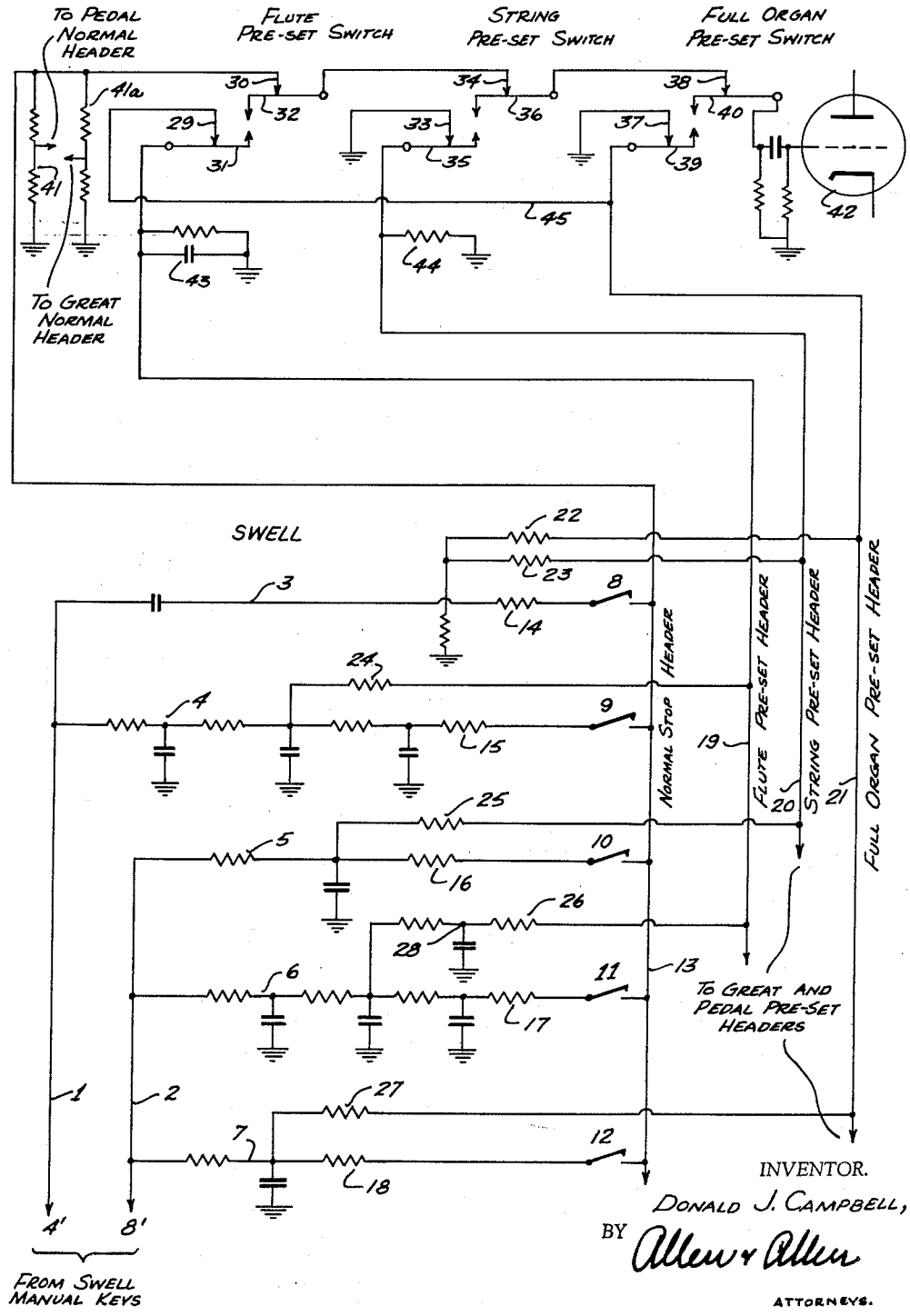
Nov. 13, 1962 D. J. CAMPBELL 3,063,324

PRE-SET COMBINATION STOP MEANS FOR ELECTRICAL ORGANS

Filed Jan. 25, 1960



INVENTOR.
DONALD J. CAMPBELL,
BY Allen & Allen
ATTORNEYS.

