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PNEUMATIC PLAYER FOR MUSICAL INSTRUMENTS.

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1,033,438.

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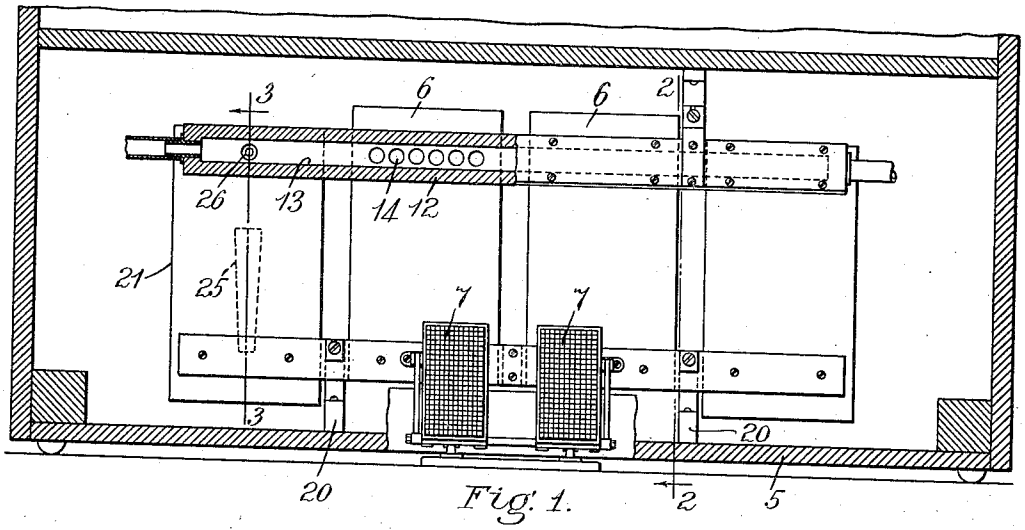

Fig. 1.

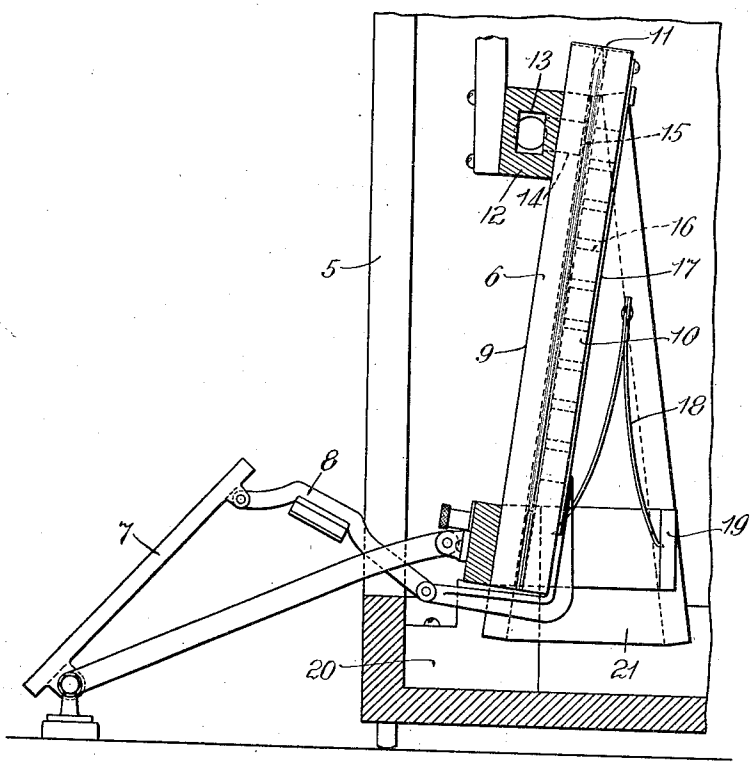

Fig. 2.

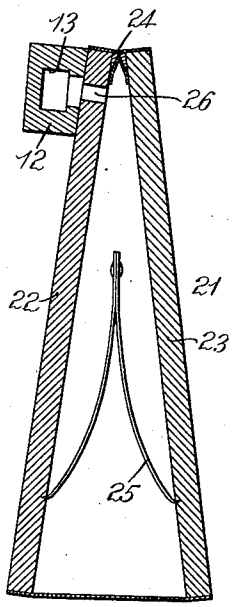

Fig. 3.

