

July 10, 1951

J. A. LINKS

2,559,777

CHILD'S MUSICAL INSTRUMENT

Filed Aug. 9, 1947

4 Sheets-Sheet 2

FIG-3

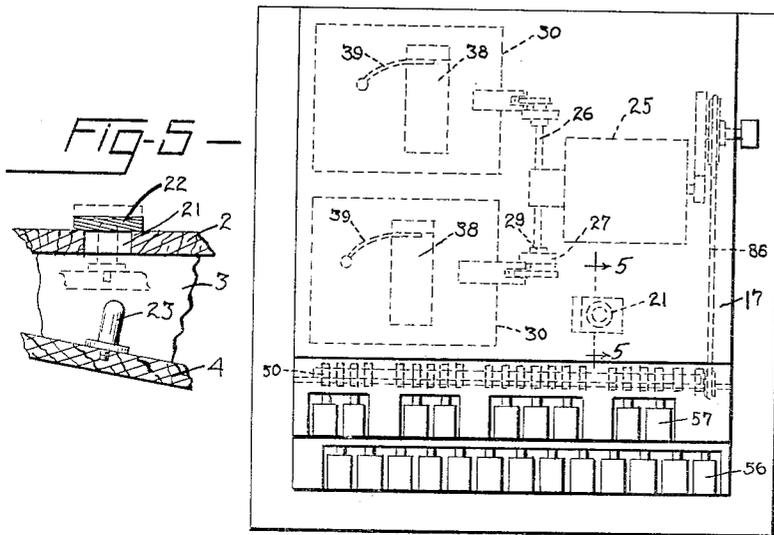


FIG-5

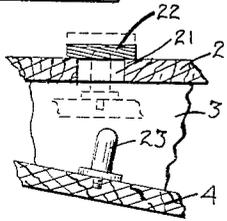
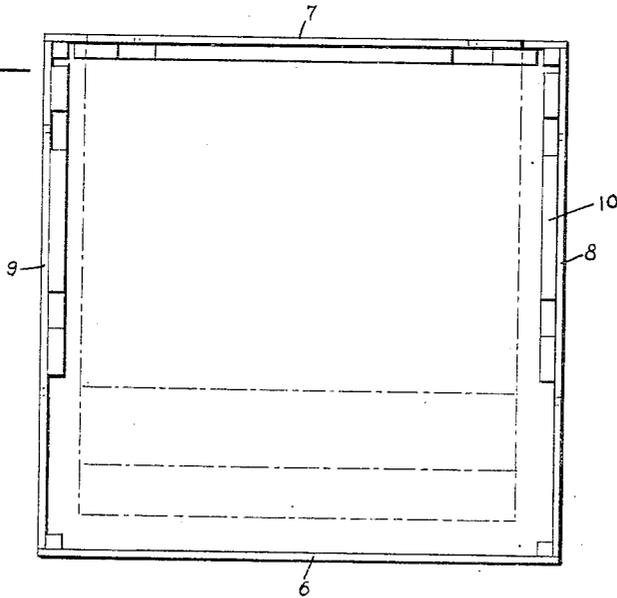


