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PLAYER PIANO PNEUMATIC.

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1,298,113.

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Fig. 1.

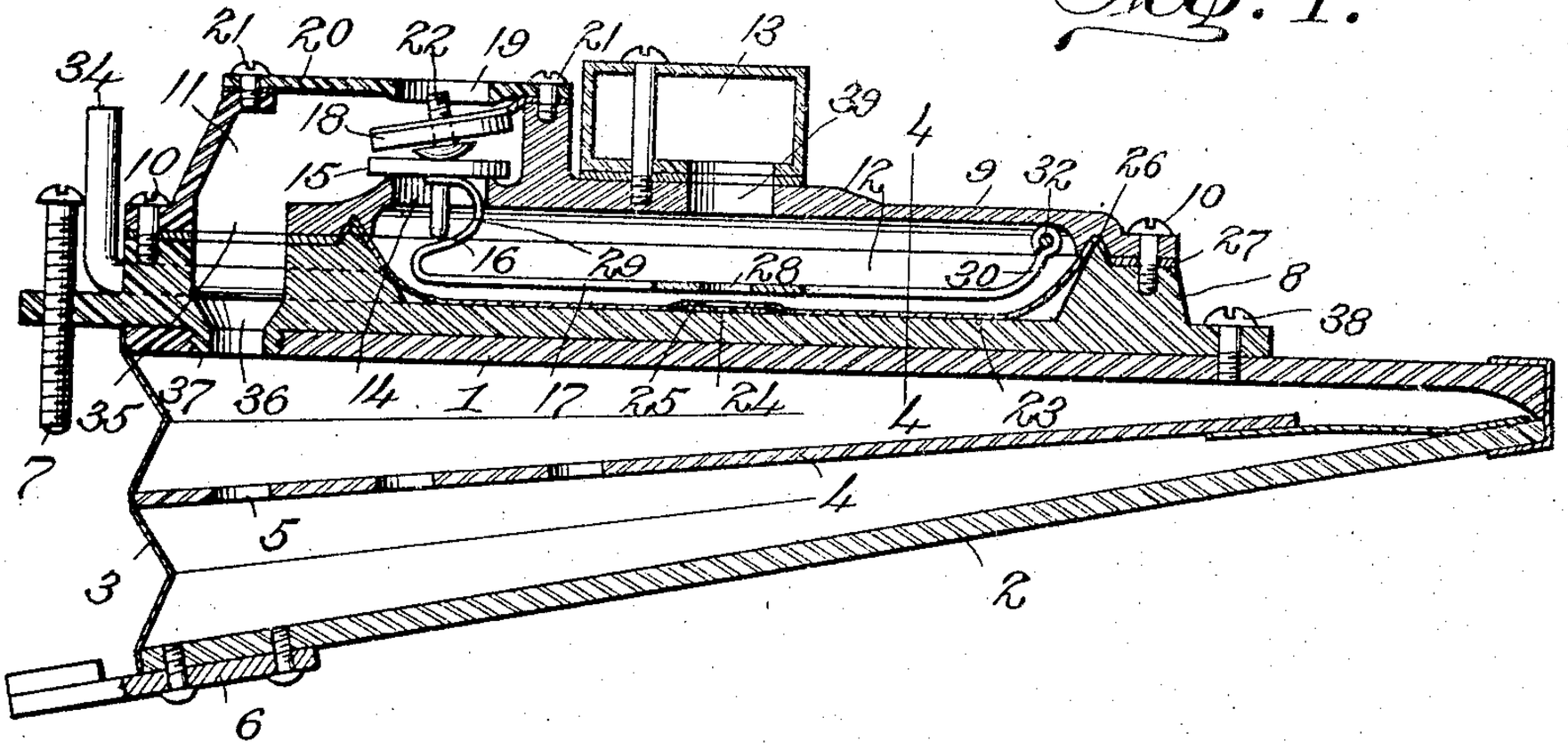


Fig. 2.

