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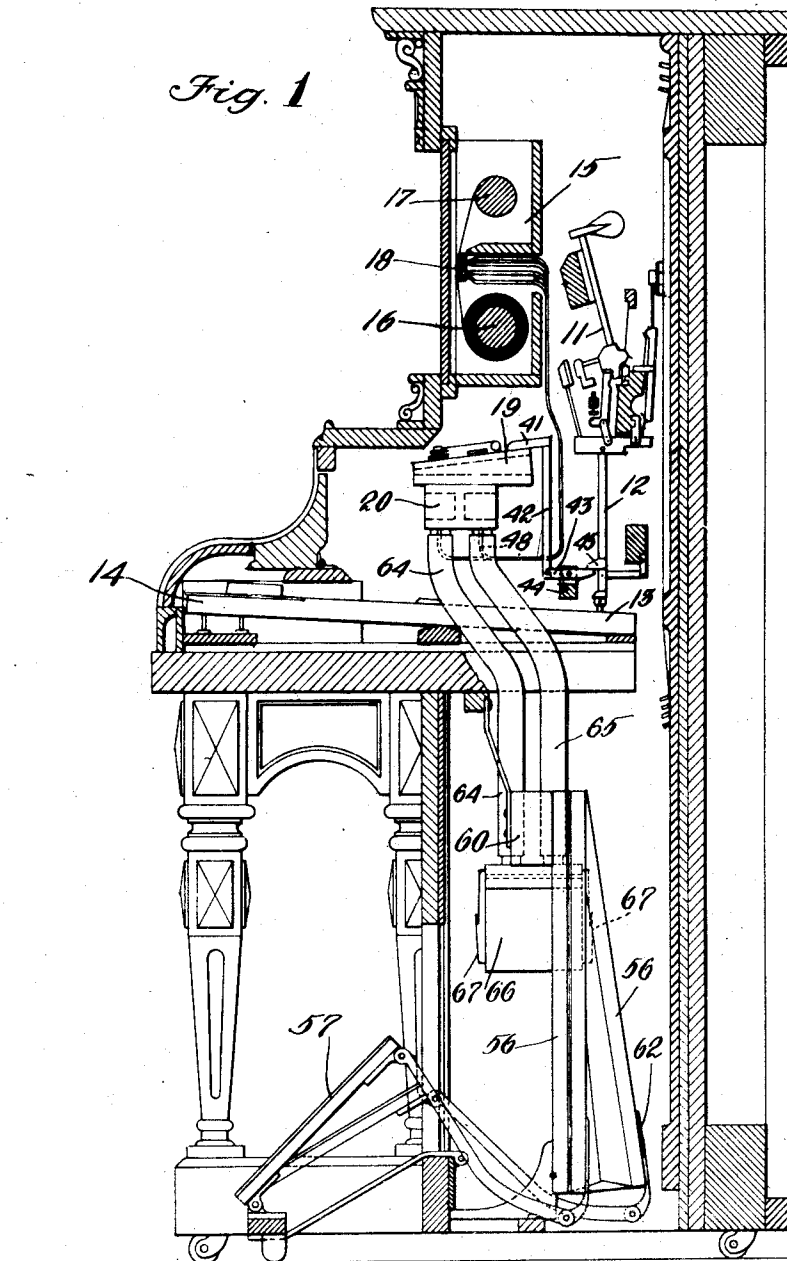
F. A. CLAPP