FIG-4



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FIG-8

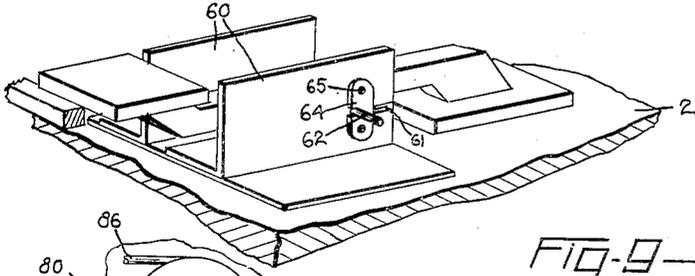


FIG-9

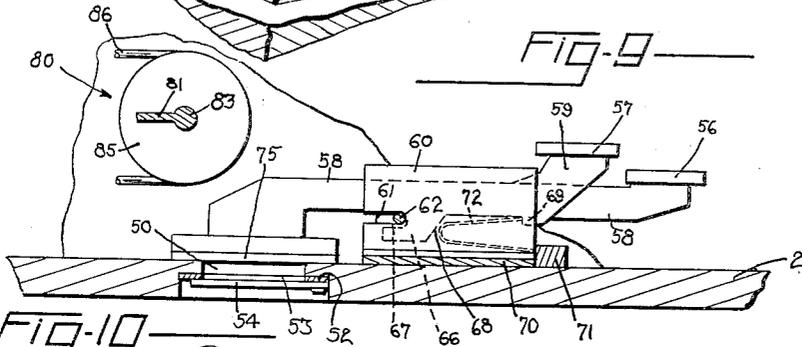


FIG-10

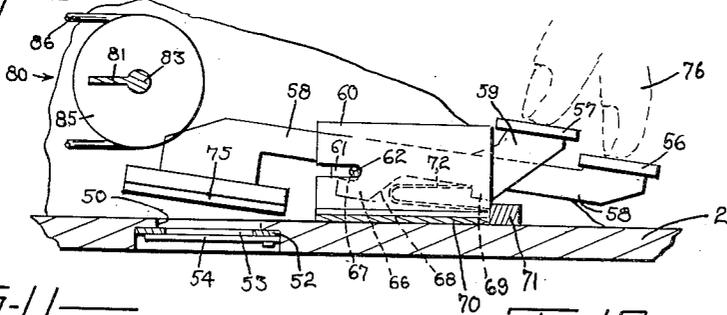
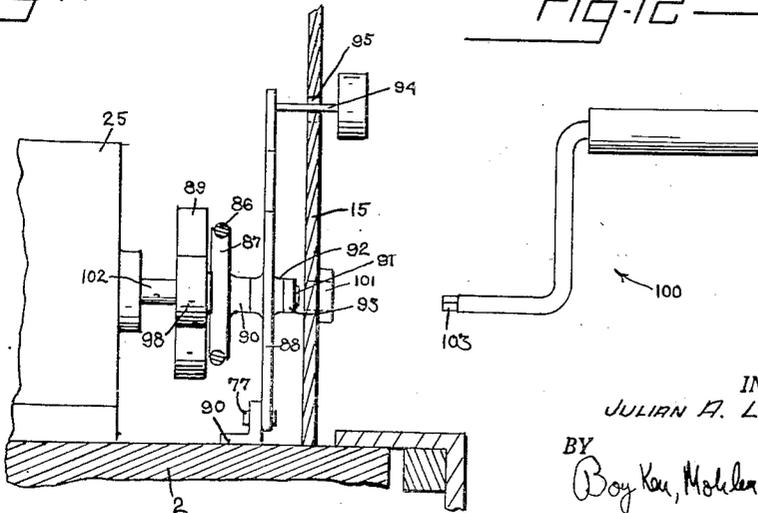


FIG-11

FIG-12



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CHILD'S MUSICAL INSTRUMENT

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6 Claims. (Cl. 84—351)

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This invention relates to a musical instrument, and particularly to a child's musical instrument adapted to be supported on a table or the like, and which instrument has a standard keyboard arrangement like a piano or an organ, except that it is limited to several octaves.

One of the objects of the invention is to provide a child's musical instrument similar to an organ that is economical to produce, true in tone, compact, easy for a child to play, and which instrument is sufficiently rugged to withstand such abuse as the normal child might give it.

Another object of the invention is the provision of a child's musical instrument similar to an organ and in which reeds for both the full and half tones are actuated by suction, there being a suction chamber with which the reeds are associated.

A still further object of the invention is the provision of a child's musical instrument similar to an organ and which instrument has a spring expanded bellows, one side of which is stationary and supports the keyboard, reeds, key actuated air valves, and the means for withdrawing air from said bellows so that expansion of the latter under the spring will cause actuation of the reeds by air entering the bellows when the key actuated valves are opened by manipulation of the keys for admitting air to the bellows past the reeds.

An additional object of the invention is the provision of a child's musical instrument similar to an organ in which the elements are so constructed and arranged for quick and easy assembly and replacement.

Other objects and advantages will appear in the description and in the drawings.

In the drawings, Fig. 1 is a side elevational view of the instrument with one of the side panels removed so as to expose the interior.

Fig. 2 is a fragmentary enlarged top plan view of a portion of the instrument with the top panel of the enclosing cabinet removed.

Fig. 3 is a reduced size top plan view of the instrument with certain interior elements being indicated in dash lines.

Fig. 4 is a top plan view of the cabinet with the bellows carrying all of the operating elements removed from the cabinet and with the top of the cabinet removed. The area occupied by the bellows is indicated in dash lines.

Fig. 5 is an enlarged fragmentary sectional view of the safety device for the main suction chamber.

Fig. 6 is an enlarged fragmentary elevational view, partly broken away, showing the tremolo and its cut off.