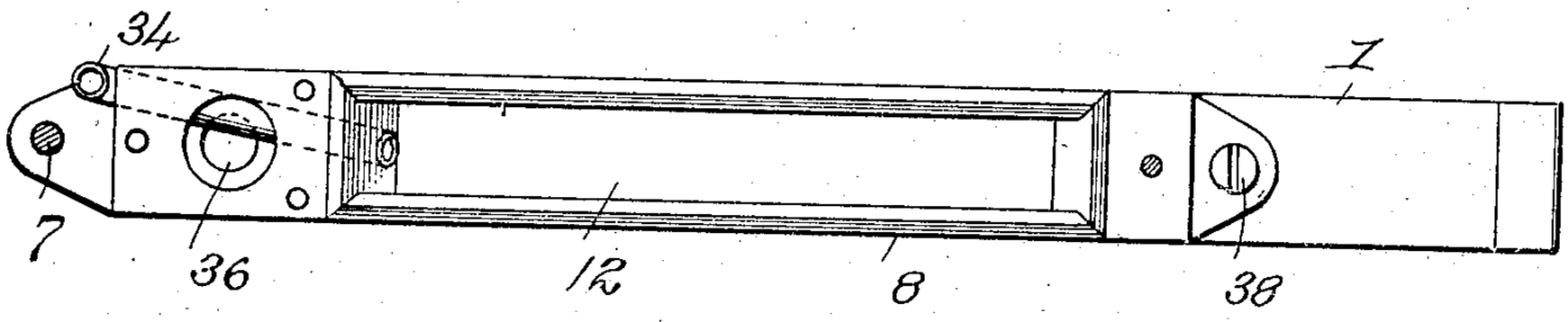


Fig. 3.

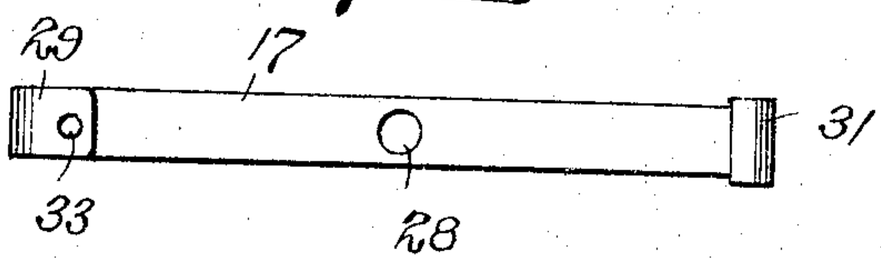
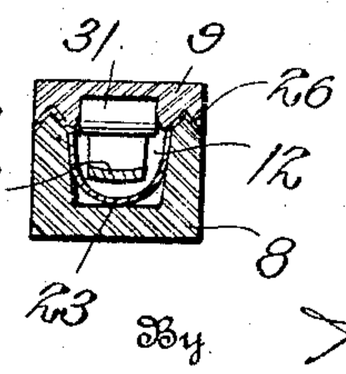


Fig. 4.



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PLAYER-PIANO PNEUMATIC.

1,298,113. Specification of Letters Patent. **Patented Mar. 25, 1919.**

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To all whom it may concern:

Be it known that I, CHARLES H. SPENCER, a citizen of the United States, residing at Baltimore, State of Maryland, have invented certain new and useful Improvements in Player-Piano Pneumatics, of which the following is a specification.

The primary purpose of the invention is to simplify and cheapen the construction of pneumatics, such as generally embodied in musical instruments of the piano type having a manual, and enable the pneumatics to be manufactured with a comparatively few number of parts, thereby reducing the chances for impairment of the action after a comparatively short period of service.

The invention consists in the construction of the striker pneumatic and the valve casing separately to admit of their convenient disposition according to the type or make of instrument to be equipped with a pneumatic player action.

The invention also consists in the peculiar formation of the valve casing and the disposition of the valve mechanism therein to insure compactness of structure and quick response of the valve mechanism as the openings in the tracker bar are opened and closed.