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PNEUMATIC PLAYER MECHANISM FOR MUSICAL INSTRUMENTS

Filed Oct. 9, 1919

3 Sheets-Sheet 1



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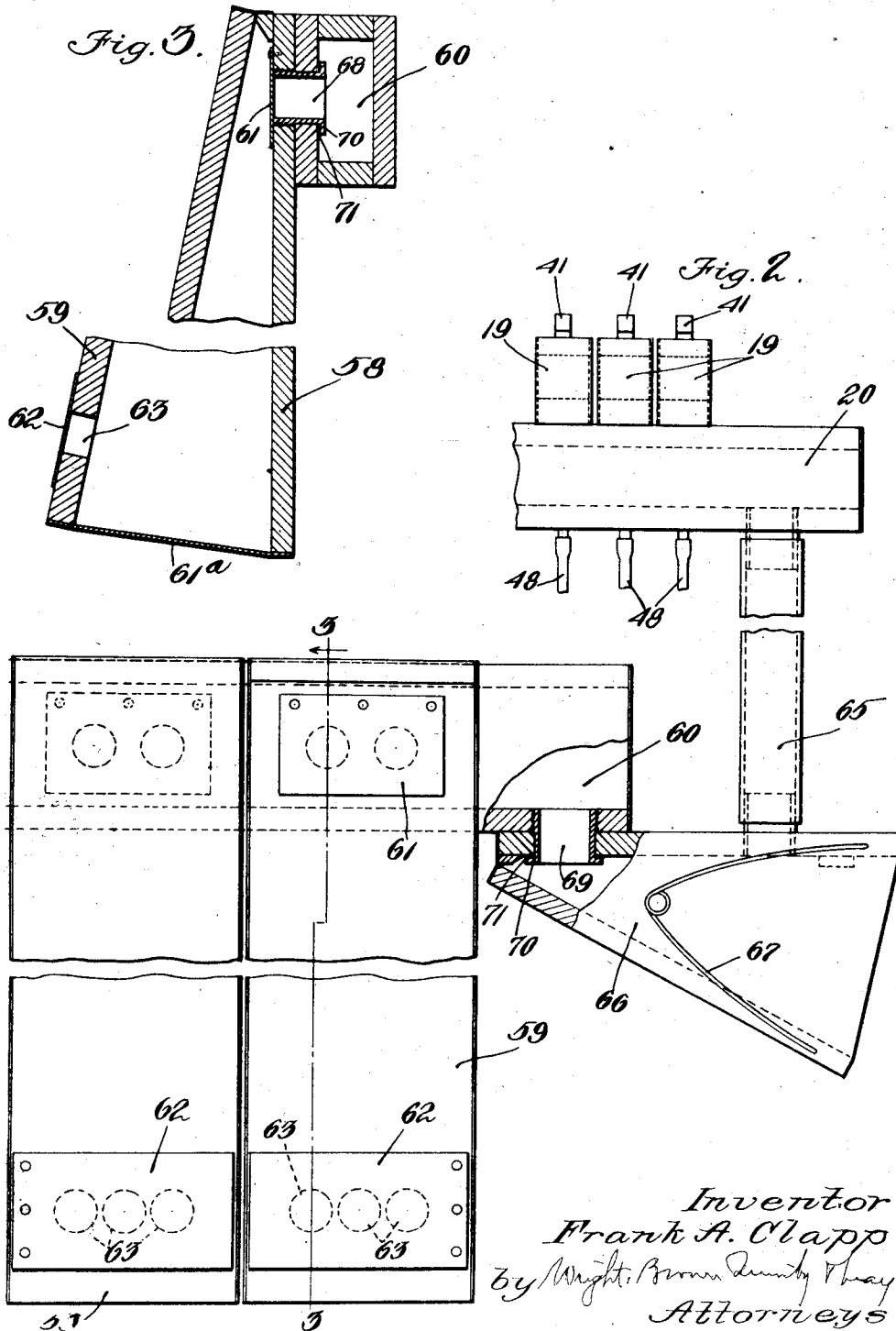
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3 Sheets-Sheet 2



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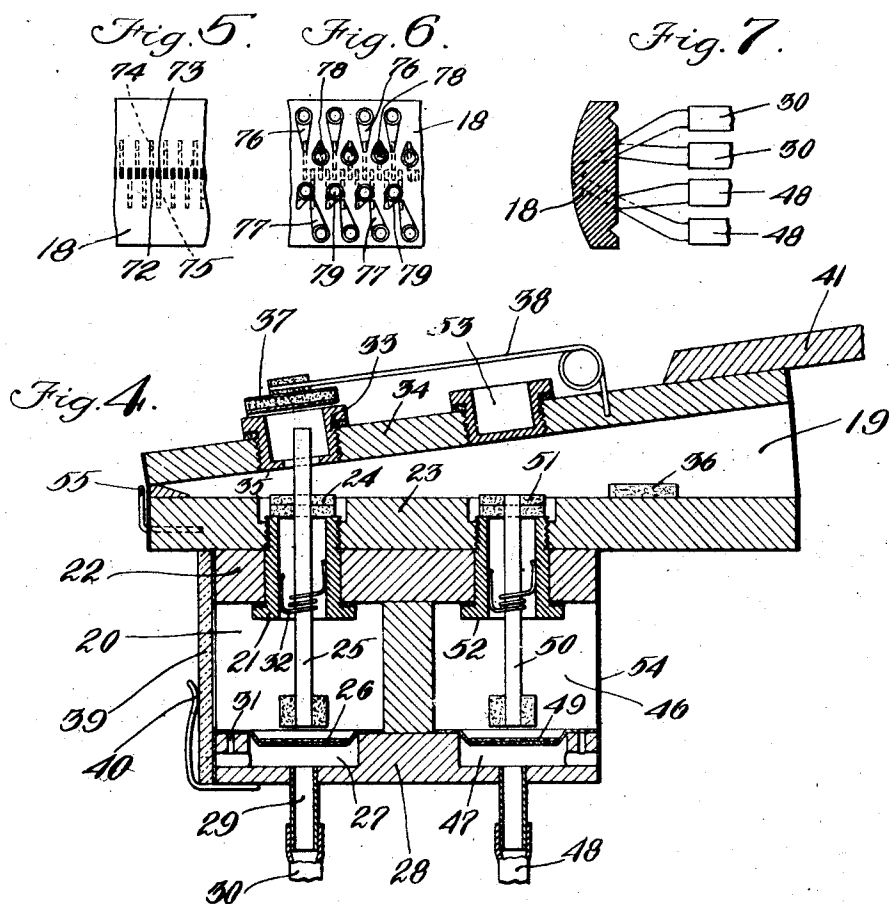
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PNEUMATIC PLAYER MECHANISM FOR MUSICAL INSTRUMENTS