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Fig. 7 is an enlarged fragmentary sectional view of one of the bellows that draws air from the main suction chamber.

Fig. 8 is a perspective view, partly in section, showing the construction of one of the keys.

Fig. 9 is an enlarged fragmentary sectional view showing the tremolo and two of the keys and valves in closed position, and also showing one of the reeds.

Fig. 10 is a view similar to that of Fig. 8 showing the valve in open position with the fingers of an operator in dash lines.

Fig. 11 is an enlarged sectional view showing in dash lines means for converting the motive power from electric to manual without changing any of the existing structure.

Fig. 12 is an elevational view of a crank that is adapted for use in operating the main bellows.

In detail, the instrument herein illustrated comprises a main suction chamber 1 in the form of a horizontally disposed bellows having a rigid horizontal rectangular upper wall 2 on which is supported all of the elements for operating the instrument.

Flexible side walls 3 of leather or other sufficiently flexible air-tight material adapted for bellows use connects the opposite lower rigid rectangular wall 4 with the horizontal upper side 2. This lower wall 4 extends divergently downwardly from the rear edge of the top wall when the bellows side walls 3 are expanded, and the size of said lower wall is substantially the same as that of the upper wall.

The words "front," "forward," "forwardly," "rear" and "rearwardly" where used in the description are used with reference to the keyboard, which is along the "front" edge of the bellows 1, while the opposite edge is the "rear" edge. The player would be at the front side of the instrument in playing it, and the front side of the cabinet enclosing the bellows is along the keyboard or at the side of the bellows adjacent the keyboard.

The bellows 1 is supported within a cabinet that is formed in simulation of an organ, having a front side wall 6 (Figs. 1, 4), a rear side wall 7 and opposed lateral side walls 8, 9. Horizontally extending coplanar ledges 10 may be respectively secured to the rear and lateral side walls of the cabinet from which the top wall 2 of the bellows may be suspended, as by lugs or clips 11 (Fig. 2) and the said top wall may be directly secured by screws or the like to the front wall 6 of the cabinet. Legs 12 at the four corners are adapted to support the cabinet on a desk or table.

The upper surface of the top wall 2 of the bellows is preferably substantially flush with the upper edges of the front and side walls of the cabinet, while the rear wall 7 may project upwardly from said upper edges to form the rear wall 14 of a slight superstructure disposed above the main body of the cabinet and enclosing the operating elements of the organ rearwardly of the keyboard.

Opposed lateral side walls 15, a front wall 16 and a top wall 17 cooperate with rear wall 12 of said superstructure for so enclosing the operating elements.

As already mentioned, the top wall 2 of the bellows supports the operating elements of the instrument and forms a table or platform that substantially fills the entire space within the upper portion of the cabinet.

Expansion springs 20, which may be generally of V shape with one leg attached to the lateral edges of the upper wall 2 and lower wall 4 of the bellows 1 at the divergent ends of said edges, function to constantly expand the bellows to its fullest extent or to tend to expand the latter. These springs are preferably flat or leaf springs and as they are well rounded at their convergent ends in the plane of the legs or sides and as the legs are relatively long, said springs are not subject to objectionable fatigue in bending and are substantially indestructible in normal use.

The upper wall 2 of the bellows is formed with an opening 21 (Figs. 3, 5) over which a flap valve 22 extends so as to close the opening on the expansion stroke of the bellows and upon suction within the bellows. The bottom wall 4 of the bellows carries a small projection 23 that is within the bellows and that is adapted to extend through the opening 21 and to lift the valve 22 when the bellows is substantially collapsed. This valve 22 and the projection 23 constitute a safety valve, which, as will later be described more in detail, functions to prevent the overheating or burning out of the motor that operates the instrument.

A small electric motor 25 is supported on the upper wall 2 of the bellows. The armature shaft of this motor is connected by reduction gears with a main drive shaft 26 (Fig. 3) that has a pair of annular disks 27 respectively at opposite ends thereof and which disks have eccentrically disposed pins 28 (Fig. 7) positioned at opposite sides of the axis of shaft 26. Bearings 29 rotatably support shaft 26.

Adjacent each of the disks 27 are relatively small bellows 30 which, in structure, may be said to be miniatures of the main bellows. The rigid bottom wall 31 of each small bellows 30 is rigidly secured to the rigid top wall 2 of the main bellows 1 and a passageway 32 extends through both walls 2, 31. The structure of both bellows 30 is the same so only one will be described in detail.

