

June 15, 1937.

R. M. GEORGE ET AL

2,084,266

MUSICAL INSTRUMENT

Filed April 23, 1936

3 Sheets-Sheet 1

Fig. 1.

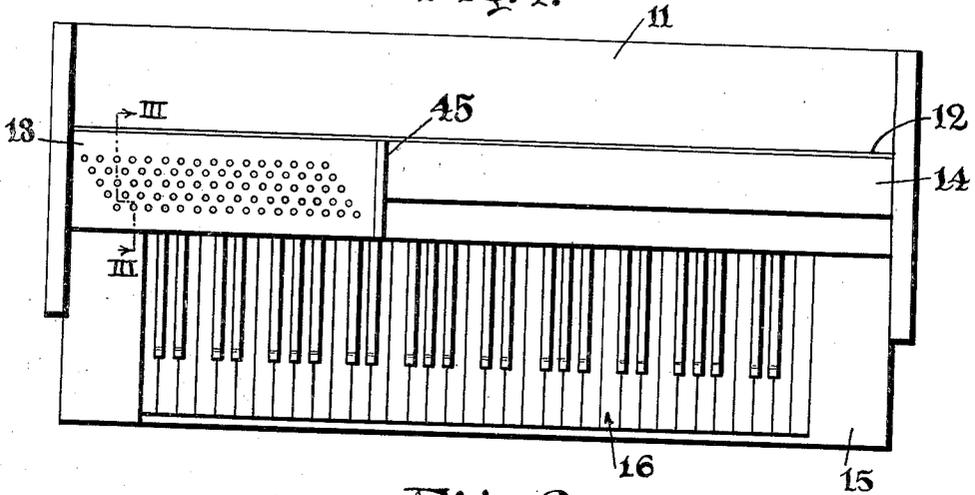
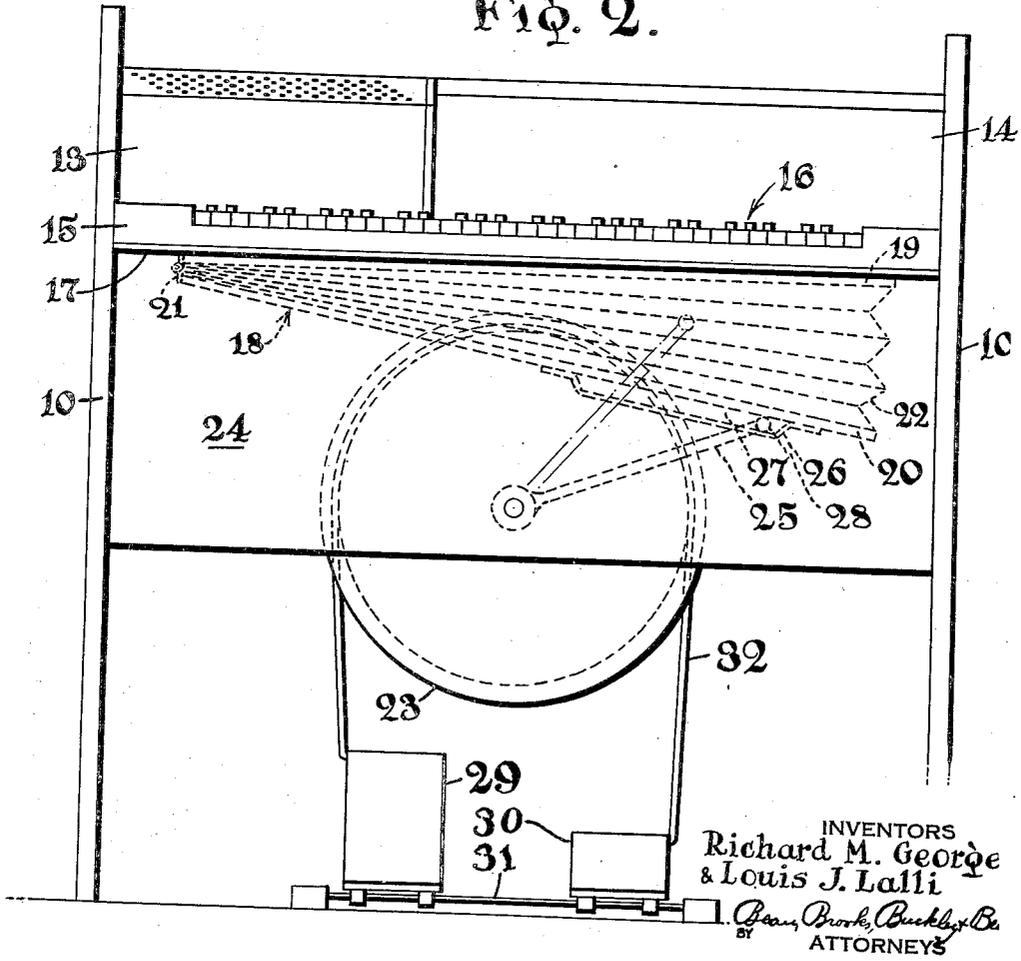


Fig. 2.