United States Patent Office 3,063,324 Patented Nov. 13, 1962

3,063,324

PRE-SET COMBINATION STOP MEANS FOR ELECTRICAL ORGANS

Donald J. Campbell, Cincinnati, Ohio, assignor to The Baldwin Piano Company, Cincinnati, Ohio, a corporation of Ohio

Filed Jan. 25, 1960, Ser. No. 4,924
11 Claims. (Cl. 84—1.01)

This invention has to do with the provision of a relatively limited number of pre-set combination voices in electrical organs, particularly where the cost, as reflected in the sales price of the instrument, is a factor of considerable importance. The invention of this application may be used in connection with electrical organs of various types including those in which the tones are generated by mechanical or photo-electrical means; but it will be described in an exemplary embodiment in connection with that type of instrument in which the tones are derived from a series of electrical generators, are collected in suitable headers through the actuation of playing keys in accordance with the requirements of a musical composition, and are then filtered so as to impart distinguishable voices to the tones. Such an instrument may, if desired, be that described in U.S. Patent No. 2,233,948 in the name of Kock.

In such an instrument there will be for each manual and for the pedal clavier a series of voicing circuits selectively controlled by stop switches. The performer can thus select voices at will; or, by depressing a number of the stop switch tabs, he may utilize the combined effect of a number of voices. Nevertheless, it is desirable to provide means which, upon the actuation of a single stop tab or other operating element, the predetermined effect of various combinations of voices may be attained more rapidly than by raising the stop tabs of unwanted voices, and depressing the stop tabs for the particular combination desired.

There are various ways in which pre-selected voice combinations may be attained. Mechanical means have hitherto been suggested which will act to close the stop switches for the particular voices desired in the combination, and at the same time open the stop switches for undesired voices if these happen to be closed at the time. However, such mechanical means are inherently complicated and expensive. At the same time they are bulky and take up a substantial amount of room in an organ console, so that they are not available for use in the smaller instruments and in particular instruments which may be placed in the home.

It is also possible by switching means to disconnect the key switch headers from the normal stop filters, and connect them to additional sets of voicing filters in the desired combinations. This method is expensive not only because it requires duplication of filter means, but also because it unduly complicates the switching problem, requiring many sets of double-throw contacts for each pre-set combination.

It is the purpose of this invention to provide a simple and inexpensive system for the derivation of pre-set combinations of voices in the output of the system.

It is an object of the invention to provide a number of pre-set combinations of voices which may be effectuated by the actuation of stop tabs without a complication of the switching means, and without a complication of the necessary wiring.

It is an object of the invention to provide a system for the attainment of pre-set combinations of voices, which system operates at the input of the amplifier or pre-amplifier of the instrument.

It is an object of the invention to provide a limited number of pre-set voicing combinations so inexpensively

that they become available for lower priced instruments where cost is a governing factor.

These and other objects of the invention which will be set forth hereinafter or will be apparent to one skilled in the art upon reading these specifications are accomplished by that construction and arrangement of parts of which an exemplary embodiment will herein be described. The invention will be set forth in connection with the provision of pre-set combinations of voices for one manual of an electrical musical instrument, it being understood that if desired similar provisions may be made in connection with another manual or manuals of the instrument, and even in connection with the pedal clavier. Reference is made to the accompanying drawing which is a diagrammatic representation of the aforesaid exemplary embodiment.

The details of the instrument up to the point at which tones derived from the several oscillators or other tone producing instrumentalities are present in one or more headers, form no limitation on this invention and will not be outlined herein.

The details of the specific filters employed likewise form no limitation on this invention. The skilled worker in the art will understand that the filters are normally made up of capacitors and resistors, and sometimes inductors, arranged in various combinations generally acting to suppress unwanted harmonics in complex tones or to accentuate certain harmonics therein. The filters may be connected individually to the same or to different headers, and one or more of the filters may be connected simultaneously to a plurality of headers including in some instances headers which carry mutually de-phased oscillations. The principles of this invention are applicable not only to filters which are made up of combinations of capacitors and resistors or other impedances, but also to voicing instrumentalities which employ vacuum tubes or other electronic devices to alter the nature of the received electric oscillations so as to impart desired tone colors to them. The term "filter" will be used herein as a convenient generic expression intended to embrace all of these tone-color instrumentalities.