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE.

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PNEUMATIC PLAYER MECHANISM FOR MUSICAL INSTRUMENTS.

Application filed October 9, 1919. Serial No. 329,462.

This invention relates to machines or apparatus in the nature of piano players, in which power pneumatics are provided to actuate the hammer actions of a piano, and are themselves operated by air pressure under the control of a perforated sheet passing over a so called tracker bar and allowing air to flow through passages in the tracker bar when uncovered by perforations of the sheet. The structure in which I have embodied the invention is organized and arranged to operate piano hammer actions, but it may be arranged and suitably connected to control the tone producing means in other musical instruments, wherefore I desire it to be understood that I do not limit the scope of the protection which I claim herein to mean applicable to pianos only, or to exclude the adaptation of the principles of the invention to use for operating any musical instrument whatever; and that in the following description the reference to a piano as the musical instrument with which the invention is combined is to be construed as typifying, by reference to one species the entire genus of musical instruments capable of being played by pneumatic mechanism.

There are two main objects of the invention, one of which is to produce a more compact, efficient, and simple means or mechanism for the purpose indicated than other player mechanisms yet produced, one which is less liable to deterioration, and can be more easily repaired when out of order; and the other object is to furnish means by which a theme, or any selected notes in a musical composition being performed on the instrument, may be accented and the accompaniment or other selected notes may be subordinated to the accented notes. These and other subordinate or secondary objects, together with the means and principles for carrying them into effect, in which the invention principally consists, appear from the following description in detail of a preferred embodiment of the invention in a mechanism constructed for and applied to an upright piano.

In the drawings, Figure 1 is a vertical sectional view of an upright piano with my pneumatic player mechanism applied thereto. Figure 2 is a rear elevation, with a fragment thereof cut away and shown in section, of the principal parts of the mechanism comprising a vacuum pump, an air chest or chamber, a reservoir, a vacuum chamber,

and power pneumatics. Figure 3 is a sectional view of the air chest and pump showing the means for detachably connecting the pump to the chest; said section being taken on line 3—3 of Figure 2. Figure 4 is a sectional view through one of the power pneumatics and the vacuum chamber, showing the controlling valve therefor and the means employed for accenting selected notes. Figures 5, 6, and 7 are fragmentary views of a form of tracker bar embodying part of the means by which accenting of particular notes is effected, Figure 5 being a front elevation, Figure 6 a rear elevation, and Figure 7 a section of said fragment.

The same reference characters indicate the same parts wherever they occur in all the figures.

Referring first to Figure 1, 11 represents as a whole one of the hammer actions of a piano and 12 a bar which forms that part of the action known as the abstract, this being the part which is lifted by the rear end of the key lever 13 when the corresponding key 14 is depressed by the performer to strike a note. 15 is the roll box in which is contained the drawing off or take up spool 16 and into which is placed detachably the music roll 17. 18 is the tracker bar across which the perforated music sheet is drawn from the roll 17 to the take-up spool, such tracker bar having evenly spaced openings in its front face and passages leading to the rear from said openings. All of the parts thus far described may be of any construction, including those used in the standard makes of player pianos now on the market; except that in order best to carry out my object before mentioned of accenting certain notes, I may use a special construction of tracker bar.

The pneumatic player mechanism comprises a series of power pneumatics 19, preferably of the usual bellows construction, there being one for each of the hammer actions within the range of the automatic player, of which one is shown in Figure 1 and three are shown in Fig. 2. These pneumatics are mounted side by side on top of a vacuum chamber 20, which latter extends across the instrument through substantially the whole length of the keyboard, or at least, through the range of the player, and is supported at its ends by means not necessary to be shown herein, as such means may be supplied by the

skilled mechanic from knowledge available in the art. Each pneumatic is secured to the chamber by a tubular nipple or coupling 21, which is passed through the top wall 22 of the chamber and is screwed into the bottom member 23 of the pneumatic, as shown in Figure 4.