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3 Sheets-Sheet 2

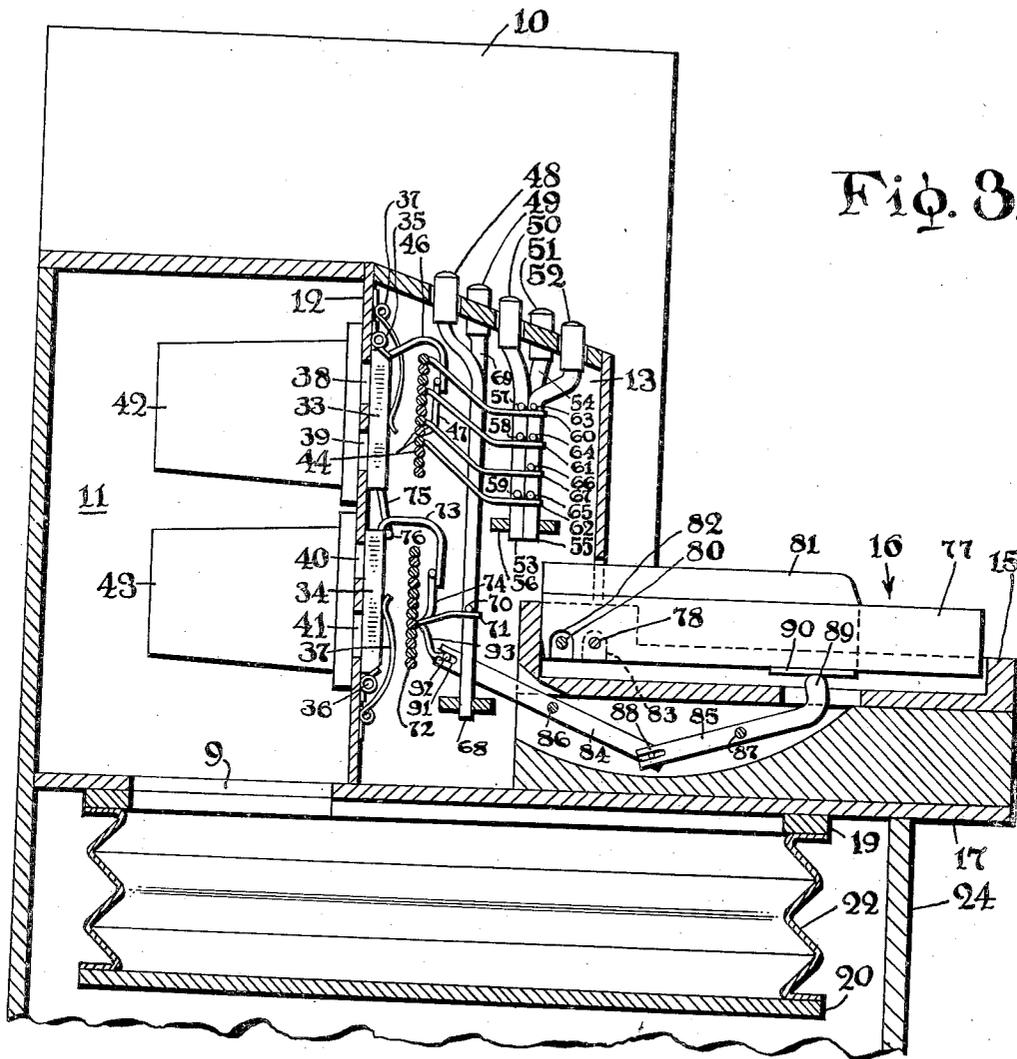


Fig. 3.