Briefly in the practice of the invention, the filters are connected between an input header or input headers in which the oscillations are derived from the generators through playing key switches or their equivalent, and an output header which is connected to an amplifier or pre-amplifier. The various filters have switches operated by stop tabs so that one or any combination of the filters may be connected to the normal output header. Additional headers are provided for the pre-set combinations of voices (however many there may be) and these headers are selectively provided with connections to particular ones of the filters desired to make up the several pre-set combinations. Switching means are provided in connection with stop tabs appropriately designated for the pre-set combinations. These particular stop tabs can be provided with a mechanical arrangement acting, when one of the pre-set stop tabs is moved to the "on" position, to turn "off" any other pre-set stop tab in the group. The arrangement further is such that any pre-set stop tab in the group which happens to be "on," may be turned "off" by the operator at will without affecting the other stop tabs in the group. The switching means used in connection with the pre-set stop tabs is so arranged that if all of the pre-set stop tabs in the group are in the "off" position, the normal header is connected to the output system, i.e. the amplifier or pre-amplifier. At the same time the pre-set headers are disconnected from the output, and may be grounded. If, however, one of the pre-set stop tabs is moved to the "on" position, the connection between the normal header and the output system will be broken and the particular

pre-set header appropriate to the pre-set stop tab in the "on" position will be connected to the output.

An exemplary embodiment of the structure will now be described in connection with the simplified diagram forming the drawing of this application. In the drawing, index numerals 1 and 2 indicate collector headers (respectively 4' and 8'), although as indicated above, other or additional headers may be utilized as desired. The collector headers, which in this instance can be considered headers for the Swell Manual, carry oscillations derived from sources or generating means through playing keys in accordance with the requirements of a musical composition. Filter circuits have been indicated at 3, 4, 5, 6 and 7. The details of these filter circuits form no limitation upon this inventon, and hence their electrical constructon will not be described. Certain of the filter circuits may be of a character to produce flute tones, by way of example; others may be of a character to produce string tones, woodwind tones or any others within the scope of the instrument. The filters are connected to one or more of the collector headers, and through stop switches 8, 9, 10, 11 and 12 to a normal header indicated at 13. The stop switches 8 to 12 are individual to the particular filters, and are used by the operator of the instrument to add or subtract individual voices. These connections from the filters to the normal header include relatively high impedances 14, 15, 16, 17 and 18. There is no limit as to this invention on the number of filters which may be employed.

Pre-set headers are indicated in the drawing at 19, 20 and 21. For convenience these pre-set headers have been indicated as a Flute pre-set, a String pre-set, and a Full Organ pre-set. It will be understood that other or additional combinations may be chosen. The pre-set headers are connected to different ones of the filters at points electrically removed from the normal header 13. The location of the connections must be electrically removed from the normal header to avoid an alteration of the contribution of any filter to any pre-set combination depending upon the position of the stop switch appropriate to that stop. The connection must further be made through a high impedance to avoid loading the filters when the pre-set header is grounded. These high impedances are indicated in the drawing at 22, 23, 24, 25, 26 and 27. It will be noted in the drawing that there are connections between the Flute pre-set header and filters 4 and 6. There are connections between the String pre-set header and filters 3 and 5. There are connections between the Full Organ pre-set header and filters 3 and 7. This is exemplary merely; but the drawing is indicative of the fact that two or more of the pre-set headers may be connected to the same filter along with another or others.

In some instances, it may be found advantageous to duplicate a portion of a particular filter in the connection between that filter and a pre-set header. This is indicated at 28 (filter 6). It will be noted that the system of this invention, however, makes use of the filters already present in the instrument, generally without duplication of parts, although some duplication of parts may be employed if found desirable. So long as the system utilizes the normal filters of the instrument, a significant economy is achieved as will be evident; but it does not violate the spirit of the invention to provide in connection with any pre-set header one or more special filters, although this is not normally necessary or desirable.

