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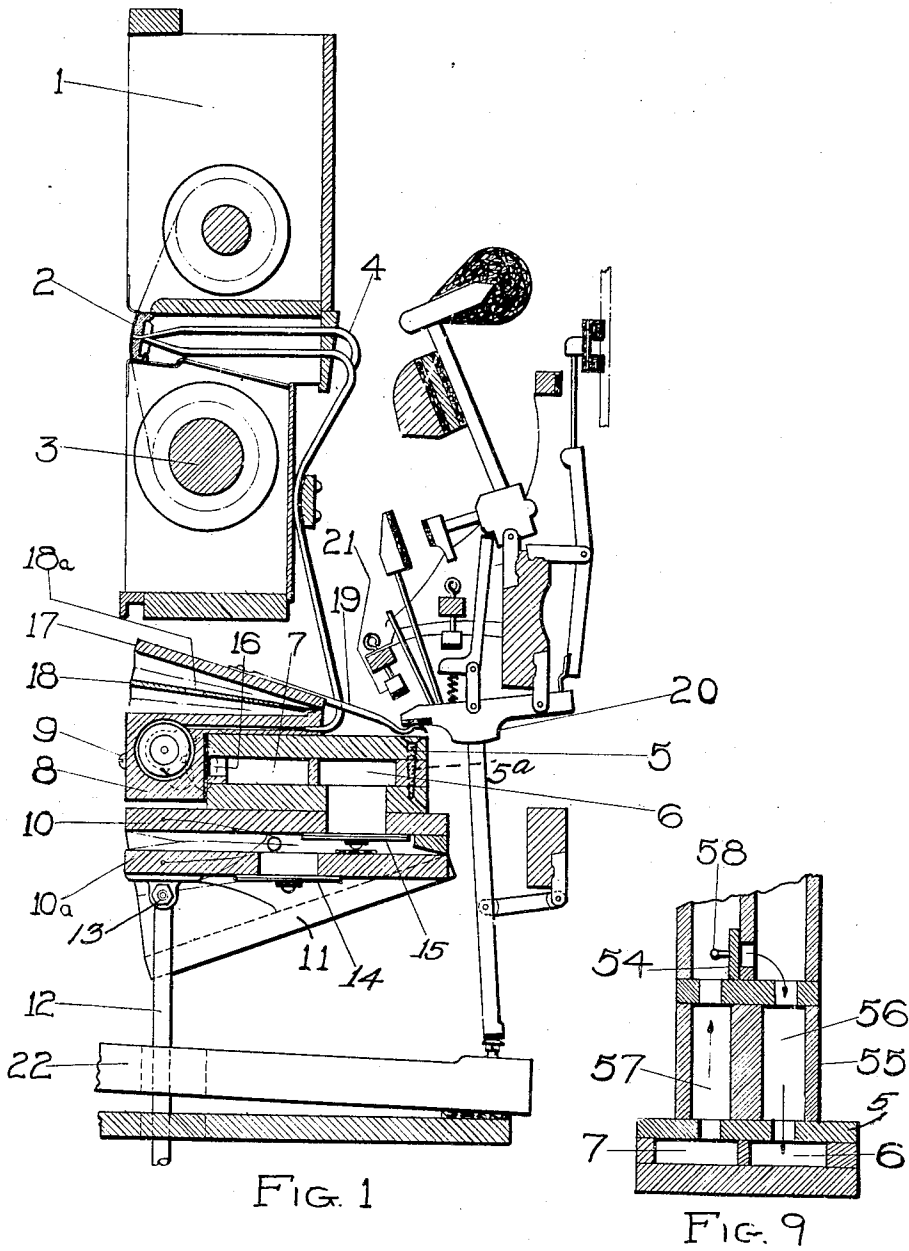
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MECHANISM FOR PLAYER PIANOS