The invention further consists in the provision of separate valves for controlling the inflow of air to the striker pneumatic and the outflow of air from the striker pneumatic to the air space of the valve casing having direct communication with the wind trunk, and adjustable means between such valves to allow for any variations in material and construction, so as to insure proper seating of the valves which is essential to a sensitive and quick response.

The invention furthermore consists of the novel features, details of construction and combination of parts which hereinafter will be more fully described and claimed.

While the drawings illustrate a preferred embodiment of the invention, it is to be understood that in adapting the same to meet varying conditions, changes in the form, proportion and minor details of construction may be resorted to without departing from the nature of the invention.

Referring to the drawings:

Figure 1 is a vertical central longitudinal section of a player piano pneumatic embodying the essential features of the invention;

Fig. 2 is a top plan view of the lower section or base of the valve casing and striker pneumatic attached thereto;

Fig. 3 is a detail view of the valve lifter or follower;

Fig. 4 is a cross section of the valve casing on the line 4—4 of Fig. 1 looking to the right.

Corresponding and like parts are referred to in the following description, and indicated in the several views of the drawing by like reference characters.

As indicated most clearly in Fig. 1, the striker pneumatic and the valve casing are formed separately, but for convenience, are illustrated as assembled in one structure. The striker pneumatic is of bellows formation, such as usually provided in player piano actions of the pneumatic type. As illustrated, the striker pneumatic comprises members 1 and 2 and a connecting fabric 3 having the usual bellows folds. A partition 4 is disposed between the members 1 and 2 and is attached at one end and along its edges to the fabric 3 and serves to hold the folds distended. The partition 4 is provided in its length with a plurality of openings 5 to admit of equalization of the air throughout the interior of the pneumatic. An extension 6 is disposed at the swinging end of the member 2 for operating the piano action in a manner well understood. The upward movement of the projection 6 is limited by means of a stop 7 adjustably supported about in line with the member 1. As shown, the stop 7 consists of a set screw threaded into an extension of the valve casing. However, it is to be understood that the stop 7 may be supported in any convenient way.

The valve casing comprises a lower section or base 8, and an upper section, or cap 9. These parts 8 and 9 are formed separately and secured, when assembled, by suitable fastening means, as screws 10. While the valve casing may be constructed of any suitable material, it is preferred to form the same of aluminum, which in practice, has been found to give the best results. The valve casing incloses two air spaces or chambers 11 and 12. The air space or chamber 11 is in communication with the atmosphere and with the striker pneumatic. The air space, or chamber 12, is in communication with an air trunk, or wind chest 13, and

with the air space, or chamber 11. To avoid confusion, the air space 11 will be designated hereinafter as the striker chamber and the air space 12 as the trunk chamber. The trunk chamber is formed partly in the cap 9 and the base 8 and the striker chamber 11 is formed wholly in the cap. The inner ends of the chambers 11 and 12 overlap and are separated by a part of the cap 9 in which is formed an opening 14 which establishes communication between the two chambers. A valve 15 disposed in the striker chamber 11 closes downwardly upon the seat surrounding the opening 14 and is provided with a depending stem 16 which, in conjunction with the valve lifter, or follower 17, serves to guide the valve 15 in its movements. A second valve 18 is adapted to close an opening 19 formed in the top of the striker chamber 11 and normally opens downwardly. The top of the striker chamber 11 preferably consists of a cover plate 20 which is secured to the cap 9 by means of screws, or like fastenings 21. By this means, access is readily had to the interior of the striker chamber to admit of proper adjustment of the valves 15 and 18. An adjustable stop 22 is disposed between the valves 15 and 18 and preferably consists of a set screw threaded into the valve 18 with its head coming between the two valves. This stop provides for relative adjustment of the valves 15 and 18 so as to insure quick and proper action thereof, which is essential to sensitiveness in the operation of the action. The stop 22 also provides for adjustment of the valve to compensate for any variation in material or construction so as to secure proper coöperation between the valves.