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3 Sheets-Sheet 3

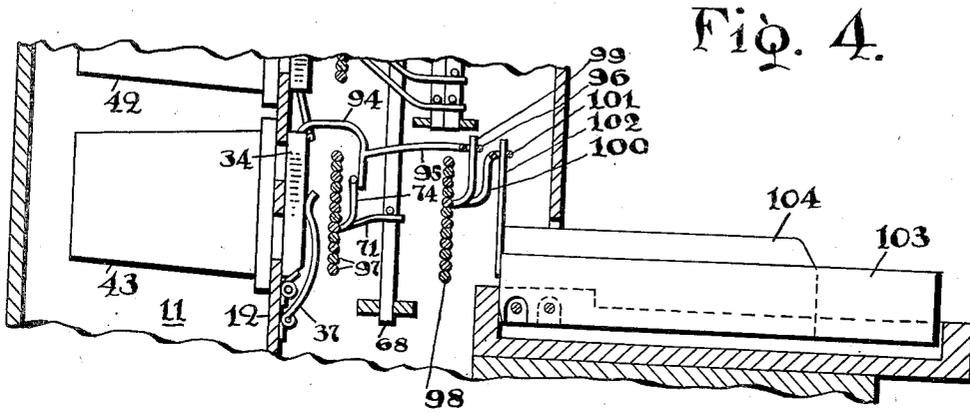
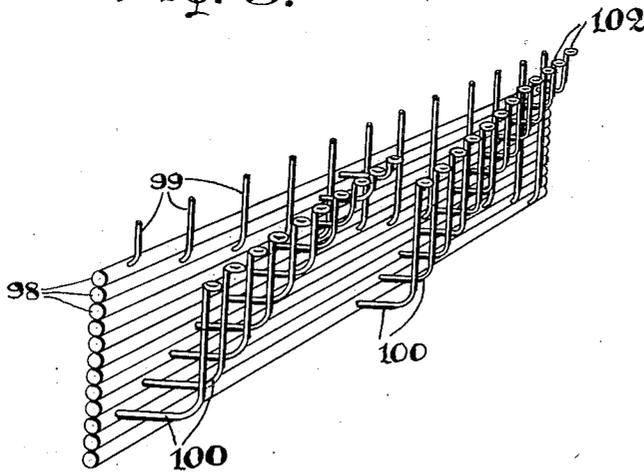


Fig. 5.



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# UNITED STATES PATENT OFFICE

2,084,266

## MUSICAL INSTRUMENT

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Application April 23, 1936, Serial No. 76,000

12 Claims. (Cl. 84—365)

This invention relates to musical instruments of the reed organ type.

It has heretofore been proposed to construct musical instruments wherein a differential fluid pressure, generated either manually by the performer, by motor means, or in any other way, is used to cause vibration of reeds selectively to produce musical sounds. In such instruments a series of reeds, graduated in pitch, and each of which may be rendered operable through a key-controlled stop, is usually employed.

In normal operation of these devices each key controls a single stop but devices generally known as chord couplers have been suggested which make it possible for the performer, by the manipulation of a single key, button, or the like, to cause a plurality of stops to be opened and a harmonic group of tones to be produced simultaneously.

For successful operation of devices of this latter type it has heretofore been necessary for the performer to have special training in the manipulation of the chord coupler keys, and their arrangement upon the instrument varies greatly in previously suggested constructions.

In instruments of the type known as piano accordions, which are really a form of portable reed organ, two frame members, each containing reeds, stops and operating keys, are connected by a bellows in such a way that they may be moved toward and away from each other to reduce or enlarge the bellows chamber and thereby provide fluid pressure for agitating or vibrating the reeds. As is well known, the application of fluid pressure to the reeds is selectively controlled by key-actuated valves called stops.

In piano accordions the set of keys, stops and reeds in each end of the instrument is complete and independent and cooperates in no way with the set of keys, stops and reeds in the other end or frame member. Usually one end consists of a chromatic series of reeds controlled by stops which are operated from and by a set of keys arranged in the manner of the usual piano keyboard. The other end contains a set of reeds controlled by stops which are operated by a bank of buttons. These buttons do not, in general, control single, specific stops. Special mechanism is arranged between the buttons and the stops in such manner that the depression of a single button will cause the opening of a number of stops and the activation or vibration of a number of reeds whose tones combine to form a chord. For instance, if the button for the dominant seventh chord in the key of G flat major is depressed,

four stops will be opened and the notes D flat, F, A flat and C flat will be sounded. The identical reeds and stops used in forming this chord will be used in other combinations and in combination with other reeds and stops to form different chords when other buttons are depressed.