Filed July 11, 1927

3 Sheets-Sheet 1



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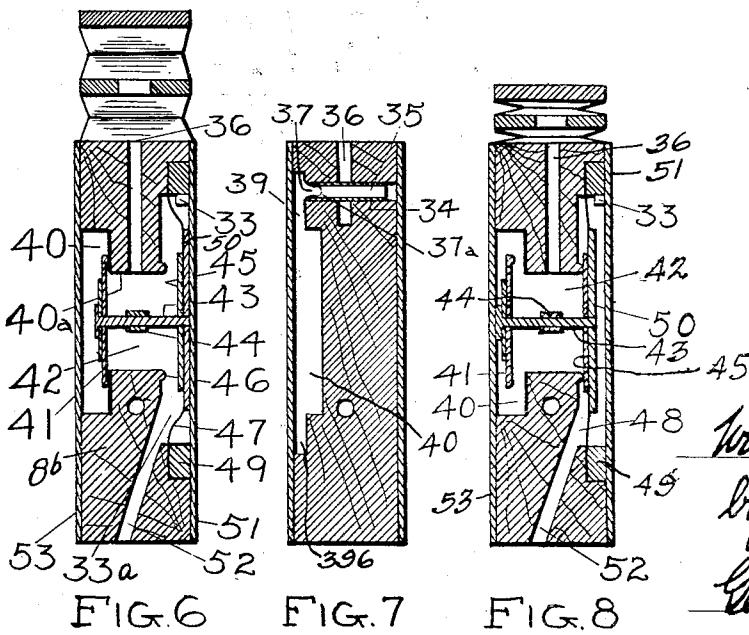
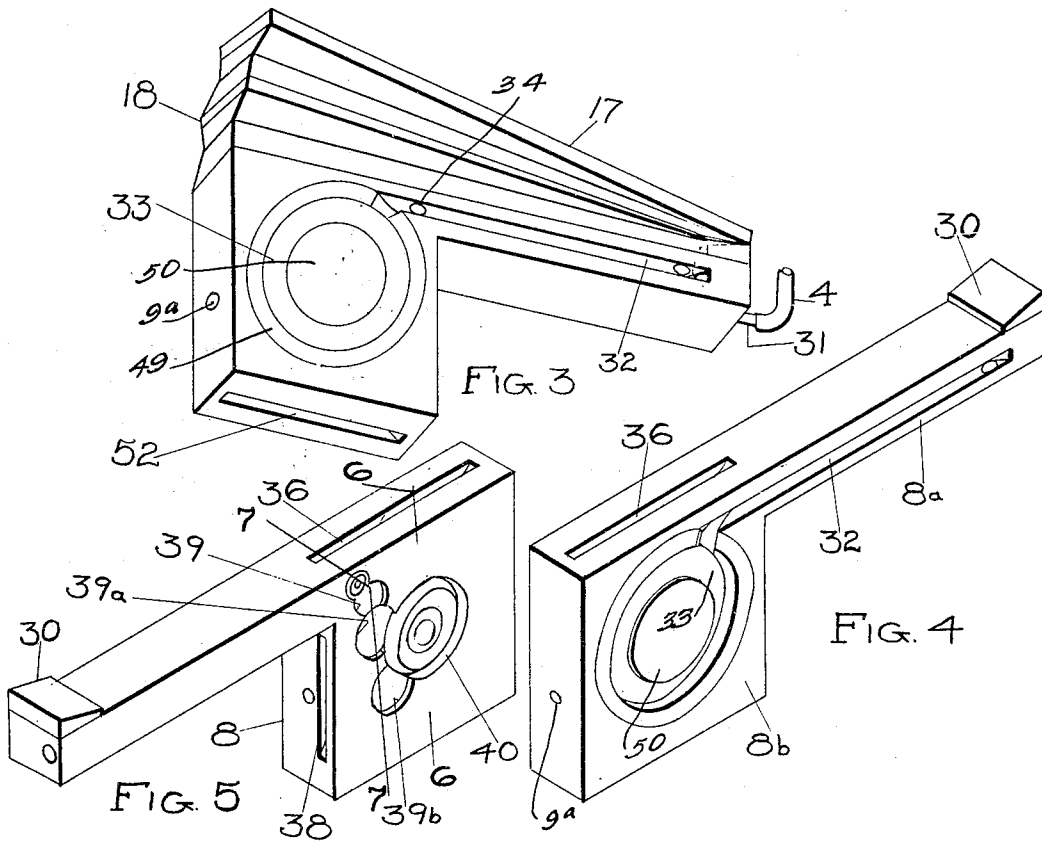
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## UNITED STATES PATENT OFFICE