Within the trunk chamber 12 is disposed a diaphragm 23 consisting of textile which has its edge portions clamped between the cap 9 and base 8, the intermediate portion of the diaphragm being loose so as to move freely under the influence of the charge of air pressure due to the opening and closing of the tracker bar openings. The diaphragm 23 is provided preferably at a central point with an opening 24 for the escape of air when the diaphragm assumes a normal position as being actuated. The opening 24 is reinforced by a piece of suitable material attached to the fabric, such material preferably consisting of a disk 25 of mica. To insure a firm connection between the edges of the diaphragm and the parts of the valve casing between which the same are clamped, the meeting faces of the cap 9 and base 8 are formed with a matching tongue and groove, preferably of V form, as indicated at 26. This tongue and groove joint is arranged adjacent the walls of the chamber 12. A packing 27 is arranged between the cap 9 and base 8 to insure the formation of a close joint to prevent any escape of air pressure. The diaphragm 23 normally sags so as to occupy the lowest part of the trunk chamber 12.

The valve lifter, or follower 17, is disposed within the trunk chamber 12 close to and above the diaphragm 23 and is of a shape to conform to the outline of the trunk chamber. An opening 28 is formed in the valve lifter, preferably in line with the bleed opening 24 of the diaphragm. The end portions of the valve lifter are bent upwardly, as indicated at 29 and 30. The bent end 30 terminates in an eye or sleeve 31, which receives a pin 32 by means of which the valve lifter is pivotally connected at one end to the valve casing. The bent end 29 is preferably of ogee form and its extremity is provided with an opening 33 through which the stem 16 of the valve 15 passes. Vertical movement of the part 17 effects an unseating of the valve 15 and a closing of the valve 18, with the result of operating the striker pneumatic to sound the note as will be described in full hereinafter.

A conduit 34 communicates with the lower portion of the trunk chamber 12 at a point below the diaphragm 23, and this conduit is adapted to be connected with the tracker bar in a manner well understood. An opening 35 is formed in the lower wall of the striker chamber 11 and communicates with an opening 36 formed in the base 8. A nipple 37 projects from the base 8 in line with the opening 36 and is adapted to make connection with the striker pneumatic. In the construction illustrated, the nipple 37 is externally threaded and screws into an opening formed in the member 1 of the striker pneumatic, thereby serving in part to connect the striker pneumatic and a valve casing. A screw or other suitable fastening 38 serves to connect the opposite end of the valve casing with the striker pneumatic.

The action is connected to the wind trunk 13 in any manner and the upper portion of the trunk chamber has communication with the wind trunk by means of a passage 39 comprising registering openings formed in the adjacent walls of the wind trunk 13 and valve casing. The air is exhausted from the wind trunk 13 in a manner well understood and this creates a partial vacuum in the upper portion of the trunk chamber 12. This condition obtains so long as the conduit 34 is closed, but when the conduit 34 is opened by reason of a perforation in the music sheet registering with an opening in the tracker bar, the conditions change and the operation is as follows:

The diaphragm 23 being drawn upward by the partial vacuum in the upper portion of the trunk chamber 12 draws air into the lower portion of the trunk chamber below

the diaphragm, and as the diaphragm 23 rises, it elevates the part 17 which acts as a follower, thereby lifting the valve 15 and closing the valve 18. At this instant, the air is exhausted from the bellows, or the striker pneumatic, such air passing through the openings 36 and 35, the striker chamber 11, opening 14, upper portion of the striker trunk 12, and into the wind trunk 13 through the passage 39. The exhausting of the air from the striker pneumatic causes the end of the member 2, provided with a projection 6, to move upward, thereby operating the piano action of the instrument in a manner well understood. When the conduit 34 is closed by an imperforate portion of the music sheet passing over the opening in the tracker bar, the following action takes place:

The air below the diaphragm 23 escapes through the bleed opening 24 into the upper portion of the trunk chamber 12, thereby causing the diaphragm to drop to the lower portion of the trunk chamber and with it the follower, or valve lifter 17, and the valve 15 being no longer supported, drops upon its seat and closes the opening 14 and at the same instant, the valve 18 drops and uncovers the opening 19 and air passing into the striker chamber 11 through the opening 19 enters the bellows of the striker pneumatic and permits the outer end of the member 2 to drop, thereby restoring the parts to normal position, as indicated in Fig. 1 of the drawing.