In an exemplary embodiment, three pre-set stop tab switches have been designated respectively "Flute pre-set switch," "String pre-set switch," and "Full Organ pre-set switch." These switches are operated by stop tabs, appropriately marked and provided with a mechanical arrangement such that if any pre-set stop tab in the group is moved to the "on" position, any other pre-set stop tab in the same group will be moved to the "off" position. At the same time any pre-set stop tab of the group which is in the "on" position may be moved manually to the "off" position so that none of the pre-set stop tabs in the group will be in the "on" position. Various mechanical arrangements may be employed; but a simple, cheap, and reliable mechanism is shown in the copending application of Campbell, Elbrecht, and Fritz entitled Mutually Exclusive Stop Switch Mechanism, Serial No. 4,273 filed January 25, 1960.

In the practice of this invention the switching means may be simple and inexpensive, consisting of several four-contact switch arrangements. Thus the Flute pre-set switch has been shown as comprising members 29, 30, 31 and 32. Exactly similar switching means has been shown for the String pre-set switch and the Full Organ pre-set switch comprising respectively elements 33, 34, 35 and 36 for the former, and elements 37, 38, 39 and 40 for the latter.

The normal header 13 is shown as connected to element 30 of the first pre-set stop switch. Element 32 of that stop switch is connected with element 34 of the next pre-set switch. Element 36 of that switch is connected with element 38 of the third pre-set switch. Element 40 of that switch is shown as connected to an amplifier or pre-amplifier represented by the thermionic tube 42.

The switches in the drawing are shown in the "off" position in which elements 30 and 32 are in electrical contact, as are elements 34 and 36 and elements 38 and 40. Thus there is a direct path between the normal header 13 and the output system 42 for normal operation of the instrument. The operator under these circumstances can select any one or any combination of the voices represented by filters 3 to 7 through the operation of the stop switches 8 to 12.

It will be seen that the Flute header 19 is connected to element 31 of the Flute pre-set stop switch, that the String pre-set header 20 is connected directly to element 35 of the String pre-set switch, and that the Full Organ pre-set header is connected directly with element 39 of the Full Organ pre-set switch. In the "off" position, element 37 of the Full Organ pre-set switch is in connection with element 39 and is grounded as shown. Similarly, element 35 of the String pre-set switch is in electrical connection with element 33 thereof which also is grounded. In the Flute pre-set, switch element 31 is in electrical contact with element 29, which may be grounded either directly or through one or more of the other pre-set stop switches by a cross connection 45. Thus, when the pre-set stop switches are all in the "off" position, there will be no connection between the output system and any of the pre-set headers. Further, the pre-set headers will be grounded as aforesaid.

If the Flute pre-set switch is moved to the "on" position, three actions occur. The connection between elements 30 and 32 is broken, thus disconnecting the normal header from the output system. The connection between elements 29 and 31 is also broken, ungrounding the Flute pre-set header. At the same time electrical connection is established between elements 31 and 32, connecting the ungrounded Flute pre-set header to the output system of the instrument.

If the String pre-set switch is now moved to the "on" position, the Flute pre-set switch will automatically be moved to the "off" position through the mechanisms aforesaid. Thus, the String pre-set switch acts in a manner similar to that previously described to disconnect the normal header from the output system, to unground the String pre-set header, and to connect the String pre-set header to the output system. A similar action will take place if the Full Organ pre-set switch is moved to the "on" position.

It may be pointed out that it is possible to use modifying means in connection with the pre-set headers. Thus a resistor and capacitor combination 43 is shown as connected between the Flute pre-set header and ground for the purpose of removing additional harmonic components

from the output of the Flute pre-set header to give a purer tone. Similarly, a by-pass to ground including a resistor **44** is shown in connection with the String pre-set header **20**, the purpose of which is to keep the String pre-set header at a desired impedance level. These expedients are exemplary merely.