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## MECHANISM FOR PLAYER PIANOS

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My invention relates to player pianos and has particular reference to an improved construction of the pneumatic action for striking the notes of the piano.

5 Some of the objects of my invention are to produce more simple and compact player pianos than have been heretofore constructed, to reduce the number of parts embodied in the pneumatic action, to insure accessibility  
10 of the parts of the pneumatic action for either adjustment, repair or replacement, and to facilitate the standardization of the parts of the pneumatic action for instruments of varying scale dimensions.

15 Heretofore it has been the common practice of manufacturers of player pianos to locate the pneumatic action for striking the notes of the piano above the piano key bed and to place the bellows and other auxiliary  
20 parts below the keys, thereby necessitating the interconnection of the various elements by a number of rubber tubes. By my invention, I reorganize the entire structure of the pneumatic action and its associated elements,  
25 by combining in a single unit, not only the bellows and pneumatic units but also various other auxiliary parts of the pneumatic mechanism. In my improved construction, I eliminate a large number of parts heretofore  
30 employed by making one wind chest serve as a common wind chest for the entire pneumatic mechanism, thereby eliminating the necessity for connecting the various separated elements by rubber tubing, with a resulting  
35 reduction in the cost of maintenance of the instrument.

Furthermore, my invention results in a great saving in the cost of manufacture of pneumatic actions for instruments of different  
40 scale range, due to the fact that instead of providing two or more rows of striking pneumatics arranged one above the other, as in common practice, my improved construction employs only one row of striking pneumatics  
45 arranged in side by side relation. My improved pneumatic units are so constructed that they can be placed in approximate vertical alignment with the corresponding notes to be struck on the piano, each pneumatic unit  
50 being a duplication of the others; thus per-

mitting wind chests for different pianos to be bored or grooved alike in accordance with the scale range of the piano. In other words, a large number of standardized parts can be employed in constructing pneumatic actions  
55 for pianos of different scale ranges, the single row arrangement of pneumatic units being extremely flexible as regards instruments having different proportions. The above and other advantageous features of my invention  
60 will hereinafter more clearly appear in the accompanying drawings in which

Fig. 1 is a view partially in section and partially in end elevation of a portion of an upright piano provided with my improved  
65 pneumatic action.

Fig. 2 is a front view of the parts shown in Fig. 1 on a reduced scale.

Fig. 3 is a perspective view of one of my improved pneumatic units removed from the  
70 piano.

Fig. 4 is a perspective view of the unit shown in Fig. 3 with the power pneumatic removed.

Fig. 5 is a perspective view similar to Fig. 4  
75 4 looking at the other side of the unit.

Fig. 6 is a sectional view through the unit along the line 6, 6 of Fig. 5.

Fig. 7 is a sectional view along the line  
80 7, 7 of Fig. 5.

Fig. 8 is a sectional view similar to Fig. 6 showing the power pneumatic in collapsed condition to strike a note.

Fig. 9 is a fragmentary sectional view along  
85 the line 9, 9 of Fig. 2.

Like reference characters refer to like parts in the different figures.