The knowledge of the arrangement and sequence of these buttons and their proper manipulation plays an important part in the art of the accordionist, and a person skilled in the playing of another form of organ or the piano would find it impossible to perform on the accordion without first being trained in the manipulation of the chord buttons; just as an accordionist without other special training would be faced with the problem of learning the constituent notes comprising particular chords, which, in most cases, he recognizes by name only rather than by their component tones, before he could play these chords on a keyboard of the piano type.

Furthermore, an accordionist has no occasion to develop piano keyboard technique in his left hand and, as a consequence, the necessity for performing upon a piano keyboard with his left hand means making a new beginning in this field.

The aim of the present invention is to provide a musical instrument of the type indicated which may be played either by persons skilled primarily as pianists or as accordionists. The instrument is so constructed and arranged that artists in either branch may perform upon the instrument, employing their accustomed technique, without any limitations that are not present in their accustomed instruments.

In providing a practical and usable instrument which meets the requirements laid down in the preceding paragraph, the present inventors have developed novel means for making it possible to manipulate a single set or series of stops, selectively, either from a set of single tone controlling keys arranged in the manner of a piano keyboard, or from a set of buttons which control chord couplers for opening the stops in harmonic combinations and which are identical in arrangement with the usual accordion bass buttons.

An added advantage of the present construction resides in the possibility of producing, by means of the piano keys, bass chords which are not usually provided for in the bass-button arrangement of piano accordions.

In the drawings:

Fig. 1 is a top plan view of the instrument;

Fig. 2 is a front elevational view thereof;

Fig. 3 is a cross-sectional view, with some of the parts in elevation, taken about on the line III—III of Fig. 1, and on a larger scale;

Fig. 4 is a fragmentary cross sectional view similar to Fig. 3 but showing a modified form of piano key action;

Fig. 5 is a perspective view of the secondary bank of rotatable control rods of the modified form of construction of Fig. 4.

In the embodiment disclosed in Figs. 1, 2 and 3, the numeral 10 designates a pair of upright end members which carry between them a fluid-pressure chamber 11 in which all of the reeds of the instrument are located, a reed plate 12 which supports the reeds, a housing 13 which contains the bass-note controlling mechanism, a housing 14 in which the treble-note stops are disposed, and a key tray 15 which supports a series of piano keys designated generally at 16.

All of the elements 11 through 15 are positioned upon a base plate 17 which supports, upon its under side, a bellows 18 consisting of rigid upper and lower wall members 19 and 20, hinged at one edge as at 21, and connected at their other three edges by a flexible material 22 such as fabric or the like. The upper wall member 19 is secured to the base plate 17 and the lower wall member 20 is movable toward and away from the upper wall member about the hinge 21 for enlarging and reducing the volumetric content of the bellows.

A pulley 23 is mounted for free rotation against a front wall member 24, which extends between the upright side walls 10, and carries with it an arm 25. A strap member 26 is secured to the under side of the lower wall member 20 of the bellows and is bent to form, with the wall member, an elongated slot 27. A portion 28 at the end of the arm 25 rides in the slot 27.

A pair of pedal members 29 and 30 are hingedly mounted at their front edges upon a bar 31 and are joined at their rear edges by a cable 32 which extends over the pulley 23.

It will readily be seen that, beginning with the positioning of bellows and pedals shown in Fig. 2, if the pedal 29 is depressed by a person seated before the instrument in playing position, the pulley 23 and the arm 25 will be given a counter-clockwise actuation and the pedal 30 will be raised. During this movement the outer end of the arm 25 will move upwardly to the dotted line position, carrying with it the movable lower wall 20, and the volume of the bellows will be reduced substantially to zero. The operator then depresses the pedal 30 and a reverse action takes place, the bellows being extended and its volume increased to a maximum.

This alternate expansion and contraction of the bellows chamber creates a differential pressure in the chamber 11, with which the bellows communicates through the opening 9, as compared with the atmospheric pressure which obtains in the housing 13.

In the embodiment illustrated only the thirteen white piano keys and their nine associated black keys, lying at the extreme left of the keyboard, are associated with the chord coupler buttons and mechanism previously mentioned and which will hereinafter be described in detail. For convenience we shall refer to these twenty-two keys as the bass keys.