This coupling is likewise a valve seat and it provides on its upper end a seating face with which there coacts a valve 24 carried by a stem 25, the foot of which extends into operative proximity to a pouch 26 of flexible material which overlies a pocket 27 in the bottom wall 28 of the vacuum chamber. From this pocket leads a tubular nipple 29 which is connected with a flexible tube 30 leading to one of the openings in the tracker bar. A passage 31 vents the pocket 27 into the vacuum chamber.

A guide 32 is provided for the valve stem 25 within the nipple or coupling; and this guide may be variously constructed, but most conveniently perhaps as a helix of sufficiently stiff wire, the ends of which are carried out so as to bear with friction-producing pressure against the inner walls of the nipple to retain the guide therein.

In the top member 34 of the power pneumatic is an opening containing a tube or thimble 33 which opens into the pneumatic for the purpose of admitting air to permit expansion of the pneumatic, and the lower end of which is provided with a seating surface 35 complementary to the valve 24 to be closed by the latter when the pneumatic is collapsed. The passage through this tube is the necessary breathing inlet. 36 is a stop for arresting the movement of the top member 34 in the collapse of the pneumatic when the seating surface 35 is parallel to the complementary face of valve 24. With the outer end of the tube 33 there cooperates a valve 37 which is supported by a springy holding arm 38 normally at a slight distance from the tube, but near enough to be closed against the end thereof by a current of inflowing air. The latter valve, however, although useful, may be dispensed with as presently appears, and is therefore not claimed as an essential of the invention. The tube 33 is externally threaded so that it may be screwed into and out of the top member of the pneumatic 19, and preferably it is enough larger externally than the valve 24 to permit removal of the latter through the hole which is left in said top member when the tube is removed, although in case the valve is so large in proportion to the width of the pneumatic that so large a hole would weaken the top member, the tube may be made smaller, and provision for removing the valve when in need of repair may be made by taking out the coupling tube 21 after having first obtained access to it by removing the front wall 39 of the vacuum chamber. This wall may be of

glass, and may run in one piece the whole length of the chamber, but preferably it is made in panels, each of which is removable separately. Spring holding supports or clips 40 for the wall or panels are provided in order that the glass wall may be easily removed and replaced. Its transparency evidently gives a view to the interior of the chest and enables anything visibly wrong therein to be detected.

Operation of the hammer mechanism by the power pneumatic is effected through an arm or finger 41 projecting rearward from the top member of the pneumatic and connected to a bar or link 42 which in turn is connected to a rocker 43 pivoted to a fixed bar 44, which rocker has an arm underlying a foot 45 projecting from the abstract.

As shown in Figure 4 two vacuum chambers are provided, the second chamber numbered 46 being a duplicate of the chamber 20, and containing a pocket 47 coupled with the tracker bar by a tube 48. A flexible pouch 49 overlies the pocket and operates a valve stem 50 and a valve 51 connected to said stem, and cooperates with a seat on the end of the tube 52 which passes from the chest to the interior of the pneumatic and may be the duplicate of the coupling 21. In fact tube 52 as well as 21 is preferably a coupling in order to increase the security of mounting the pneumatic; and in short all the parts in chamber 46 are preferably duplicates of the parts in chamber 20. An imperforate thimble or cap 53 is inserted detachably in, so as to close, an opening in the top member 34 when such an opening is provided for removal of valve 51. The opening and its closure may be omitted and provisions made for removing the tube 52, when necessary for repairs, through the rear wall 54 of the chamber, which may be removable and may be made of glass, like the wall 39. A spring 55 is provided to expand the pneumatic, and such spring may be one of a known sort, such as a piece of wire having its ends embedded in the top and bottom members 23 and 34, respectively, and being under torsional strain great enough to separate these members when the air pressures inside and outside of the pneumatic are equal.

Air is exhausted from the chambers 20 and 46 by a pump 56 consisting of two separate bellows each connected to one of two pedals 57. The pumps may be of any construction usually used in this art, or suitable for the purpose, and preferably of two rigid plates or boards 58 and 59 as shown in Figure 3, one of which is rigidly attached to an air chest 60, and the other of which is pivoted to the first; and the space between the plates 58 and 59 is enclosed by a flexible covering 61^a. This is substantially the construction which is likewise adopted for the

power pneumatics previously described. This pump is a vacuum pump and is equipped with simple intake and outlet valves 61 and 62 consisting of flexible flaps of leather, or other material sufficiently impervious to air, arranged to overlie, respectively a passage between the pump and the air chest, and an opening 63 in the movable pump wall 59. When the wall 59 is pushed to the rear by pressure applied to the pedals it exhausts air from the two vacuum chambers, which are connected to the chest 60 through tubes 64 and 65, respectively, and an intermediate receiver or pressure equalizer 66.