Flexible side walls 33 connect the lower rigid wall 31 with a rigid upper wall 34 of similar shape and size (Fig. 7). A small generally V-shaped spring 35 formed with a loop at the bend is at each of two lateral sides of the bellows 30 and one leg of each spring is secured at its outer end to a lateral edge of the top wall 34 while the other leg is secured at its outer end to the bottom wall 31. These springs are expansion springs and yieldably hold the bellows expanded and constantly urge them to expand position when collapsed.

An opening 37 is formed in the upper wall 34 of each bellows 30 and a flap valve 38 on the outer upper side of said wall closes said opening. A

spring 39 over the free end of said valve yieldably holds the valve closed, but upon moving the top wall 34 toward collapsed position the valve will open to expel the enclosed air and will close during the return movement of the top wall to expanded position for withdrawing air from within the main bellows through passageway 32 that communicates between the interiors of the main and smaller bellows.

As above stated, the pin 28 on disks 27 are positioned at opposite sides of the axis of shaft 26. Connecting rods 45 respectively connect the pins 28 with extensions 46 on the upper wall 34 adjacent the expansible sides of bellows 30. A pivot 47 (Fig. 7) connects each rod 45 with each extension 46.

By the above structure, upon rotation of the shaft 26 by motor 25 the pair of bellows 30 will be expanded and collapsed alternately producing a steady suction of air from the main bellows 1, whereupon the main bellows will be collapsed until the projection 23 lifts the valve 22, unless there is admission of air into the main suction chamber or bellows 1 from some other source. If it were not for the valve 22, the motor 25 would be stalled and its windings would overheat and possibly burn out upon a full collapse of the main bellows.

Spaced from the front edge of the upper wall 2 of the main suction chamber 1 is a row of spaced rectangular openings 50 providing separate passageways between the interior of the main suction chamber and the atmosphere.

A strip 52 extends across said openings, which strip is formed with spaced rectangular apertures 53 that are substantially in registration with openings 50. A row of reeds 54 on strip 52 is positioned on the underside of said strip with one of the ends of the reeds secured to the strip adjacent each opening. The free ends of the reeds extend over said openings. These reeds are formed to vibrate at the desired rates for producing the correct sounds of the notes of a scale, including the half notes, within the range provided for by the number of keys used. For example, in the instrument illustrated, there are twenty-two keys which represent thirteen full notes and nine half notes. Therefore, there are twenty-two openings 53 in strip 52 and a corresponding number of openings 50 in the top wall 2.

Along the row of openings 50 and between said openings and the front side of the cabinet is a row of separate keys 56, 57, the numerals 56 designating the keys for the full notes and the numerals 57 designating the keys for the half notes.

Each of the keys 56, 57 is provided with a horizontally extending arm 58 (Fig. 9) extending rearwardly from the underside of each key and in the case of keys 57 an angular upwardly and forwardly extending section 59 of the arm 58 elevates the half keys 57 to a level above the full keys.

Each of the arms 58 extends between an adjacent pair of partitions or supports 60 (Fig. 8), which supports are formed with corresponding horizontally aligned rearwardly opening slots 61.

A shaft 62 extends parallel with the row of slots 61 and is inserted into said slots through their rearwardly opening ends. Plates 64 (Fig. 8) are removably secured by screws 65 to the end partitions of the row and function to secure the shaft 62 at the closed rear ends of the slots 61.

Each arm 58 is integrally formed along its lower edge with a downwardly and rearwardly projecting member 66, which member defines the

lower side of a rearwardly opening slot 67 on each arm. The forward edge 68 of the projecting member 66 is slanted upwardly and forwardly from the lower edge of said member and at a point spaced forwardly of said projection the said arm is formed with a square rearwardly facing shoulder 69.

Each of the shoulders 69 is adjacent the forward edge of a strip 70 to which the supports 60 are secured and a retainer strip 71 along the forward edge of strip 70 projects slightly above the upper side of said strip.

One manner of assembling the keys and installing them is to place the keys on shaft 62 and to then position the shaft with the keys thereon in the slots 61 in supports 60 so that the shaft is adjacent the forward closed ends of the slots 61, 67 that are respectively in supports 60 and arms 58. The retainer plates 64 may then be secured on the end supports 60, thus locking the shaft in place and thereafter leaf springs 72 of uniform tension and size are positioned between the under sides of arms 58 forwardly of the projections 66 thereon and the strip 70 so that one leg of the spring extends forwardly from its juncture with the other leg to a point where its free forward edge is substantially in engagement with the shoulder 69 on arm 58 while the free end edge of the other leg is behind the retainer strip 71. The bend connecting the legs of the spring will be adjacent the upwardly inclined edge 68 along the lower edge of arm 58.