The treble keys, all of the remaining piano keys lying to the right of these twenty-two keys, are ordinary piano accordion keys. These keys carry stops, located in the housing 14, fixed rela-

tively to the keys and extending upwardly from the rear end thereof at approximately right angles to the keys. The stops bear over openings in the reed plate 12 behind which are the usual reed blocks located in the pressure chamber 11. The treble key action forms no part of the present invention, is constructed in a conventional and well known manner, and has, therefore, not been illustrated in detail.

Referring now to Fig. 3, we find a cross section taken approximately on the line III—III of Fig. 1. This view shows means for actuating a single series of stops selectively either from the bass keys or from the so-called bass buttons. For the sake of clarity and simplicity most of the parts lying behind the cutting plane in Fig. 3 have been omitted and the cross section is not in a single continuous plane. The manner of off-setting the depending portions of the bass buttons, in the direction of extent of the keyboard, in order that unaligned buttons in the same key will have their depending portions aligned and to avoid interference of parts, is the same as is usually employed in constructing the chord coupling mechanism in piano accordions. The inventor has adopted the usual bass button and chord coupler mechanism found in piano accordions insofar as that construction adapts itself to his requirements.

An upper horizontal row of stops 33 and a lower horizontal row of stops 34 are positioned against the reed plate 12. The upper row is connected to the reed plate 12 by hinges 35 at their upper edge and the lower row by hinges 36. Wire or leaf springs 37 serve to normally hold the upper and lower stops against the reed plate 12 and in a position to close the openings or ports 38, 39, 40 and 41 in the reed plate.

Reed blocks 42 and 43 are located behind the stops 33 and 34 respectively and each reed block carries two horizontal rows of reeds (not shown). The four rows of reeds are in alignment with the rows of openings 38, 39, 40 and 41. The four reeds in each vertical tier are tuned to the same note, each of them in a different octave. The tones of the higher octaves are produced by the reeds of upper reed block 42 while those of the lower octaves, the bass notes, are produced by the reeds of the lower reed block, 43.

Each reed block contains, in each of its two rows, twelve horizontally aligned reeds graduated chromatically in pitch and beginning with F natural and ascending, to the right as viewed in Figs. 1 and 2, to E natural. Correspondingly, there are twelve stops 33 in the upper horizontal row and twelve stops 34 in the lower horizontal row.

Positioned before the upper row of stops 33 is a vertical bank of twelve rods 45 which are rotatably mounted at their ends in the left-hand end member 10 and a member 46 which forms the right end (as seen in Figs. 1 and 2) of the housing 13. These twelve rods are mounted for free and independent rotation about their axes and each rod, by its rotation, controls a corresponding one of the twelve stops 33 in the upper row of stops.

This control is effected by means of a pair of cooperating arms 46 and 47 which are rigidly secured, as by soldering or the like, to each cooperating stop 33 and rod 45, respectively. An arm 47 is shown in Fig. 3, associated with the eighth rod from the top and extends outwardly from the rod, then upwardly, then in a direction parallel with the axis of the rod. The arm 46, se-

cured to the upper end of a stop 33, extends outwardly and upwardly to clear the bank of rods 44, then downwardly in front of the bank of rods to a point slightly below the parallel portion of the arm 47.

It will now be apparent that clockwise rotation of the rod which carries the arm 47 will, through the force exerted against the arm 46 by the parallel portion of the arm 47, cause counter-clockwise rotation of the stop 33 about the hinge 35 and a consequent uncovering of the openings 38 and 39 in the reed plate 12.

It is to be understood, of course, that each stop 33 in the upper row is provided with an arm 47 and each rod 44 in the upper bank is provided with an arm 46, the only difference being that the downwardly projecting portions of the several rods 47 are of varying length depending upon the distance of the related rod 44 from the top of the bank.

The arrangement of bass buttons at the top of the housing 13, see Fig. 1, is the usual accordion bass button arrangement. In the present embodiment we have shown five horizontal rows of buttons. Each row is for playing chords or combinations of a different class and in the present instance the chords or combinations of the five rows, beginning at the top in Fig. 1, are: 1. counter bass, 2. bass, 3. major tonic chord, 4. minor tonic chord, and 5. dominant seventh chord. The buttons of these five rows have been designated 48, 49, 50, 51 and 52, respectively.

It is well to note at this point that the three lower rows of buttons, that is those for the major and minor chords and the row for the dominant seventh chord, manipulate and control the stops of the upper row, 33, only. They do this by means of rods 53, 54 and 55 which depend from the buttons 50, 51 and 52, respectively, and are guided at their lower ends in a plate 56 which extends between the wall members 10 and 45.