Said receiver is constructed substantially like the pumps and the power pneumatics, and is normally distended by springs 67. It is coupled to the chest 60 with intercommunication and its function is to convert the distinct vacuum impulses exerted by the intermittent pumps into a pull or suction of substantially uniform and continuous force.

It will be noted from Figures 2 and 3 that the pump members and the receiver are both attached to the chest 60 by couplings 68 and 69, respectively, which are essentially like the couplings between the vacuum chamber and the power pneumatics, that is, tubes open from end to end, passed through one of the abutting parts, and threaded into the other part. These tubes, it should be noted, have flanges 70 on their base or rear ends for the purpose mainly of retaining a gasket or packing 71 to prevent leakage. The couplings are preferably made of metal, and preferably also of non-corrodible metal such as aluminum. They afford a means for securely attaching together the parts which they respectively connect, which can be readily disconnected at need, and a means also for providing for free flow of air between the connected parts.

The material of which the rigid parts of the vacuum chamber, air chest, pumps, power pneumatics, and receiver, are made is preferably wood, as usual in this art; and the flexible fabric which encloses the spaces between these rigid parts in the collapsible bellows members (pumps, receiver, power pneumatics) may be any sheet material which is sufficiently impervious to air and is also flexible enough to serve the purpose. Among such fabrics may be named rubber-coated or frictioned textile fabrics, soft leather, so called artificial leather, and so forth.

It is to be understood, of course, that the number of power pneumatics is equal to the number of hammer actions which are controlled by the perforated music sheet. When the pneumatics are wider than the space between the actions, they may be arranged in two, three, or more banks with adjacent pneumatics in the same bank operating

every second or every third hammer action. This arrangement, however, involves only a duplication in the vacuum chambers 20, or 20 and 46; but all vacuum chambers are coupled with the vacuum pump, and the power pneumatics are mounted on their supporting chambers in substantially the manner here shown.

The power pneumatics are operable by the chamber 20 and the valve therein alone; the valve 51 being unnecessary in the normal operation and being indeed not brought into action except to accent a note. The uncovering of the hole in the tracker bar to which pocket 27 is connected, allows air to enter the pocket at the atmospheric pressure and puff out the pouch or diaphragm 26, raising the valve 24 and allowing air to flow from the power pneumatic into the vacuum chamber. As soon as this flow commences the cover valve 37 is closed and then the unbalanced external pressure on the pneumatic collapses it. Thus the top piece 34 is depressed and the associated hammer action is thrown. The same effect will occur, however, if the cover valve be omitted and the opening through the tube 33 be made of less capacity than that through the coupling 21, for then air will pass from the pneumatic faster than it can enter and unbalanced external pressure will result. When the top piece 34 is somewhat lowered, the seat 35 comes in contact with the upper side of valve 24, which remains raised as long as the note hole in the tracker bar remains uncovered, whereby air inflow to the pneumatic is shut off. If now air should be admitted through tubes 30 and 48 to both pockets 27 and 47, and both valves 24 and 51 should be opened at the same time, the preponderating external atmospheric pressure will be applied on the pneumatic more suddenly, and will be therefore collapsed more quickly and caused to move the hammer more swiftly and forcibly than in the normal way thereby giving a harder blow of the hammer on the string. In this way a note is accented. Hence by having two holes in the tracker bar to control each note and connecting one of the holes with the primary valve pneumatic 27 and the other with the secondary valve pneumatic 47, it is made possible to control the force with which the notes are struck and to cause selected notes among a number struck at the same time to sound louder than others, or to accent a single note or chord at any time. In this explanation the valve 24 is considered the primary valve; the pocket 27 with its pouch or diaphragm 26 is considered the primary valve pneumatic; the valve 51 is considered the secondary valve; and the pocket 47 with its pouch or diaphragm 49 is considered the secondary valve pneumatic.

The construction of tracker bar which I

have designed to secure these ends is shown in Figures 5, 6, and 7. The holes in the face of the bar are arranged in pairs indicated 72 and 73, and the holes of any one pair control the same note. In order to apply this form of control with a tracker bar of the ordinary length, I have made the holes in the bar slightly less than one half the usual width, and to give room for the tube connection at the rear of the bar, I have caused the through channels from the face openings to run at opposite inclinations from the adjacent holes as indicated in dotted lines by the channels marked 74 and 75 in Figure 5. That is, the channel 74 from the opening 72 inclines toward the upper edge of the bar while the channel 75 from the opening 73 inclines toward the lower edge of the bar. At the rear side of the bar the openings from these channels lie in two separated lines and are spaced wider apart than are the face openings 72, 73, thus giving room for connection to them of the rigid nipples 76, 77, 78, and 79 to which the flexible tubes 30 and 48 are attached. The perforations in the music sheet necessarily correspond in width and location to the front openings in the tracker bar. For playing notes with the normal touch the perforations in the sheet are only wide enough to uncover one of the pair of holes which controls each note, but for accenting the note, the perforation corresponding to the given note is either made wide enough to uncover both holes of the pair, or two separate perforations are arranged to the same effect.