By the foregoing structure the keys will be held in position against movement longitudinally of arms 58, yet they can be removed by applying sufficient force on the keys pulling them forwardly to cause the springs to compress under the influence of the slanted forward edge 68 of each arm.

The springs 72 exert a uniform upward pressure on the arms 58 forwardly of the shaft 67 to yieldably hold the rear ends of the arms 58 downwardly. Said rear ends each carry a valve member 75 that is of resilient material and that is of a size to extend over the openings or passages 50. Thus the valves will be yieldably held closed but upon downward pressure of the fingers 76 of an operator on the keys, the valves will be opened. The result of opening valves 75 is that atmospheric air is admitted through the openings 50 that are uncovered into the bellows 1 or main suction chamber, thereby causing instant vibration of the reed that extends across the opening that is uncovered.

The bellows 30 are adequate to maintain sufficient suction within the main bellows for producing a uniform flow of air into the main bellows past the reeds for actuating the reeds even when a plurality of the keys are struck simultaneously for producing relatively complex chords.

A very desirable tremolo effect is produced by a tremolo 80 (Fig. 9) that is in the form of an elongated horizontally extending vane 81 projecting radially from a shaft 83 that extends over the row of openings 50. Shaft 83 is journaled in any suitable bearings at the ends of row 50 and carries a pulley 85 over which an electric belt 86 extends to a pulley 87 (Fig. 6) that is carried on an arm 88. Arm 88 is vertically extending and is pivoted at its lower end by a pivot 77 to a bracket 90 secured on the upper wall 2 of the suction chamber 1. The pulley 87 has a friction wheel 89 secured thereto, both pulley 87 and wheel 89 being on a hub 90 (Fig. 11) that is secured

to a rotary shaft 91. Shaft 91 rotatably extends through a bearing 92 rigid with arm 88 and a collar 93 on the side of arm 88 holds the shaft in said bearing 92, the hub 90 and collar 93 functioning also as thrust bearings. A laterally projecting spring arm 94 projects from the upper end of the arm 88 through a slot 95 in the wall 15 of the superstructure. Said slot is enlarged at one end to form a vertically extending shoulder 96 (Fig. 6).

The periphery of friction wheel 89 is adapted to engage the periphery of a rubber surfaced wheel 98 that is driven by the motor 25 when the spring arm 94 is in the reduced end of slot 95, but upon swinging said arm 94 into the enlarged end, thereby swinging the friction wheel 89 away from wheel 98, the arm 94 will drop into the enlarged end of said slot and will be held by shoulder 96 against return of the wheel 89 into engagement with wheel 98 until the arm 94 is urged upwardly a sufficient distance to clear shoulder 96. The elastic belt 86 will provide a tension of the arm 94 against shoulder 96.

In the event it is desirable to operate the main bellows 1 manually, a manually actuatable crank 100 is adapted to be inserted at one end through a bearing 101 carried by wall 15 in axial alignment with the end of the shaft 102 of the motor 25. The end of said shaft is formed with a square recess for receiving the square end 103 of crank 100. The use of the crank is usually only in an emergency, but it enables actuation of the main bellows when found necessary or desirable.

From the foregoing description, it is believed that the operation of the instrument is obvious. The sole use of suction force as described for providing the means for vibrating the reeds has been found to be perfectly satisfactory and to provide ample power for producing instantaneous clear and sustained vibrations free from variations in strength, whereas in pressure actuated reeds greater power is required and the reeds are very sensitive to the changes in pressure. Where a positive pressure in a pressure chamber is required, each pulsation of the pump immediately causes a change in the degree of pressure, whereas in utilizing the suction in a collapsible chamber or chambers, the collapse of which is resisted by the uniform tension of expansion springs, there is no noticeable variation in the pressure characteristic of the air within the chamber. The suction impulses when the keys are not being manipulated are translated to the springs, compressing the latter while opening of the key manipulated valves permits air under the expansion influence of the springs to pass the reeds.

It is to be understood that the detailed description and drawings are not to be considered as restricting the invention to the precise details so described and disclosed. The drawings merely show a preferred form of the invention.

