudinal movement to alternative spaced positions, means for selectively placing said bars in their alternative positions, a plurality of circuit closers mounted on each bar and each including a switch member movable to alternative positions for controlling the "off" and "on" position of a stop, the circuit closers on any one bar controlling the same stop in different combinations and each switch member having a pair of spaced parts projecting laterally from one side of the bar; an actuator disposed transversely of said bars adjacent the projecting parts of said switch members and registering with one or the other of said spaced parts, and means for moving said actuator to engage the projecting parts of said switch members for displacing said switch members to their alternative positions determined and selected by the alternative placement of said bars.

9. In a combination stop action for organs, the combination of a series of supports mounted for movement to alternative spaced positions, means for selectively placing said supports in their alternative positions, a plurality of circuit closers mounted on each support and each including a switch member movable to alternative positions for controlling the "off" and "on" positions of a stop, a plurality of actuators disposed transversely of said supports and each engageable with a group of said switch members for moving said switch members to alternative stop-controlling positions determined by the alternative placement of said supports, said group including a switch member on each support, and common means for selectively moving any one of said actuators into engagement with its co-operating switch members.

10. In a combination stop action for organs, the combination of a trace, means for placing said trace in alternative spaced positions, a circuit closer carried by said trace and including a movable switch member alternatively engageable with a pair of contacts for controlling the "off" and "on" positions of a stop, and a movable actuator alternatively engageable with spaced parts of said switch member for placing said circuit closer in alternative stop-controlling positions determined by the placement of said trace.

11. In a combination stop action for organs, the combination of a support, a rock-

ing switch member pivotally mounted on said support, a pair of stop-controlling contacts carried by said support and alternatively engageable by said switch member for controlling the "off" and "on" positions of a stop, and an actuator alternatively engageable with said rocking switch member at spaced points for displacing said switch member to alternative stop-controlling positions.

12. In a combination stop action for organs, the combination of a plurality of parallel trace bars, a support on which said trace bars are movable, and spaced pins projecting transversely between said trace bars for guiding and spacing said trace bars.

13. In a combination stop action for organs, the combination of a plurality of parallel trace bars, a support on which said trace bars are movable, a transverse member carried above said trace bars, and pins depending from said transverse member and entering between said trace bars for guiding and spacing said trace bars.

14. In a combination stop action for organs, the combination, with a plurality of stop keys, of a series of traces mounted for movement to alternative spaced positions, there being a trace for each stop key, stop key controlled means for selectively placing said traces in their alternative spaced positions, a plurality of circuit closers associated with each trace and each including a switch member movable to alternative positions for controlling the "off" and "on" positions of a stop, the circuit closers associated with any one trace controlling the same stop in different combinations, and an actuator arranged transversely of said traces and movable to displace a group of said switch members to alternative positions determined and selected by the alternative placement of said traces, said group including a switch member for each trace, and means for moving said actuator to displace said group of switch members.

In testimony whereof, I affix my signature.  
EDMOND VERLINDEN.

CERTIFICATE OF CORRECTION.

Patent No. 1,664,053.

Granted March 27, 1928, to

EDMOND VERLINDEN.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 6, line 100, claim 3, strike out the words "for partially offsetting the weight of the forwardly-projecting hooked portion"; page 7, line 32, claim 5, for the word "each" read "said"; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 1st day of May, A. D. 1928.

(Seal)

M. J. Moore,  
Acting Commissioner of Patents.