

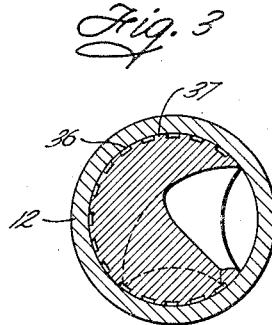
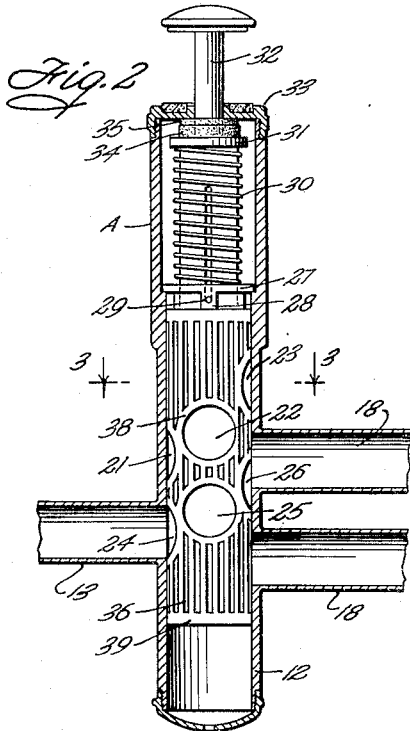
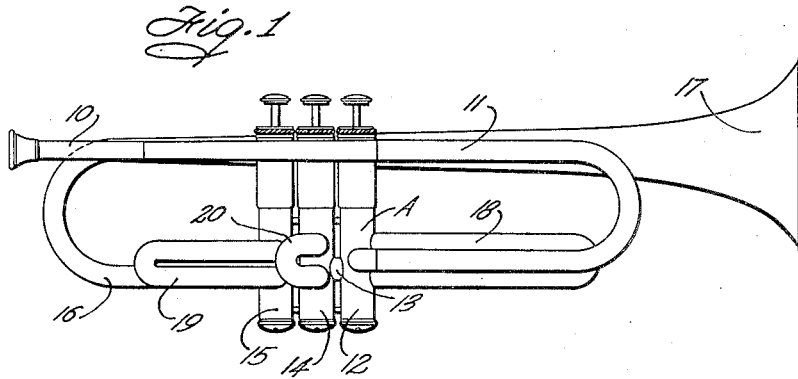
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PISTON VALVE FOR MUSICAL WIND INSTRUMENTS

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# UNITED STATES PATENT OFFICE

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## PISTON VALVE FOR MUSICAL WIND INSTRUMENTS

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9 Claims. (Cl. 84—388)

This invention relates to improvements in musical wind instruments and particularly to piston valves employed therein for increasing and decreasing the effective length of the air column of the instrument. Heretofore musical instruments employing piston type valves have been designed wherein on reciprocation of the valve the effective length of the air column of the instrument is varied. It has been customary in such constructions to form the exterior of the valve with a perfectly smooth cylindrical surface, the valve being frequently ground and polished for this purpose so that it will very closely fit the interior of the valve casing. A close fit is desirable in order to prevent leakage regardless of the position of the valve in varying the effective length of the air column.

Such constructions, wherein the exterior surface of the valve is ground perfectly smooth and cylindrical, are disadvantageous for the following reasons: Where the fit is extremely close it is impossible to maintain a suitable lubricant between the engaging surfaces between the valve and casing. Moisture and saliva of the player are insufficient to properly lubricate these valves. It is highly important in such instruments as cornets, trumpets, and the like, that although a close fit is maintained that the valve operate very freely and easily without binding or dragging. Particularly is this true in the case of such wind instruments as trumpets that may be played with very short notes requiring a quick shifting of the valve. Where the fit is very close any small particle of dust that may enter between the engaging surfaces during a concert or other rendition may cause the valve to stick or the speed of its operation to decrease.

It is an object of the present invention to provide an improved piston type valve for wind musical instruments wherein the design of the valve is such as to enable a supply of suitable lubricant to be maintained adjacent the engaging surfaces.

Another object of the invention is to provide a piston type valve for wind musical instruments wherein the piston valve has a series of spaced raised portions on its exterior providing the sole points of engagement between the valve and the valve casing, thus enabling the intervening spaces to receive and retain a supply of lubricant and in the event that a particle of dust or other foreign matter should enter between the piston valve and the casing it may quickly work its way into these spaces and thus never bind nor reduce the speed of operation of the valve. By having

only spaced, raised portions forming the points of engagement between the valve and the casing the friction of the valve is materially reduced, thus increasing its speed of operation and freedom of operation over valves having smooth cylindrical exterior surfaces.