Making a tracker bar equipped with extra holes according to the foregoing description enables it to be substituted in instruments already constructed in place of the tracker bars originally provided. But of course I may embody the invention in a tracker bar of greater length and so give room for holes of correspondingly increased width.

I have described the vacuum chamber 20 as normally the primary chamber and the valve therein as the primary control valve. Of course the relation between this and the other chamber may be reversed without departure from the principle of the invention. Indeed that phase of the invention which involves duplicating the vacuum chamber and control valves for accenting the theme or other specific notes may be embodied in a pneumatic mechanism otherwise than with the specific types of valves and valve seats here shown. That phase which calls for the same valve controlling the suction outlet from the power pneumatic and the breathing inlet, requires that such double acting valve be the primary valve, as that is the one which is always used whether the note is accented or not. Of course when the opening in the tracker bar is covered, air is no longer drawn into the pocket 27, while it is be-

ing continuously led off through the vent 31, whereupon the valve is at once released and closed against the seat of coupling 21. When the cover valve 37 is used its springy holder is adjusted to separate it from its seat under normal conditions and to hold it away from the seat when it is pressed upon from the outside by such light pressure as is applied when the pneumatic breathes. But the protruding valve stem opens it.

The double chamber structure and double valve arrangement has utility and may be employed without any regard to control of accenting certain notes; for this arrangement enables strong striking influences to be delivered to the hammer actions even by pneumatics of small area on account of the suddenness with which a great reduction of the internal pressure in the pneumatic below the external atmospheric pressure may be effected. The further result follows that a complete player mechanism of small overall dimensions, and therefore capable of being located in a restricted space, is provided.

The arrangement and means for mounting the power pneumatic may be used either with the double vacuum chamber as shown or with a single chamber and without the means for accenting special notes. In either case it affords a very rigid and secure mode of mounting the pneumatic, which is particularly secure in the case of the double chamber and the two couplings. Thus the impulse applied by the pneumatic to the hammer action is sharp and firm and the reaction of the impulse upon the pneumatic is not liable to work it loose. Then the connection between the pneumatic and the chamber is altogether positive and mechanical, that is, not dependent upon glue, and it is of a sort which is easily made air tight, since it is screwed tightly into the wall of the pneumatic and may be packed by a gasket between its end flange and the wall of the chest. Thus it is not affected by weather conditions of heat, cold, and particularly humidity.

Most of the same advantages inhere in the connecting means between the pump and air chest 60 and between the air chest and receiver 66 as are found in the connecting means between the vacuum chamber and power pneumatic in the situations described greatly simplifies the construction of the player mechanism from what has been heretofore known, besides increasing its strength; and the liability of damage and need of repairs, while making it much easier to effect repairs when such are needed. The great majority of repairs concern the valves for the power pneumatics, and these can be effected without harm to the power pneumatic. Adjustment of the seat 35 with respect to the valve may be readily made by screw-

ing the thimble 33 appropriately either inward or outward, and the thimble is easily accessible for that purpose.

The opening through this thimble or tube is called in the art the intake or stack of the pneumatic, and where either of these terms is used in the following claims, they have the meaning here indicated.

As previously intimated the principles of the pneumatic player mechanism are applicable to other instruments than pianos and may be so applied by those skilled in the art.

In the foregoing description of two vacuum chambers I have not intended to indicate that there must be two independent and unconnected chambers for carrying out that part of the invention which relates to means for specially accenting selected notes, for such is not the case. The qualitative effect of causing a heavier or lighter blow is secured by providing the two valve controlled openings to the power pneumatic, and this effect will result if both openings pass to the same chamber. For an accurate and quantitative regulation of the force of the impulse it may be desirable to provide totally separate chambers and carry different degrees of absolute pressure in each. Whether or not the chambers are thus separate, the structure shown is mechanically efficient and economical in that it provides a centrally located spacing beam between the top and bottom walls of the chamber, securing the latter rigidly and allowing the external walls to be removed as previously described; relieving such external walls of any duty of giving strength to the structure.

The descriptive terms used in this specification are used for the purpose of distinguishing identification and without intent to indicate limitation. Thus the principles of the invention may be applied and used where the operating pressure is higher than atmospheric as well as where the atmosphere is caused to exert the operating pressure by exhausting air from within the pneumatics. I have here illustrated the embodiment of the invention applied to the vacuum type of player mechanism on account of the general use of that type.