Referring particularly to Figs. 1 and 2, the spool box 1, of any usual construction, has mounted therein the tracker bar 2, take  
90 up spool 3 and the tubes 4, leading from the tracker bar 2 to my improved pneumatic action, which is located just below the spool box. The action comprises a main channel board 5, having a bellows section or  
95 chamber 6 and an action section or wind chest 7 mounted on the board 5 and in direct communication with a row of pneumatic units 8, secured to the chest 7 by means of the screws 9 extending through holes 9a in 100

the units, the details of which units will be hereinafter described.

Rigidly secured to the board 5 in any suitable manner as by glue and screws 5a and in communication with the bellows section 6 are mounted the feeders or exhausters 10 and the reservoir 11. The movable leaf 10a of each feeder 10 is connected by means of the link 12 and lug 13 to any suitable pedal mechanism, not shown, beneath the key bed of the piano. The exhausters 10 provide valves 14 and 15 to regulate the flow of air from the bellows section 6 to the reservoir 11.

The wind chest 7 provides spaced ducts 16 each adapted to convey the effect of the vacuum in the chest 7 to a striker pneumatic unit 8. Each striker unit 8 provides what will be hereafter termed a power pneumatic which consists of two movable leaves 17 and 18 connected by flexible material, the outer lead 17 carrying a striking lever 19 which is in contact with the wippen 20 of the piano actions.

As shown, an adjustable stop 21 is provided to regulate the throw of each wippen 20 although it is evident that this stop 21 can either engage directly with the end of the wippen 20 or be so placed as to engage the striking lever 19, carried by a striker unit 8. As is ordinarily the practice, the key 22 can operate the wippen 20 to strike the notes independently of the player mechanism, or the player mechanism can be operated independently of the keys 22.

Referring to Fig. 2, a number of parts not directly related to the present invention are shown as comprising the wind motor 23 for operating the roll mechanism; through transmission or gear mechanism 24; and the automatic tracking mechanism within the box 25. The tempo governor and action shut off are contained within the box 26 while the hammer rail pneumatics for the treble end, and bass end are shown at 27 and 28, respectively. The loud pedal or damper lifting pneumatic is shown at 29.

Referring now to Figs. 3 to 8, inclusive, it will be seen that each pneumatic unit 8 consists of an L shaped block, preferably of wood and fabric, the elongated portion 8a of which provides a bevelled projection 30 to which the center leaf 18 of the power pneumatic is hinged by means of a piece of thin fabric glued to the projection 30 and attached to the center leaf 18, and to the end of the outside leaf 17, respectively. The center leaf 18 provides a passage 18a leading to the space between the center leaf 18 and the outer leaf 17, the two leaves in combination giving added power to the action of the pneumatic as compared to a single leaf pneumatic.

As best shown in Fig. 3 the rubber tube 4 leading from the tracker bar 2 is connected to the unit block 8 by means of a nipple

31 which leads to a longitudinal channel 32 provided in the elongated block portion 8a. This channel 32 leads into an annular opening 33 on one face of the block 8, and this channel 32 also is in communication with a tube 34 located in a hole 35 extending transversely through the block. The tube 34 in passing through the block goes through a slot 36 extending from the center of the block to the power pneumatic, as clearly shown in Figs. 4 and 5. The end of the tube 34 opposite to the channel 32 is partially closed by a closure 37 providing a small vent hole 37a so that the channel 32 is in restricted communication with a recess 39 provided in the face of the block 8 in the form of a shallow bore. The recess 39 is in turn in communication with similar recesses 39a and 39b, and the latter recess 39b is in communication with a vertical slot 38 that is adapted to register with a duct 16 extending from the wind chest 7, as shown in Fig. 1. Thus the vent 37a is in direct communication with the wind chest 7 through the channel 38 which may be readily made by a circular saw cutting into the block until it enters the recesses 39a and 39b.