It is observed that the pneumatic is of such structure as to be disposed in a comparatively small space and in a single tier, and is therefore of advantage when installing a player action in certain types of upright instruments having a limited restricted space.

What I claim is:

1. In a pneumatic action of the character set forth, a valve casing comprising oppositely disposed striker and trunk chambers having inner portions overlapped, and having an opening in the wall separating the overlapped portions of the chambers, the striker chamber having an opening in line with the opening formed in the separating wall between the chambers, reversely disposed separate independently mounted valves for alternately closing said openings and an adjustable stop carried by one of such valves and disposed between the valves, one of said valves being removable independently of the other valve.

2. In a player piano pneumatic, a valve casing comprising a trunk chamber having an opening at one end, a valve for closing the opening, a diaphragm extending across the trunk chamber, with its edges secured to the walls thereof and the intermediate portion being loose, and a valve lifter arranged within the trunk chamber and supported on the diaphragm and actuated thereby and having one end coacting with said valve and having the opposite end pivoted to the valve casing.

3. A player piano pneumatic comprising a valve casing embodying separable parts between which is formed a trunk chamber, one of such parts having an opening in an end portion thereof, a valve for closing such opening, a diaphragm within the trunk chamber and having its edge portions clamped between the parts of the casing, and a valve lifter within the trunk chamber and pivoted at one end to the part of the valve casing provided with the valve controlled opening and having its opposite end in engagement with the said valve.

4. In a pneumatic of the character specified, a valve casing comprising a base recessed to form a trunk chamber, a cap secured to the base and closing the trunk chamber and having a striker chamber formed therein and provided with openings leading to the atmosphere and to said trunk chamber, separate valves independently mounted within the striker chamber for alternately closing the openings leading to the atmosphere and to the trunk chamber, one of said valves being removable independently of the other, a diaphragm within the trunk chamber and a valve lifter within the trunk chamber adapted to be actuated by the diaphragm.

5. In a pneumatic of the character set forth, a valve casing comprising a base and a cap, a trunk chamber being formed partly in the cap and base and the cap having a striker chamber formed wholly therein, openings being formed in opposite walls of the striker chamber leading to the atmosphere and to the trunk chamber respectively, valves disposed within the striker chamber for closing the openings thereof leading to the atmosphere and trunk chamber, a diaphragm within the trunk chamber and having edge portions clamped between the cap and base and a valve lifter within the trunk chamber pivoted at one end to the valve casing and having its opposite end bent and engaging the stem of the valve closing the opening between the striker and trunk chambers.

6. A pneumatic of the character specified comprising a base having an opening at one end and a recess in its opposite end, a cap secured to the base and extending over the opening and recess thereof, said cap having a recess opposite the received portion of the base and forming therewith a trunk chamber and having a space in the end opposite the end of the base having the opening to provide a striker chamber which is in communication with the trunk chamber through

an opening, the striker chamber having an opening leading into the atmosphere, valves within the striker chamber for closing the openings thereof leading to the atmosphere and to the trunk chamber, a diaphragm within the trunk chamber and having its edge portions clamped between the base and cap, and a valve lifter pivoted at one end to the cap and having its opposite end bent and apertured to receive a stem of the valve closing the opening by means of which intercommunication is had between the striker and the trunk chambers.

In testimony whereof I affix my signature in the presence of two witnesses.

CHARLES H. SPENCER.

Witnesses:
WALTER E. SMITH,
EMANUEL DOUGHERTY.