The terms "pouch" and "pouch pneumatic" used herein are intended to include generically any sort of original means or actuator capable of operating the valve of the power pneumatic by pressure of air under control of a perforated note sheet. While the embodiment of such original actuator or pouch is shown as a chamber having a flexible wall, the terms referred to are not necessarily limited to that structure but include other means operable to like effect.

What I claim and desire to secure by Letters Patent is:

1. A pneumatic player mechanism comprising a chamber, a power pneumatic

mounted upon said chamber, a mechanical coupling securing said pneumatic detachably to said chamber and formed to provide a passage between said pneumatic and chamber for the flow of air, means for creating a different air pressure within the chamber from the external air pressure, and a valve for opening and closing said passage under control of a perforated sheet.

2. In a pneumatic player a chamber, a power pneumatic lying across said chamber, a tubular coupling contained in the adjacent walls of the chamber and the pneumatic, securing one to the other and providing a connecting passage between them, a valve in the pneumatic for closing and opening said passage, a stem passing from the valve through said connection into the chamber, and a pneumatic for shifting said valve under the control of a perforated note sheet.

3. In a pneumatic player mechanism a chamber, a power pneumatic extending across said chamber, a tubular coupling passing through the contiguous walls of the chamber and pneumatic securing them together and having a valve seating surface toward the interior of the pneumatic, the opposite wall of the pneumatic having an intake and a seating surface surrounding the same in substantial alinement with said tubular connection, a valve situated between said two surfaces and adapted to seat against one or the other, means for creating a difference between the air pressure within and that without said chamber, and means for shifting said valve under the control of a perforated note sheet.

4. In a pneumatic player mechanism a power pneumatic having opposite rigid sides movable together and apart and flexible sides enclosing the space between said rigid sides, a chamber having a rigid wall against which one of the walls of the pneumatic is laid, said contiguous walls having registering openings, a tubular coupling passing through said openings and secured therein, a valve arranged to open and close the passage through said coupling, and the pneumatic having in its opposite rigid wall an inlet opening in position to be obstructed by the valve when the latter is moved into position for opening the aforesaid passage.

5. In a pneumatic player mechanism the combination with a fixed closed air chamber of a collapsible chamber having a rigid wall in contact with a wall of the fixed chamber, and a coupling connecting said chambers together and consisting of the tube passing through and held in the contiguous walls of said chambers.

6. In a pneumatic player mechanism the combination with a fixed closed air chamber of a collapsible chamber having a rigid wall in contact with a wall of the fixed chamber, and a coupling connecting said chambers

together and consisting of a tube passing through the contiguous walls of said chambers and threaded into one of them, one end of said tube projecting out from the face of the wall through which it passes and having a flange or lip overlying said face.

7. In a pneumatic player mechanism the combination with a fixed closed air chamber of a collapsible chamber having a rigid wall in contact with a wall of the fixed chamber, and a coupling connecting said chambers together and consisting of a tube passing through the contiguous walls of said chambers and threaded into one of them, one end of said tube projecting out from the face of the wall through which it passes and having a flange or lip overlying said face and a gasket confined between said lip and the wall.

8. In a pneumatic player mechanism a chamber having its own enclosing walls, a power pneumatic arranged upon a wall of the chamber with a passage extending from the chamber into said pneumatic, a valve seat surrounding the orifice of such passage within the pneumatic, a valve cooperating with said seat, a valve stem extending from the valve into the chamber, a valve-operating pneumatic arranged in an opposite wall of the chamber to that on which the power pneumatic is placed, and means for conducting air to said valve-operating pneumatic.

9. In a pneumatic player mechanism a chamber, a power pneumatic arranged upon the chamber with a passage extending from the chamber into said pneumatic, a valve seat surrounding the orifice of such passage within the pneumatic, a valve cooperating with said seat, a valve stem extending from the valve into the chamber, a valve-operating pneumatic arranged in the wall of the chamber opposite to the power pneumatic, and means for conducting air to said pneumatic for effecting operation thereof, said vacuum chamber having a lateral wall and said lateral wall being removable to give access to said pneumatic.

10. In a pneumatic player mechanism, a chamber having opposite walls and an intermediate wall, the intermediate wall being mounted detachably to give access to the interior of the chamber, a power pneumatic mounted on one of said opposite walls, the other wall having a pouch pocket opening into the interior of the chamber, and a flexible pouch or diaphragm arranged across the opening of said pocket and made fast to the inner surface of said last-named wall.

11. In a pneumatic player mechanism, a chamber consisting of opposed top and bottom walls, lateral walls and an intermediate spacing beam between the top and bottom walls and secured to the latter; one of the lateral walls being separable from the chamber, and spring holders secured to the

bottom wall arranged to support said removable wall and yieldingly hold it in place.