With the foregoing and other objects in view, which will be made manifest in the following detailed description, and specifically pointed out in the appended claims, reference is had to the accompanying drawing for an illustrative embodiment of the invention, wherein:

Fig. 1 is a view in side elevation of a trumpet to which the invention is illustrated as having been applied.

Fig. 2 is a vertical section through the casing of valve A on the trumpet shown in Fig. 1 illustrating the piston in elevation therein.

Fig. 3 is a horizontal section taken upon the line 3—3 upon Fig. 2 illustrating the valve in enlarged section and details thereof slightly exaggerated.

Referring to the accompanying drawing, wherein similar reference characters designate similar parts throughout, the invention has been illustrated as applied to a trumpet having a mouthpiece 10 applied to a tube 11 which leads to the valve casing 12 of valve A. The valve casing 12 is ported, one of its ports being connected by a suitable tube 13 to valve casing 14 of an adjacent valve. This, in turn, is also ported and connected to the valve casing 15 of another adjacent valve. From valve casing 15 a tube 16 leads to the bell 17 of the instrument. A U-tube 18 has its ends connected to other ports of valve casing 12 and, similarly, a smaller U-tube has its ends connected to the ports of valve casing 15. The smallest U-tube 20 has its ends connected to the ports of valve casing 14. Within the valve casings 12, 14 and 15 there are reciprocable piston type valves, one of which is shown in detail in Fig. 2. The body portion of the piston type valve is generally cylindrical, having ports formed therein indicated at 21, 22, 23, 24, 25 and 26, respectively. Tubes extend through the body portion of the valve connecting port 22 with port 23, port 24 with port 25, and port 21 with port 26. When the valve is in its uppermost position shown, port 24 being connected with port 25, there is established communication between tube 13 and tube 11. On depressing the valve, tube 11 is connected through port 22 and port 23 to one end of tube 18, while the other end of tube 18 is connected through ports 26 and 21 to tube 13. Thus when the valve is in depressed position

the effective length of the air column of the instrument between mouthpiece 10 and bell 17 is increased by the length of tube 18, thus varying the note produced from the note that is produced when the valve is in its uppermost position. The valves of the instrument are not all identical in shape but will vary in their construction depending upon the arrangements of the lengthening tubes, such as 19 and 20, and the positions of the ports in their respective casings. Also, it will be understood that when the invention is applied to other types of musical instruments, such as, for example, bass horns, French horns, and the like, there may be occasion to vary the position and arrangements of the passages through the valve.

The mechanism for guiding the valve and for urging it into a normal uppermost position may likewise vary and forms no part of the present invention. The construction shown consists of a guide 27 having a boss 28 which enters a recess in the casing to keep the guide from turning therein. The guide has a diametrical pin 29 extending across a slot in the upper end of the valve, thus guiding the valve during its reciprocation. A spring 30 is compressed between the guide 27 and a shoulder 31 urging the valve into its uppermost position. It may be depressed by a handle 32 which extends upwardly through a cap 33. 34 and 35 merely designate layers of felt which render the operation of the valve noiseless in moving it into either of its extreme positions.

The invention consists in forming or providing on the exterior of the piston valve a series of recesses 36 which in the preferred form of construction extend longitudinally of the piston valve, thus defining a series of spaced raised portions 37, which form the sole points of engagement between the piston valve and the valve casing. These raised portions extend longitudinally of the valve except around the margins of the ports 21, 22, 23, 24, 25 and 26, where they are continuous, as indicated at 38. The raised portions 38, which are continuous around the ports, form and maintain a leakproof joint with the interior of the casing around the ports in the casing to which the various tubes are connected.

With this type of construction it will be appreciated that the grooves or recesses 36 form small chambers for the reception of a suitable lubricant, thus keeping the engaging surfaces between the valve and casing lubricated at all times.

In the preferred form of construction the top and bottom of the piston valve has a margin 39 of a continuously extending raised portion. As only the raised portions or high points are in engagement with the valve casing the friction between the valve and its casing is materially reduced, thus increasing the speed of operation of the valve. In the event that dust or other foreign matter should enter between the valve and its casing this may quickly work its way into the recesses 36 and thus it will not cause the valve to stick or bind or in other ways detract from the speed of operation of the valve.

The recesses 36 which define the raised portion 37 may be formed in any of a number of different ways. In constructing the valve it may be first rendered of tubular shape, the ports cut in it and the connecting tubes silver soldered in place. The recesses may then be milled out or may be eaten or etched out with acid or, if desired, a suitable die may be used to press the recesses in the surface of the valve. In finishing the construction the high points or raised portions are merely sur-

faced off so as to snugly fit the interior of the valve casing.