In addition to the rather shallow recesses 39, 39a and 39b, the face of the block shown in Fig. 5 is provided with a deeper recess 40 which is in communication with the smaller recesses 39a and 39b. The recess 40 provides an annular shoulder 40a around which is adapted to seat a valve 41 so as to close the central opening 42 of the block into which leads the slot 36 previously referred to. The valve 41 is carried on a spindle 43 which is slidable in a guide 44 located in the central hole 42 and carries at its other end a valve 45 engageable with a raised seat 46 surrounding the shoulder between the recess 33 and the central opening 42. The valve 45 is in turn carried by a diaphragm 47 which is anchored around its periphery to a shoulder 48 in the recess 33 by means of a ring 49. The side of the diaphragm 47 opposite to the valve 45 carries a disc 50 which bears against the side wall 51 of the block unit when the diaphragm 47 is in the position shown in Fig. 6.

It is apparent that the disc 50 divides the recess 33 into two chambers and the inner chamber 33a is in communication with the atmosphere through a duct 52 provided in the bottom of the block, as clearly shown in Fig. 3. The recesses 39 and 40 are shut off from the atmosphere by the side wall 53 attached to the block, both side walls 51 and 53 preferably being in the form of thin cardboard strips which can be readily glued to the wooden sides of the block, although obviously metal plates could be employed for the same purpose.

It is to be noted particularly that the various ducts 36, 38, and 52 are shown as being made by the use of small circular saws of the

proper diameter while the various recesses such as 33, 39, and 40 are shown as being made by the use of boring tools. I have found that by so making the ducts and recesses in the wooden block of each unit it is possible to produce standardized blocks properly recessed and slotted, in very large quantities, with a relatively small expenditure of time and labor and with absolute accuracy. It is to be understood, however, that the principle of my improved pneumatic unit is in no way dependent upon the exact form of the various ducts and recesses which can be made in other ways than as shown to obtain the same results.

Referring particularly to the operation of the various working parts; when either of the movable leaves 10a of the exhausters 10 are moved downward, the air is exhausted through the valve 15 and through the bellows chest 6 to the reservoir 11, with the result that the movable leaf 11 is drawn upward against the pressure of a spring of any standard type. The vacuum thus created is locked against the atmospheric pressure by means of the valve 15 and is available for operating the striker pneumatic units 8, after passing through a valve 54 in the gate box 26; as shown in Fig. 9 the said valve 54 is provided to control the flow of air from the bellows chest 6 to the action wind chest 7. A spacer block 55 extends between the end of the channel board 5 and the box 26, the block 55 providing passages 56 and 57 communicating with the bellows section 6 and the wind chest 7. The valve 54 is slidable by means of a wire 58 to either permit the flow of air between passages 56 and 57, as when in operation, or to shut off the air when rerolling. The vacuum in the action chest 7 is conveyed through the slots 16 and 38 to the vacuum chambers 39, 39a and 39b, and the special valve chamber or recess 40. The vacuum thus created is in communication with the vent tube 34, through the vent 37a.

The vacuum passing through the vent 37a being transmitted to one side of the diaphragm 47 by means of the tube 34; so long as the opening in the tracker bar 2 is covered by the note sheet, the diaphragm 47 will tend to hold the valve 45 open and the valve 41 closed, due to atmospheric pressure in chamber 33a and the fact that the valve 45 and the valve 41 are connected by means of the valve spindle 43 and the valve spindle is guided by means of the guide 44.

Atmospheric pressure entering the duct 52 is the active force which tends to draw or force the diaphragm 47 away from the valve seat 46, and when the valve 41 is closed and the valve 45 opens, the atmospheric pressure entering the duct 52 passes through the chamber 33a to the slot 36. From the slot 36, air at atmospheric pressure enters the interior of the power pneumatic and thus maintains the

pneumatic at rest, due to the fact that atmospheric pressure is both within and without the pneumatic.