12. In a pneumatic player mechanism, a chamber having a top, bottom and side walls and an intermediate beam between the top and bottom walls, a power pneumatic secured to said top wall with communicating passages from its interior face to the chamber at each side of said beam, pouch pneumatics arranged in the bottom wall of the chamber respectively opposite to said passages, air admitting connections leading to the pouch pneumatics, and valves controlling said passages arranged for operation respectively by said pouch pneumatics.

13. In a pneumatic player mechanism a vacuum chamber with a power pneumatic secured upon and overlying one wall of said chamber, a valve-operating pneumatic in another wall of said chamber, there being a passage from the chamber to the interior of the power pneumatic, a valve in the power pneumatic arranged to cooperate with a valve seat in said passage, the power pneumatic having in its wall opposite to the passage an intake and a seat complementary to the valve surrounding said intake, a stem passing from the valve into proximity with the power-operating pneumatic, being movable by expansion of the latter to shift the valve from the first of the before-named valve seats toward the second valve seat, a tracker bar having passages through it and a conduit extending uninterruptedly from one of the tracker bar passages to the power-pneumatic.

14. In a pneumatic player mechanism a power pneumatic, supporting means therefor, there being a passage for air between said pneumatic and the supporting means, a valve within the pneumatic complementary to a seating surface around said passage, the pneumatic having in its wall opposite to the passage an opening through which the valve may be removed, and a thimble mounted in said opening and secured frictionally therein to provide a displaceable closure for said opening.

15. In a pneumatic valve mechanism, a collapsible pneumatic having an intake, a cover valve overlying said intake externally, and a springy holder for said valve normally holding the valve displaced from the intake and adapted to yield and permit closing of the valve under an excess of external over internal air pressure.

16. In a pneumatic player mechanism a power pneumatic having an outflow opening in one wall and an intake opening in the other wall, there being valve seats surrounding each of said openings, a valve interposed between said seats arranged to cooperate with each in turn, said intake opening having also an outer valve seat and a cover valve yieldingly mounted over the

outer valve seat of said intake opening and normally separated therefrom in a position to be closed against said outer seat by excess of external atmospheric pressure, the
 5 first valve having a stem projecting therefrom to a greater length than the distance between the inner and outer seats of said intake, whereby when the first valve is seated against said inner seat, the stem is effective to displace the cover valve from
 10 said outer seat.

17. In a pneumatic player mechanism a chamber, a bellows comprising opposite rigid walls hinged together and a flexible
 15 fabric enclosing the space between said rigid walls, one of said walls being laid against a wall of the chamber, and a rigid tube passing through the contiguous walls and secured to both, providing a coupling
 20 and an air passage between the bellows and the chamber.

18. In a pneumatic player a chamber, a power pneumatic lying across said chamber, a tubular coupling contained in the adjacent
 25 walls of said chamber and pneumatic, a valve adapted to seat across said tube, a stem extending from said valve through said tube, a guide for centering the valve embracing said stem and detachably mounted in said tube,
 30 being formed to leave unobstructed air passages between itself and inner surface of the tube, means for creating a different air pressure within the chamber from the external air pressure, and means for shifting said
 35 valve under control of a perforated note sheet.

19. In a pneumatic player a chamber, a power pneumatic lying across said chamber, a tubular coupling contained in the adjacent
 40 walls of said chamber and pneumatic, a valve adapted to seat across said tube, a stem extending from said valve through said tube, a guide embracing said stem within the tube having laterally projecting extensions

frictionally engaged with the walls of the
 45 tube, means for creating a different air pressure in the chamber from the external air pressure, and means for shifting said valve under control of a note sheet.

20. In a pneumatic player mechanism having two exhaust openings and an intake
 50 opening, two valves each controlling one of said exhaust openings, one of said valves controlling also the intake opening, two valve operating pneumatics each operatively
 55 arranged to control one of said valves, and a tracker bar having a pair of holes which are separately and independently connected with the two valves operating pneumatics.

21. A pneumatic player mechanism comprising a power pneumatic having a plurality of outlets and an inlet, vacuum means
 60 in connection with said outlets, the inlet being open to the atmosphere, valves controlling the respective outlets, one of which
 65 is arranged to close the inlet when moved to open the outlet which it also controls, and means controlled by a note sheet for so operating the last named valve alone or for operating both valves in unison.
 70

22. A pneumatic player mechanism having means for accenting selected notes, comprising the combination of a tracker bar
 75 having two holes for controlling the same note, a power pneumatic having two outlets, vacuum producing connections into which said outlets open, valves controlling the respective openings, the pneumatic having also an intake opening in position to be
 80 closed by one of said valves when such valve is displaced to open the outlet which it controls, valve operating pneumatics controlling the respective valves, and tubes passing from said valve operating pneumatics independently to each of said holes.
 85

In testimony whereof I have affixed my signature.

FRANK A. CLAPP.