It will be appreciated that the improved valve construction is in no way limited in its use or application to the instrument shown but may be used on cornets, French horns, bass horns, or any instrument conventionally employing a piston type valve. Furthermore, the spring mechanism for urging the valve into its uppermost and normal position may likewise vary in accordance with any conventional or preferred practice.

The depth of the recesses 36 does not have to be material or as great as that exaggeratedly shown in Fig. 3. It need only be a few thousandths of an inch to satisfactorily accomplish the desired results. While the recesses 36 are illustrated as being vertically arranged it will be understood that they may be given other shapes, that is they may be helically arranged or traverse each other and in fact within the areas defined by the margins of the ports and the top and bottom margins, the recesses may have any desired or preferred design.

From the above described construction it will be appreciated that an improved piston valve is provided which not only provides for suitably lubricating the surfaces but reduces the friction and at the same time maintains a leak-proof joint in its various positions.

Various changes may be made in the details of construction without departing from the spirit or scope of the invention as disclosed by the appended claims.

I claim:

1. A piston valve for wind musical instruments comprising means providing a ported valve casing disposed in the means defining the air column of the instrument, a piston reciprocable in the casing adapted upon reciprocation to produce an increase or decrease of the effective length of the air column, there being a series of spaced points of engagement between the piston and the casing with the intervening spaces designed to receive and hold lubricant, and means on the piston providing a continuous line of engagement between the piston and casing at the top and bottom of the piston.

2. A piston valve for wind musical instruments comprising means providing a ported valve casing disposed in the means defining the air column of the instrument, a piston having passages there-through adapted upon reciprocation to connect and disconnect the ports in the casing to increase and decrease the length of the air column, the piston having a series of spaced raised portions on its surface forming the sole engagement between the piston and the casing enabling the intervening spaces to receive and hold lubricant, and means on the piston providing a continuous line of engagement between the piston and casing at the top and bottom of the piston and around each of the ports in the piston.

3. A piston valve for wind musical instruments comprising means providing a ported valve casing disposed in the means defining the air column of the instrument, a piston having passages there-through adapted upon reciprocation to connect and disconnect the ports in the casing to increase and decrease the length of the air column, the piston having a series of spaced raised portions on its surface forming the sole engagement between the piston and the casing enabling the intervening spaces to receive and hold lubricant, said raised portions being continuous around the margins of the passages through the piston.

4. A piston valve for wind musical instruments comprising means providing a ported valve casing disposed in the means defining the air column of the instrument, a piston having passages there-through adapted upon reciprocation to connect and disconnect the ports in the casing to increase and decrease the length of the air column, the piston having a series of spaced raised portions on its surface forming the sole engagement between the piston and the casing enabling the intervening spaces to receive and hold lubricant, said raised portions extending longitudinally of the piston and circumferentially around the top and bottom thereof.

5. A piston valve for wind musical instruments comprising means providing a ported valve casing disposed in the means defining the air column of the instrument, a piston having passages there-through adapted upon reciprocation to connect and disconnect the ports in the casing to increase and decrease the length of the air column, the piston having a series of spaced raised portions on its surface forming the sole engagement between the piston and the casing enabling the intervening spaces to receive and hold lubricant, said raised portions extending longitudinally of the piston except around the margins of the passages where they extend continuously there-around.

6. A piston valve for wind musical instruments comprising means providing a ported valve casing disposed in the means defining the air column of the instrument, a piston having passages there-through adapted upon reciprocation to connect and disconnect the ports in the casing to increase and decrease the length of the air column, the

piston having a series of spaced raised portions on its surface forming the sole engagement between the piston and the casing enabling the intervening spaces to receive and hold lubricant, said raised portions extending longitudinally of the piston except around the margins of the passages where they extend continuously there-around.

7. A piston for piston valves of wind musical instruments comprising a piston having passages therethrough, the exterior surface of the piston having a series of spaced raised portions forming the sole engagement between the piston and the casing in which the piston is adapted to operate, there being continuous circumferential raised portions at the top and bottom of the piston.

8. A piston for piston valves of wind musical instruments comprising a piston having passages therethrough, the exterior surface of the piston having a series of spaced raised portions forming the sole engagement between the piston and the casing in which the piston is adapted to operate, there being continuous circumferential raised portions at the top and bottom of the piston, and continuous raised portions around each of the passages.

9. A piston for piston valves of wind musical instruments comprising a piston having passages therethrough and having on its exterior surface spaced raised portions forming the sole engagement between the piston and the casing in which the piston is adapted to be operated, there being continuous raised portions around each of the passages.

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