I claim:

1. A musical instrument comprising a cabinet adapted to be supported on a table and having a bottom wall, top wall and lateral side walls forming and enclosed air chamber, a row of openings formed in said top wall and a wind actuatable reed positioned in each opening for actuation by air passing through each opening, a row of finger depressable keys pivotally supported in said top wall, each key having a valve element closing one of said openings and movable for opening the latter upon depressing the key, and suction means communicating with said chamber for creating a suction force within the latter for drawing at-

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mospheric air past said reeds upon depressing said keys, said side walls being of flexible material and said bottom wall being rigid whereby the said bottom wall will move from an expanded position spaced a substantial distance from said top wall toward said top wall upon actuation of said suction means, and a spring for yieldably resisting such movement and for moving said bottom wall toward said expanded position thereof upon admission of atmospheric air into said chamber faster than said suction means is adapted to exhaust it

2. A musical instrument comprising a cabinet adapted to be supported on a table and having a bottom wall, top wall and lateral side walls forming an enclosed air chamber, a row of openings formed in said top wall and a wind actuatable reed positioned in each opening for actuation by air passing through each opening, a row of finger depressable keys pivotally supported in said top wall, each key having a valve element closing one of said openings and movable for opening the latter upon depressing the key, and suction means communicating with said chamber for creating a suction force within the latter for drawing atmospheric air past said reeds upon depressing said keys, said suction means comprising suction bellows supported on and above said top wall and means also on and above said top wall for actuating said bellows.

3. A musical instrument comprising a cabinet adapted to be supported on a table and having a bottom wall, top wall and flexible collapsible lateral side walls forming an enclosed air chamber collapsible upon exhaustion of air therefrom, a row of openings formed in said top wall and a wind actuatable reed positioned in each opening for actuation by air passing through each opening, a row of finger depressable keys pivotally supported in said top wall, each key having a valve element closing one of said openings and movable for opening the latter upon depressing the key, and suction means communicating with said chamber for creating a suction force within the latter for drawing atmospheric air past said reeds upon depressing said keys, said suction means comprising a pair of suction bellows supported on said top wall rotary means for alternately actuating said bellows, and spring means connected with said chamber constantly tending to hold the walls of said chamber in fully expanded position against collapse but yieldably permitting said collapse upon exhaustion of air from said chamber.

4. A musical instrument comprising a cabinet adapted to be supported stationary on a table, said cabinet including an air chamber comprising a relatively large bellows having a rigid top wall, rigidly secured to said cabinet, a pair of smaller suction bellows on said top wall communicating with the interior of said large bellows and valved for drawing air from said large bellows upon actuation of said smaller bellows, means for alternately actuating said smaller bellows, a row of openings formed in said top wall for admitting air into said large bellows, valve elements respectively closing said openings, spring means for automatically expanding said large bellows, reeds supported in said openings with one reed

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in each opening, a row of keys on said top wall supported for manually depressing each key, and means connecting each of said keys with one of said elements for moving the latter to a position for admitting air through the opening covered by the element so moved.

5. A musical instrument comprising a cabinet adapted to be supported stationary on a table, said cabinet including an air chamber comprising a relatively large bellows having a rigid top wall, rigidly secured to said cabinet, a pair of smaller suction bellows on said top wall communicating with the interior of said large bellows and valved for drawing air from said large bellows upon actuation of said smaller bellows, means for alternately actuating said smaller bellows, a row of openings formed in said top wall for admitting air into said large bellows, valve elements respectively closing said openings, spring means for automatically expanding said large bellows, reeds supported in said openings with one reed in each opening, a row of keys on said top wall supported for manually depressing each key, and means connecting each of said keys with one of said elements for moving the latter to a position for admitting air through the opening covered by the element so moved, a motor and means connecting said motor with said smaller bellows for alternately actuating the latter.

6. A musical instrument comprising a cabinet adapted to be supported stationary on a table, said cabinet including an air chamber comprising a relatively large bellows having a rigid top wall, rigidly secured to said cabinet, a pair of smaller suction bellows on said top wall communicating with the interior of said large bellows and valved for drawing air from said large bellows upon actuation of said smaller bellows, means for alternately actuating said smaller bellows, a row of openings formed in said top wall for admitting air into said large bellows, valve elements respectively closing said openings, spring means for automatically expanding said large bellows, reeds supported in said openings with one reed in each opening, a row of keys on said top wall supported for manually depressing each key, and means connecting said of said keys with one of said elements for moving the latter to a position for admitting air through the opening covered by the element so moved, means for automatically admitting atmospheric air into said large bellows upon predetermined collapse thereof under the influence of said smaller bellows.

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