The button rod 53 in Fig. 3 is provided with three pins 57, 58 and 59 which are located directly above arms 60, 61 and 62 which are rigidly secured to and extend downwardly and outwardly from the first, fourth and ninth rods 44, counting from the top of the upper bank. It will be seen that depression of the button 50 moves the rod 53 downwardly and, through the pins 57, 58 and 59, a clockwise rotative movement is imparted to the arms 60, 61 and 62, respectively, and the rod 44 by which they are carried.

As has previously been shown, this rotative movement will result in the unseating of the three stops 33 with which the particular rods 44 are associated. In the instance cited, this unseating of the several stops 33 will open three sets of ports 38, 39 leading to reeds which emit the notes F, A flat and D flat comprising the tonic chord of D flat major. When the button 50 is released the spring 37, bearing against the stop 33, will return all of the parts to normal position.

The button rod 55, depending from the button 52, carries, in addition to pins 63, 64 and 65, which are on a level with the pins 57, 58 and 59, respectively, a fourth pin 66 which engages a fourth arm 67 fixed to the seventh rod 44 from the top of the upper bank. Depression of the button 52 will, therefore, result in the opening of the stops 33 which control reeds emitting the notes F, A flat, D flat and B and the dominant seventh chord will result.

The buttons 48 and 49, which control the

sounding of counter bass and bass notes respectively are also provided with depending rod portions, 68 and 69 respectively. The bass and counter bass buttons are each adapted to sound a single vertical tier of stops 33 and 34 to produce a single tone in four different octaves simultaneously. To this end each of the rod portions 68 and 69 is provided with a pin 70 in such a position upon the rod 68 or 69 that it cooperates with a predetermined arm 71, similar to the arms 60, 61, etc., previously described. The several arms 71 extend, one each from a lower bank of twelve rotatable rods 72 which is similar in operation to the rods 47, previously described. The lower stop members 34 have outwardly and downwardly projecting arms 73, generally similar to the arms 46 on the upper stop members 33. The arms 73 engage arms 74 on the rods 72 in the same manner that the arms 46 of the upper tier engage arms 67 on the upper rods 47.

Extending from the lower end of the upper stop 33 is an arm 75 which has an end portion 76 which engages beneath the arm 73, as shown in Fig. 3.

It will now be clear that depression of the button 48 will move the rod 68 and the pin 70 downwardly, thereby imparting a clockwise rotation to the arm 71, and through the medium of the eighth rod 72 from the top of the lower bank, to the arm 74. This clockwise rotation of the arm 74 will draw the arm 73 to the right as seen in Fig. 3, thereby moving the stop 34 away from the reed plate against the action of the spring 37 to open the ports 40 and 41 leading to the reeds of the lower reed block 43. This movement will be accompanied by movement of the stop 33 and a consequent opening of the ports 38 and 39 leading to the reed block 42 through the engagement of the portion 76 of the arm 75 with the arm 73 of the lower stop member 34.

The mechanism just described shows the operation of the reeds by manipulation of the so-called bass buttons. For playing the bass notes of the instrument upon the piano keys which have been generally designated at 16, the following mechanism is provided. As seen in Fig. 3, a series of piano keys 77 are provided, fulcrumed upon a rod 78 which is supported at its ends in the key tray 15. A second fulcrum rod 80 is provided for a series of black keys 81. The white keys 77 are cut out as at 82 to clear the black key fulcrum rod 80 and the black keys 81 are cut out as at 83 to provide clearance for the white key fulcrum rods 78. Beneath each key 77 and each key 81 are mounted a pair of levers 84 and 85. All of the levers 84 are pivotally mounted upon a common fulcrum rod 86 and all of the levers 85 are pivotally mounted upon a common fulcrum rod 87. The levers 84 and 85 engage each other by means of a pin and slot connection 88. The lever 87 has, at its opposite end, an upwardly projecting portion 89 which bears against a wear plate 90, one of which is provided at the bottom of each key 77 and each key 81. The remote end of the lever 84 is provided with a slot 91 for engagement with a portion 92 of an arm 93. At least one of the arms 93 is fixedly carried by each rotatable rod 72 of the lower bank.

When a key 77 or 81 is depressed the lever 85 is moved in a clockwise direction and by it the lever 86 is moved in a counterclockwise direction. Through the connection of the slot 91 of the lever

86 with the portion 92 of the arm 93, the rod 72 with which the particular key which has been depressed is associated will be given a clockwise rotation and all of the ports in the vertical tier with which this rod is associated will be opened.