Witnesses.
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PNEUMATIC PLAYER FOR MUSICAL INSTRUMENTS.

1,033,438. Specification of Letters Patent. **Patented July 23, 1912.**

Application filed February 24, 1911. Serial No. 610,576.

To all whom it may concern:

Be it known that I, WILLIAM T. MILLER, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented new and useful Improvements in Pneumatic Players for Musical Instruments, of which the following is a specification.

This invention relates to improvements in pneumatic players for musical instruments and particularly to that part of the player mechanism by means of which a partial vacuum or diminution of pressure below atmospheric pressure is created and maintained within the connections leading to the pneumatics which directly operate the musical instrument.

That part of the player mechanism to which this invention relates commonly comprises a wind inducing device consisting of a pair of bellows known as feeders operated by means of foot pedals to cause the removal of a portion of the air in the suction channels throughout the entire mechanism, and an equalizer consisting of a bellows of ordinary construction commonly called a reservoir communicating with the main suction channel or wind chest. There is provided a spring constantly tending to expand this equalizer or reservoir bellows, said spring being of such strength as to expand the reservoir when the pressure within the same tends to approach the atmospheric pressure on the exterior of the reservoir; or when, in other words, the expansive force which the spring exerts upon the reservoir is greater than the difference between the internal and external pressures acting upon the reservoir. When the foot pedals operate the feeders or suction bellows to draw air from the main suction channel or wind chest and from the reservoir bellows or equalizer, the spring is forced to yield by atmospheric pressure and the movable part of the bellows actuated to contract the same.

When the operation of the pedal-operated feeders slackens or ceases or if for any other reason there is a tendency for the vacuum in the main suction channel to become lessened and thereby affect the playing of the instrument, this would be manifested in a sudden weakening of the force or power of the playing action and it is to counteract this tendency and to counteract the tendency of the alternately operated feeders to cause a pulsating air tension that the reservoir is provided; and the larger the reservoir, the more effectually are these tendencies counteracted.

When the person operating the player mechanism wishes to make an emphasis or accent in the musical expression, he may do so by applying a sudden strong pressure upon one of the foot pedals, thereby actuating its suction bellows or feeder to draw air from the main suction channel and thus tend to increase the vacuum therein. If it were not for the reservoir bellows this momentary increase of the vacuum would have its full effect in producing the desired emphasis in the playing, but in the ordinary instrument the effect is lessened because of the fact of the intervening receiver between feeders and the wind chest.

The object of my invention is to produce a player mechanism by means of which it shall be possible to obtain an emphasis or accent in the musical expression without sacrificing the reservoir function which provides the continuity of the vacuum when the operation of the foot pedals slackens or ceases. In the attainment of this object, I have produced a player mechanism for musical instruments so constructed that when one of the foot pedals is operated to momentarily increase the vacuum in the main suction channel or wind chest, the equalizing of the pressure existing in said channel and in the reservoir connected thereto is delayed and when, owing to a slackening or cessation of the operation of the foot pedals, there is a tendency for the vacuum in said channel to diminish, said reservoir is adapted to draw air from said channel to maintain the vacuum therein for a certain period of time, the length of which depends largely upon the size of the reservoir. In player mechanisms heretofore, it has been attempted to secure these results by the use of a valve controlling the flow of air from the reservoir to the main suction channel and intended to permit the free flow of air from the main suction channel into the reservoir through a large port which it controls and preventing or restricting the flow of air in the reverse direction through said port, and in some cases there has been an additional port of smaller size permitting the flow of air in the reverse direction, but at a greatly restricted speed. Devices of this character, as heretofore constructed, have performed

their function of accenting more or less imperfectly, it having been found that if it be desired to accent a particular note by a sudden increase of pressure upon the pedal, although the pressure of the foot is instantly released or diminished, the following note will also be accented although to a somewhat less degree. This is due to the fact that the port which the automatic valve just referred to controls is of such size that when the sudden pressure upon the pedal ceases there follows a sudden opening movement of the reservoir under the influence of its spring and the effect of this is to cause a tendency for the condition of increased vacuum due to the sudden pressure of the foot to remain.

