Aug. 20, 1940. N. EINHORN 2,211,770

MUSICAL INSTRUMENT AND VALVE ACTION THEREFOR

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Fig. 1.

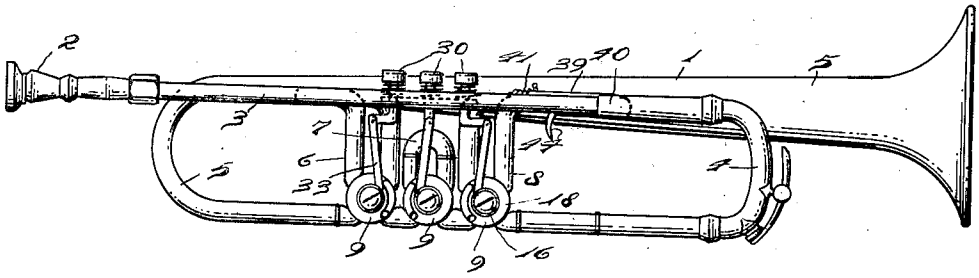


Fig. 2.

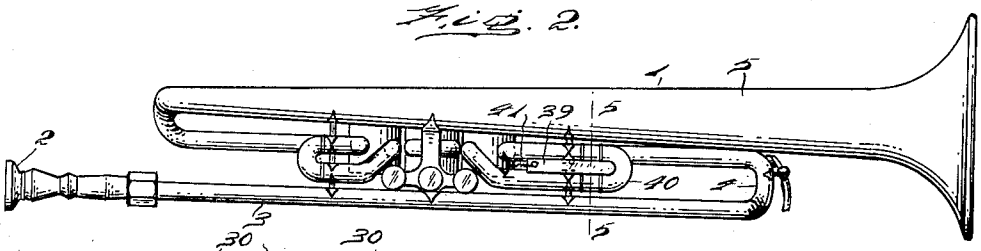


Fig. 3.

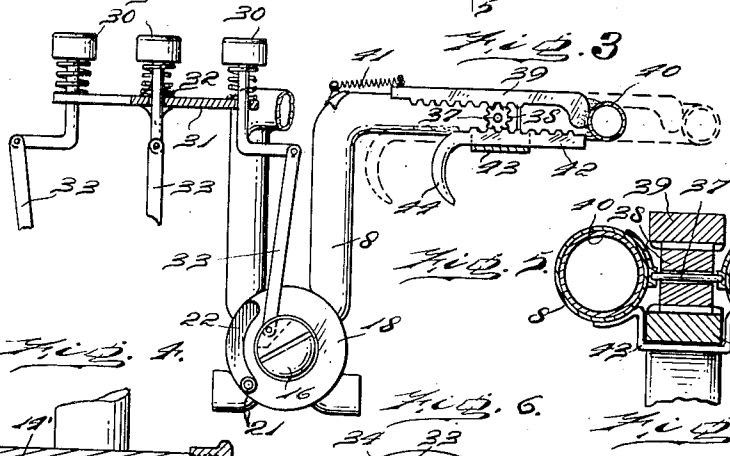


Fig. 4.

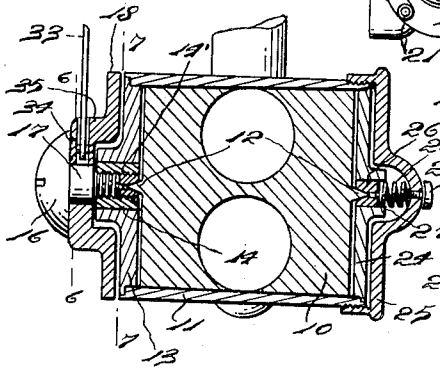


Fig. 5.

Fig. 6.

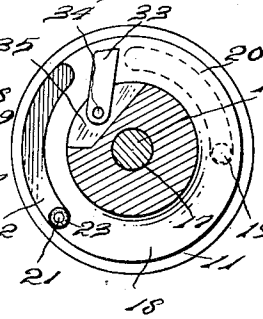
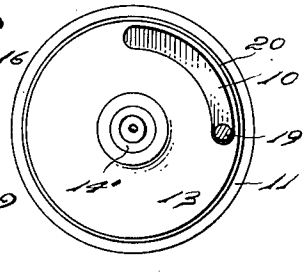


Fig. 7.



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MUSICAL INSTRUMENT AND VALVE ACTION THEREFOR

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Fig. 8.

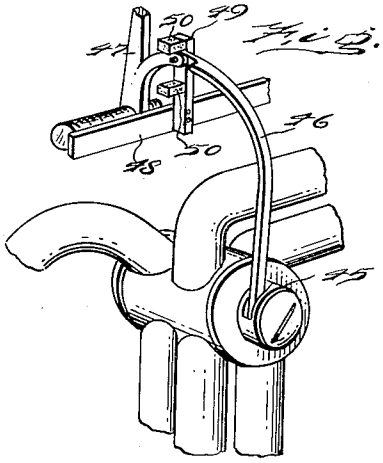


Fig. 9.