When manual pressure is removed from the key 77 or 81 the springs 37 of the stop members restore all of the parts to their normal position.

It is believed that no further discussion of the operation of this action need be indulged in since the operation by means of the various keys and bass buttons has been discussed in connection with the description of the several instrumentalities associated therewith.

A modification of the bass piano key action of Fig. 3 is illustrated in Fig. 4. In this modification the upper bank of rotatable rods 47 remains unchanged as to the bass buttons 48, 49, 50, 51 and 52 and the depending rod portions associated with them. The stops 34 are the same as in the embodiment of Fig. 3 but the arms 94, which are otherwise similar to the arms 73, have an outward extension 95 rigidly carried thereby and terminating in a loop or bight portion 96. The bank of rods 97 is similar in construction and arrangement to the bank of rods 72 and is provided with arms 71 and 74. The arms 93 of the form shown in Fig. 3, however, are omitted in the present modification.

A secondary bank of twelve rods 98 is rotatably mounted, in a manner similar to the rotatable rods previously described, in a position before and substantially on a level with the bank of rods 97. This secondary bank of rods is shown in detail in Fig. 5. Each of these rods has associated therewith an outwardly and upwardly extending arm 99 which engages the bight portion 96 of the arm 95. A second outwardly and upwardly extending arm 100 associated with each rod 98 terminates in a horizontal loop or bight portion 101 which engages an upwardly extending arm 102 which is rigidly secured to the rear face of each key member 103, 104. The keys 103 and 104 are pivoted in a manner which has been described in connection with the embodiment shown in Fig. 3, the only difference being that the wear plate 90 is omitted therefrom.

The operation of the instrument of Fig. 4 by means of the bass buttons is identical with the operation of the instrument of Fig. 3. In the case of manipulation by the keys 103 and 104, however, the following action takes place. Depression of a key 103 or 104 moves the arm 102 and with it the arm 100 and one of the rotatable shafts 98 in a clockwise direction. This also produces a clockwise rotation of the arm 99 which draws the arm 95, through the medium of the loop portion 96 to the right as seen in Fig. 4, thereby opening the stops 33, 34.

It will be noted that no springs are included in any of the mechanism shown in Figs. 3 and 4 excepting the springs 37 which are associated with the stop members 33 and 34, and that the action of these springs serves to restore all of the instrumentalities to their normal positions when manual pressure is removed from any of the bass buttons or piano keys.

It is to be understood, of course, that all of the several arms 74, 71 and 93 associated with the rotatable rods 72 are spaced longitudinally of the rotatable rods 72 in such manner as to avoid interference between themselves and between themselves and the lever 84 and the button rods 68. The same is true of the several arms associated with the rod banks 97 and 98 of the

modification shown in Fig. 4 and this staggering or spacing of the arms is aptly illustrated, in the case of the bank of rods 98, in the perspective view, Fig. 5.

While the inventors have disclosed and illustrated two specific forms of their present invention it is to be understood that its scope is not to be considered as limited to these forms or in any other way excepting as defined in the appended claims.

We claim:

1. In a musical instrument of the reed organ type, a series of chromatically tuned reeds, a stop associated with each reed, a series of manually operable key members arranged in piano keyboard formation, one of said key members being associated with each stop for selectively rendering said reeds operative, independent manually operable chord-playing buttons arranged in a plurality of rows, each row containing buttons for playing chords of a particular class and the buttons of each row being arranged in a progressive series of intervals of a perfect fifth and ranging through the twelve key signatures for playing the chords of a particular class in any key selectively, and means associating each chord button with a combination of said stops for rendering a plurality of said reeds operative to produce a chord.

2. In a musical instrument of the reed organ type, mechanism for producing musical tones which comprises a series of chromatically tuned reeds, means for applying fluid pressure against said reeds, valve means for controlling the application of the fluid pressure consisting of a stop associated with each reed, a set of keys for manually opening said stops, a second set of keys for manually opening said stops independently of said first set of keys, and a single spring means associated with each stop for urging said stop to a closed position and for returning the entire mechanism to a normal position when manual pressure is removed from a key member.

3. In a musical instrument of the reed organ type, mechanism for producing musical tones which comprises a chromatic series of reeds, means for applying fluid pressure against said reeds, valve means for said fluid pressure consisting of a stop associated with each reed, rotatable control means associated with each stop, a series of chord-playing buttons, said buttons being connected to the rotatable means associated with predetermined stops, and a piano key for and having operative connection with each of said rotatable control means for operating said stops selectively and independently of said chord-playing buttons.