The object of my invention is to provide a mechanism of the class described so constructed as to enable the person playing the instrument to accent a particular note without having the accent carried over into the next note and yet to accomplish this without sacrificing the reservoir function or carrying-over power of the instrument. In the attainment of this object, I have produced a player mechanism in which instead of providing several large ports connecting the reservoir to the wind chest or suction channel, as is usually the case, and instead of employing an automatic valve controlling the port of large size between the reservoir and wind chest, I provide between the reservoir or equalizer and the wind chest a passage or passages forming the sole communication therebetween and having a total area of not less than .01227 inches nor more than .19635 inches. By providing a port or ports the total area of which is between these two limits, I am enabled to secure the accent of the desired note without accenting the following note and without destroying the reservoir function or carrying-over power of the reservoir. This is a result which has long been sought for by these skilled in the art to which this invention pertains, but has never heretofore been attained so far as I am aware.

To the ends above set forth, my invention consists in the novel features of construction and in the combination and arrangement of parts set forth in the following specification and particularly pointed out in the claims.

Referring to the drawings: Figure 1 is a front elevation, partly in section, of a player mechanism for musical instruments embodying my invention, the parts which are not essential to the illustration of the present invention being omitted. Fig. 2 is an enlarged vertical sectional view taken on line 2—2 of Fig. 1, looking toward the left. Fig. 3 is an enlarged sectional view taken on line 3—3 of Fig. 1, looking toward the left.

Like numerals refer to like parts throughout the several views of the drawings.

In the drawings, 5 is a casing of any usual or desired construction in which the player mechanism is supported. Mounted within this casing are two suction bellows 6, 6 commonly called feeders and constituting wind-inducing devices operated by any suitable means as, for example, by means of foot pedals 7 connected to said bellows by links 8. Each of the suction bellows or feeders 6, which may be of any usual construction, comprises a front wall 9 and a rear wall 10 hinged thereto at 11, said front wall being secured to a wind chest 12 having therein a main suction channel 13 connected to the interior of said feeders by passages 14, said passages being, as usual, controlled by check valves 15.

Each of the rear walls 10 of the feeders 6 is provided with a passage or a plurality of passages 16 leading from the interior to the exterior of the feeders, these passages being controlled by suitably constructed check valves 17 which usually consist of a flap of flexible leather secured at its upper edge to the wall 10. Each of the feeders 6 is provided with suitable means normally tending to collapse the same and which may consist of a suitably constructed spring 18 bearing at one point against the wall 10 and at another point against a rigid frame 19 extending along the back and sides of the feeders 6 and mounted upon supporting blocks 20.

The springs 18 tend to close the feeders 6 after said feeders have been opened by the action of the foot pedals 7, the arrangement of the check valves 17 being such as to cause them to be opened and allow the air within the feeder to rush outwardly through the passages 16 when the spring 18 contracts its feeder, and when the connected foot pedal is operated to open or expand said feeder, said valve is closed by the external atmospheric pressure and the expansive action of the feeder produces a partial vacuum within the main suction channel.

It will be understood that the foot pedals 7 are usually operated alternately and that the feeders or bellows cause a removal of a portion of the air in the suction channels throughout the entire mechanism, it being understood that the main suction channel or wind chest is connected to the upper portion of the playing mechanism in the usual and well known manner. In operating the pedals in this manner, a part of the air is withdrawn from a reservoir or equalizer 21 which may be of any suitable construction and which, in the present instance, consists of a bellows having a front wall 22 and a rear wall 23 hinged thereto at 24, said front wall being rigidly secured to the wind chest 12, there being provided a suitable spring 25 located within the reservoir and adapted to open or expand the same when the pressure therein tends to approach the atmospheric pressure on the exterior thereof, the

expansive force which this spring exerts upon the reservoir being, of course, greater than the difference between the internal and external pressures acting upon the reservoir.