When an opening in the tracker bar 2 is exposed, atmospheric pressure enters the corresponding tube 4 and passing through the channel 32, overcomes the limited vacuum, maintained through the vent 37a and allows the outer chamber 33 to contain atmospheric pressure the same as the inner chamber 33a. The result is that the action of the diaphragm 47 is neutralized and the vacuum in the chamber 40 draws the valve 41 open and closes the valve 45 against the valve seat 46, as shown in Fig. 8.

The vacuum in the chamber 40 then enters around the valve 41, into the hole 42 and through the groove 36 into the interior of the power pneumatic.

The pressure in the interior of the power pneumatic thus being reduced, atmospheric pressure forces the power pneumatic to collapse, with the result that the note is struck by the lever 19 as the upper leaf 17 moves downwardly. It is obvious that the action of the power pneumatic is quick and positive owing to the direct connection of the lever 19 to the leaf 17 with no motion lost transmitting the action. Furthermore, it is apparent from Fig. 2 that each pneumatic striking unit 8 practically lines up with the corresponding note, so that the levers 19 extend rearwardly from the single row of units without interference, each lever 19 permitting a small amount of lateral bending to bring it directly below the corresponding wippen.

From the foregoing, it is apparent that I have provided an improved pneumatic action for a player piano comprising striking units so formed that only one row of units is necessary for the entire mechanism, each striker unit being a complete valve mechanism in itself.

It will be further observed that by providing all the necessary parts in one complete unit just above the key board, I have eliminated the need of any channel board in connection with the wind chest of the instrument.

In the process of manufacturing piano player mechanisms, those schooled in the art will readily understand the great saving that has been provided by my improved form of structure. Whereas, it was necessary, heretofore, to honeycomb valve boards, pouch board, and channel boards, and then dip them in several baths of shellac or other insulating material to make them wind tight; by means of this invention, all this work is eliminated, as is also, the danger of cross leaks and trouble due to checking of the wood thus honeycombed.

Furthermore, by this process of elimination, I have been enabled to build an action, the mechanism of which is so small that I

can incorporate the entire bellows mechanism and other parts into one unitary structure above the key bed of the piano; thus simplifying the work of installation and also providing an action which can be tested and regulated, in its entirety, before installation.

I claim:

1. In a mechanism for automatic musical instruments, in combination, a plurality of similar pneumatic power units and a single wind chest having two chambers, one connecting the exhausters and the reservoir, and the other forming a common channel for conveying the vacuum effect from said exhausters to pneumatic power units fastened thereon.

2. In an automatic musical instrument, a unitary wind chest player action mechanism mounted thereon above the keys including a common wind chest, striker pneumatics and valve mechanism to control communication between the striker pneumatics and the wind chest, exhausting devices carried by the wind chest, in direct communication therewith, and means for operating the exhausting devices.

3. An automatic musical instrument having a key bed, a wind chest disposed above the key bed, exhausters mounted on and in direct communication with the wind chest and adapted to exhaust air therefrom, and operating means for said exhausters.

4. An automatic musical instrument having a key bed, a wind chest mounted there above, striker pneumatics mounted on the wind chest, exhausting devices carried by the wind chest and in direct communication therewith, operating mechanism for the exhausters disposed below the key bed, and connections between said exhausters and the operating mechanism.

5. In an automatic musical instrument, an action wind chest, striker pneumatics supported thereby, and exhausting devices also supported by the wind chest in direct communication therewith.

6. In a mechanism for automatic musical instruments, the combination with a wind chest providing separate chambers extending the length of the instrument, a series of pneumatic power units for striking the notes carried by said wind chest and connected individually to one of said wind chest chambers, an air exhauster and reservoir carried by and directly connected to the other of said wind chest chambers and parallel passages extending from both of said wind chest chambers at one end of the instrument, of a valve interposed between said passages for controlling the travel of air from one wind chest chamber to another, and means for moving said valve to prevent the flow of air between said passages and thereby cut off the power units from said exhauster.

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