It may be noted also that the element **29** of the Flute pre-set switch is not grounded directly but has a cross connection **45** to the Full Organ pre-set header **21**. This arrangement is also illustrative of the fact that it is possible by such a cross connection to arrange that when a particular pre-set header is connected to the output through its pre-set switch, the oscillations derived in the output system may be caused to embody the full output of some other pre-set header without interfering with the operation of the system, despite the fact that only one of the pre-set switches may be actuated to the "on" position at any one time.

It will be appreciated that when the pre-set stop tabs are in the "off" position, the instrument will be operated in the normal fashion with such selection of voices as may be made by the operator through the actuation of the normal stop tab switches. If, however, the operator then presses one of the pre-set stop tabs to the "on" position, the normal header will be disconnected from the output system, thus canceling any voice or combination of voices previously secured through the actuation of the normal stop switches, and providing a new output made up of oscillations from pre-selected filters derived in a pre-set header. The actuation of a second pre-set stop switch to the "on" position will cancel the output of the previously connected pre-set header and cause the oscillations derived in another pre-set header to pass to the output system. When a pre-set switch is manually moved from the "on" to the "off" position (resulting in an "off" position for all of the pre-set stop switches), the oscillations derived in the normal header will again pass to the output system restoring any voice or combination of voices previously chosen in connection therewith.

A pre-set voicing system has hereinabove been described in connection with a single manual of the organ. If the organ has one or more additional manuals and a pedal clavier, it is possible to provide a similar system in connection with each. However, for most uses in the small organ, and in the interests of simplicity and economy, a single pre-set system may be made to serve for all keyboards. As a consequence, in the drawing arrows at the bottom ends of the pre-set headers **19**, **20** and **21** have been indicated by an appropriate legend as being connectable to corresponding pre-set headers for a Great Manual and a Pedal Clavier. The normal headers from these keyboards may be connected to the same output system through the same pre-set switches as have been above described. Thus, the normal header for the Great Manual assembly may be connected to the switch element **30** through a resistive network **41***a*, as shown in the upper part of the figure at the place marked with an arrow. Similarly, the normal header from the Pedal Clavier may be connected to the same point in the system through a resistive network **41**, as also indicated by an arrow. When these connections are made, the actuation of any pre-set switch, say, the Flute pre-set switch, will simultaneously disconnect from the output system the normal headers from all of the keyboards and will connect the Flute pre-set header (now carrying the output from all keyboards) to the output system. Needless to say, the particular selection of stops for the various keyboards may be specifically different.

More elaborate systems may be constructed on the same general principles. While three pre-set headers have been shown, there may be either a larger number of pre-set headers giving a greater variety of pre-set voices, or various filter circuits from one or more keyboards may be connected to different pre-set headers which are in essence subdivisions of the pre-set headers shown herein. Furthermore, it is not necessary that the outputs of all of the pre-set headers go to the same output system. In some electrical musical instruments, where in addition to the normal loud speaker system there is some special loud speaker employed such as a loud speaker with a revolving sound deflector, it may be found desirable to route only certain voices through the last mentioned loud speaker. This may be accomplished through a separate amplifier system by means of a separate header. When using the pre-set stop mechanism described by Campbell, Elbrecht, and Fritz in the copending application referred to above, a very large number of switches may be connected with the mechanism so that it becomes easy to route different voices or combinations of voices through different amplifiers to different loud speakers.

Modifications may be made in the invention without departing from the spirit of it. The invention having been described in a certain exemplary embodiment, what is claimed as new and desired to be secured by Letters Patent is:

1. In an electrical musical instrument of the type in which electrical oscillations from sources thereof are derived in at least one collector header through the operation of playing keys, there being a plurality of voicing circuits selectively connectable through stop switches to a normal stop header which in turn is connectable to an output system, at least one pre-set header, a plurality of connections between said pre-set header and some of said voicing circuits whereby to derive in said pre-set header oscillations comprising those of a predetermined combination of voices as determined by said voicing circuits, and switching means having connection with said normal stop header and said pre-set header and with ground and said output system, and acting in one position to connect said normal stop header to said output system while grounding said pre-set header, and in another position to disconnect said normal stop header from said output system, to disconnect said pre-set header from ground and to connect said pre-set header thereto.