Thus far the construction and operation of the player mechanism are substantially the same as other mechanisms. It will be understood that the common practice is to provide a series of large ports connecting the reservoir with the main suction channel and, as before stated, in some cases there has been provided a large port controlled by an automatic valve intended to enable the operator to secure the desired accent. According to my invention, however, I provide between the equalizer or reservoir and the main suction channel or between said equalizer and the feeders a passage or passages 26 forming the sole communication therebetween and having a total area of not less than .01227 inches nor more than .19635 inches, and I have found that a port .03758 inches in area gives the most satisfactory results and while the size of the port may be varied within the limits stated, yet if its area be made outside of this limit, either one way or the other, the desired results which I have secured are lost and the operation of the instrument is entirely changed so that on the one hand it is impossible to secure the desired accent if the area of the port be made greater than the maximum limit stated and, on the other hand, the reservoir function or carrying-over power of the instrument is gone if the area be less than the minimum limit stated, the difference being so great as to be instantly appreciated by even the most unskilled person.

Having thus specifically described the mechanism, I will now proceed to describe its general operation. The operator places his feet upon the pedals 7 and operates the same in a well known manner to cause the feeders 6 to reduce the pressure in the main suction channel 13 below atmospheric pressure, or, in other words, to create a partial vacuum therein, such removal of the air causing air to pass outwardly from the reservoir 21 through the port 26 into the main suction channel 13 and thereby causing said reservoir to partially contract against the tension of the spring 25. The player action is then placed in operation, and continued uniform movement of the pedals 7, tends to cause a continued uniform vacuum in the main suction channel 13. If now, the user wishes to cause a momentary accent in musical expression, that is to say, if he wishes to emphasize a particular note, he applies a sudden strong pressure upon one of the foot pedals 7, such pressure acting to open or expand the feeder 6 connected thereto and thereby drawing air from the main suction channel 13 into said feeder. The sudden increase of the vacuum in the main suction channel would naturally tend to cause air to be drawn from the reservoir 21 through the port 26 and said reservoir would thus naturally tend to prevent the sudden diminution of pressure which is essential in producing the desired accent, but by making the port 26 of an area between the limits hereinbefore set forth the port is so small as to prevent any appreciable amount of air from passing from the reservoir into the main suction channel and as a consequence the quick impulsive movement of the foot upon the pedal has its full effect in producing the desired accent. In other words, the area of this port is so limited that in the brief interval of time occupied by the sudden pressure upon the pedal and during which the accent is obtained, so far as practical purposes are concerned there will not be enough air passing through the port during such interval of time to affect the increased vacuum caused by the sudden strong pressure upon the pedal. When, however, the operation of the foot pedals slackens or ceases, the vacuum in the suction channel 13 is temporarily sustained by reason of the fact that any tendency toward diminution of the vacuum therein causes the spring 25 to assert itself in opening or expanding the reservoir 21, it being understood that the size of the port 26 is such that under normal conditions, that is, under conditions other than those produced during the accenting, this port will permit the flow of air from the main suction channel into the reservoir or equalizer at a rate of speed sufficient to produce the equalizing and reservoir functions.

If the port be made of an area of less than .01227 inches, the equalizing or reservoir function of the reservoir 21 is lost, and if, on the other hand, the port be made larger than .19635 inches, the ability to produce the desired accent is lost, but between these two limits both of these desirable results are attained and what is a matter of great importance is that a particular note may be picked out and accented without the accent being carried over into the next note.

Having thus described my invention, what I claim and desire by Letters Patent to secure is:

1. A pneumatic player for musical instruments having, in combination, a wind chest, a wind-inducing device communicating directly with said wind-chest, and an equalizer having a passage or passages leading directly from said equalizer to said wind chest and forming the sole communication between equalizer and said wind-chest and having a total area of not less than .01227 inches nor more than .19635 inches, said total area being such that a sudden change in pressure in said wind chest is not materially affected by the flow through said

passage, but such that with ordinary changes of pressure in the wind chest the pressure in said equalizer will substantially correspond thereto.

2. A pneumatic player for musical instruments having, in combination, a wind-chest, a feeder-bellows for exhausting the air therefrom and communicating directly therewith, means for operating said feeder-bellows, and an equalizer consisting of a bellows having a passage or passages leading directly from said equalizer to said wind chest and forming the sole communication between said equalizer and said wind chest, and having a total area of not less than .01227 inches nor more than .19635 inches, said total area being such that a sudden change in pressure in said wind chest is not materially affected by the flow through said passage, but such- that with ordinary changes of pressure in the wind chest the pressure in said equalizer will substantially correspond thereto.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WILLIAM T. MILLER.

Witnesses:
LOUIS A. JONES,
SADIE V. MCCARTHY.