4. In a musical instrument of the reed organ type, mechanism for producing musical tones which comprises a chromatic series of reeds, means for applying fluid pressure against said reeds, valve means for said fluid pressure consisting of a stop associated with each reed, a rotatable shaft associated with each stop, a series of chord-playing buttons, said buttons being connected to predetermined rotatable shafts for opening corresponding stops, and a piano key having operative connection with each of said rotatable shafts for operating said stops selectively and independently of said chord-playing buttons.

5. In a musical instrument of the reed organ type, mechanism for producing musical tones which comprises a chromatic series of reeds, means for applying fluid pressure against said reeds, valve means for said fluid pressure consist-

ing of a stop associated with each reed, a rotatable shaft associated with each stop, a series of chord-playing buttons arranged in a plurality of rows, each row containing buttons for playing chords of a particular class and the buttons of each row being arranged in a progressive series of intervals of a perfect fifth for playing the particular class of chords in any key selectively, said buttons being connected to predetermined rotatable shafts for opening corresponding stops, and a piano key having operative connection with each of said rotatable shafts for operating said stops selectively and independently of said chord-playing buttons.

6. In a musical instrument of the reed organ class having a vertically disposed reed plate, a reed block positioned upon one face thereof, a stop member positioned upon the opposite face of the reed plate and in registry with said reed block, and an opening in said reed plate providing fluid communication between said reed block and said stop; a rotatable rock shaft having an arm extending therefrom for engagement with said stop member whereby rotation of said rock shaft moves said stop member away from the reed plate, a key action comprising a key member extending perpendicularly with respect to said reed plate and pivotally supported adjacent the end nearest said reed plate, a second arm fixed to said rock shaft, and linkage means connecting said key member and said second arm whereby pivotal movement of the key member produces rotation of the rock shaft.

7. In a musical instrument of the reed organ class having a vertically disposed reed plate, a reed block positioned upon one face thereof, a stop member positioned upon the opposite face of the reed plate and in registry with said reed block, and an opening in said reed plate providing fluid communication between said reed block and said stop; a rotatable rock shaft having an arm extending therefrom for engagement with said stop member whereby rotation of said rock shaft moves said stop member away from the reed plate, a key action comprising a key member extending perpendicularly with respect to said reed plate and pivotally supported adjacent the end nearest said reed plate, a second arm fixed to said rock shaft, linkage means connecting said key member and said second arm whereby pivotal movement of the key member produces rotation of the rock shaft, a second key member comprising a rod member mounted for movement longitudinally of its axis, and a third arm fixed to said rock shaft and engageable by said rod member.

8. In a musical instrument of the reed organ class having a reed plate, a reed block positioned thereon, and stop members associated with said reed block; stop control mechanism comprising a rotatable shaft having an arm extending therefrom for engagement with said stop member, a second arm extending therefrom, an axially movable button rod engaging said second arm, a second rotatable shaft having an arm for engagement with said stop member, a pivoted key member, and a second arm on said second rotatable shaft for engagement with said pivoted key member.

9. In a musical instrument of the reed organ class having a reed plate, a reed block positioned thereon, and movable stop members associated with said reed block; stop control mechanism for each stop member comprising a pair of rotatable shafts, independent manual means for producing rotation of each shaft selectively, and a bifurcated member positioned upon each stop member and engageable with each of said pair of rotatable shafts.

10. In a musical instrument of the reed organ class having a reed plate, a reed block positioned thereon, and movable stop members associated with said reed block; stop control mechanism for each stop member comprising a pair of rotatable shafts, independent manual means for producing rotation of each shaft selectively, and a pair of arms carried by each stop member and engageable with said pair of rotatable shafts.

11. In a musical instrument of the reed organ class having a reed plate, a reed block positioned thereon, and movable stop members associated with said reed block; means for controlling said stop members from a plurality of positions comprising a plurality of rotatable shafts for each stop member, a control key for producing rotation of each rotatable shaft, and arm means on said stop member and in engagement with each rotatable shaft.

12. In a musical instrument of the reed organ class having a reed plate, a reed block positioned thereon, and movable stop members associated with said reed block; stop control mechanism for each stop member comprising a pair of rotatable shafts, independent manual means for producing rotation of each shaft selectively, and means fixed to each stop member and engageable with each of said pair of rotatable shafts.

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