2. The structure claimed in claim 1 wherein the connections between said normal stop header and said pre-set header and said voicing circuits include high impedances whereby to avoid undesired changes in amplitude and tone color upon the actuation of said stop switches.

3. The structure claimed in claim 2 wherein said pre-set header has in connection therewith a tone modifying means distinct from said voicing circuits.

4. In an electrical musical instrument of the type in which electrical oscillations from sources thereof are derived in at least one collector header through the operation of playing keys, there being a plurality of voicing circuits selectively connectable through stop switches to a normal stop header which in turn is connectable to an output system, a plurality of preset headers, connections between individual ones of said preset headers and some of said voicing circuits, whereby to derive in said pre-set headers different predetermined combinations of oscillations representative of different voices as determined by said voicing circuits, a plurality of switching means, one for each of said preset headers, each of said switching means having connection with said normal stop header, one of said preset headers, with said output system and with ground, each of said switching means acting in one position to connect said normal stop header with said output system and to ground the preset header connected to said switching means, and in another position to disconnect said normal header from said output system, to unground said preset header, and to connect it to said output system, said several switching means having a mechanical interconnection such that a movement of any one of said switching means to an "on" position, in which said normal stop header is not connected to said output system, will result in a movement of any other of said switching means in the "on" position to the opposite "off"

position, each of said switching means being independently movable from the "on" to the "off" position.

5. The structure claimed in claim 4 wherein the connections of said normal stop header and said preset headers to said voicing circuits respectively contain high impedances whereby to avoid undesired changes in amplitude upon actuation of said switching means.

6. The structure claimed in claim 5 wherein at least one of said preset headers has in connection therewith an additional tone modifying means distinct from the said voicing circuits.

7. The structure claimed in claim 4 wherein the connection between said normal stop header and said output system is effected by said several switching means acting in series so that a movement of any one of said switching means from the "off" to the "on" position will break said connection.

8. The structure claimed in claim 7 wherein each of said switching means has four elements, pairs of said elements acting as single pole single-throw switches, an element of each pair being arranged to be brought into contact with each other and out of contact with the opposite element of each pair upon actuation of the switching means from the "off" to the "on" position.

9. The structure claimed in claim 8 wherein there is a cross connection between one of said switching means and another of said switching means, which cross connection serves to ground the pre-set header connected with the first mentioned switching means when the second mentioned switching means is in the "off" position, and serves further, when the second mentioned switching means is in the "on" position to add to the oscillations in the pre-set header of the second mentioned switching means the oscillations of the header of the first mentioned switching means.

10. The structure claimed in claim 9 wherein at least one of said pre-set headers has in connection therewith tone modifying means distinct from the said voicing circuits.

11. In an electrical musical instrument of the type in which electrical oscillations from sources thereof are derived in collector headers through the operation of playing keys, said instrument having a plurality of keyboards, there being at least one such collector header for each keyboard, each keyboard having a plurality of voicing circuits selectively connectable through stop switches to normal stop headers, pre-set headers for each keyboard, a plurality of connections between said pre-set headers and some of the voicing circuits for each keyboard, whereby to derive in said pre-set headers oscillations comprising those of a predetermined combination of voices as determined by said voicing circuits, said pre-set headers for each keyboard being classifiable as pertaining to various voicing combinations, the normal stop headers for each keyboard being connected together and through switching means to an output system, the pre-set headers for the various keyboards being connected together in accordance with their classifications, and connected through switching means to an output system, and connections between said switching means effective when said normal headers are connected to the output system to disconnect the pre-set headers therefrom, and effective when said pre-set headers are connected to the output system to disconnect the said normal headers therefrom.

References Cited in the file of this patent

UNITED STATES PATENTS

2,458,178	Langer	Jan. 4, 1949
2,468,062	Hanert	Apr. 26, 1949
2,505,182	Haller	Apr. 25, 1950
2,547,759	Kent	Apr. 3, 1951
2,555,040	Jordan	May 29, 1951
2,949,803	Leslie	Aug. 23, 1960