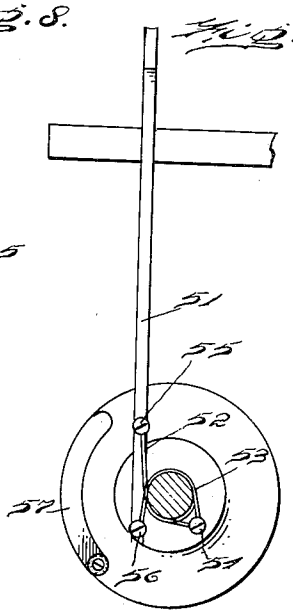


Fig. 10.

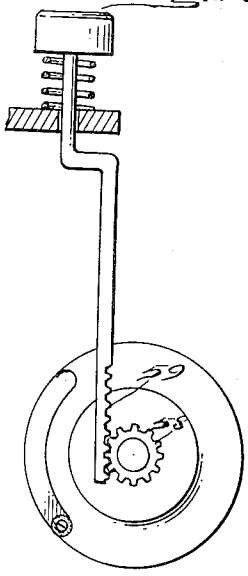


Fig. 11.

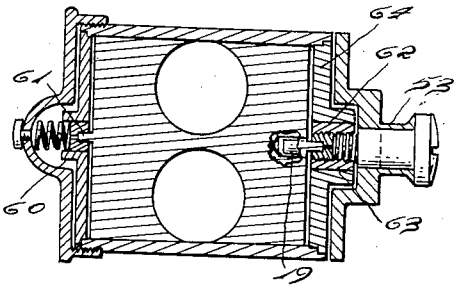


Fig. 12.

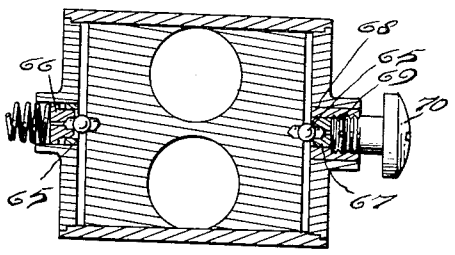


Fig. 13.

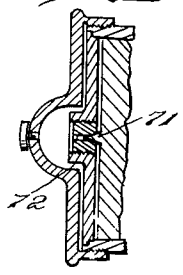


Fig. 14.

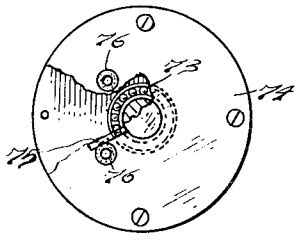
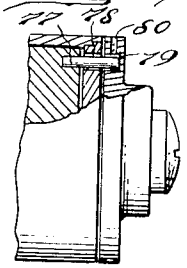


Fig. 15.



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MUSICAL INSTRUMENT AND VALVE ACTION THEREFOR

Nathan Einhorn, Philadelphia, Pa.

Application September 28, 1937, Serial No. 166,035

13 Claims. (Cl. 84—390)

The object of this invention is to devise a novel musical instrument which will have many advantages over those now in use.

My invention can be embodied in many different types of instruments such as for example trumpets, cornets, French horns, valve trombones, baritones or tubas.

A further object of the invention is to obtain more direct passages for trumpets and cornets through the valves and connecting tubing for open tones, which provides freer passage for sound vibrations.

A further object is to provide a better arrangement for trumpets and cornets of valve slides to make the instrument easier to hold in playing position.

A further object is to so arrange the parts for trumpets and cornets that the drainage will be at one place on the instrument.

A further object is to devise an instrument which can have a very short length of action for the finger tips.

A further object is to devise a valve action for musical instruments which will be faster, quieter, and easier to operate; one in which a very light spring can be used, and one in which an increased leverage action is present to increase the speed and give smoother playing since a quicker and better mechanical registry with the ports of the valve action is obtained.

A further object is to devise a valve action which will give truer tones in fast or slow playing.

A further object is to devise an instrument which will give less shock to the embochure or lips, due to the light touch of fingers in operation.

A further object is to reduce the friction on the trunnions or bearings of the valve by maintaining constant the axis of rotation of the valve so that there is uniform clearance during operation. Reduction of friction also eliminates the necessity of frequent cleaning and lubrication. The valve can be sealed to prevent injury to the valve mechanism by an incompetent or an unskilled person taking the valve mechanism apart or trying to assemble it. The openings for lubrication of the jewels and their ports and the removable plugs makes it possible to supply sufficient lubricant for a long period of time and to add lubrication without taking the valves apart or changing their adjustment.

A further object is to provide a valve mechanism in which the valves are not sluggish and will not stick.

With the above and other objects in view as will hereinafter appear, my invention comprehends a novel musical instrument.

It further comprehends a novel valve action and novel means for actuating it.

Other novel features of construction and advantage will hereinafter more clearly appear in the detailed description and the appended claims.

For the purpose of illustrating the invention, I have shown in the accompanying drawings, typical embodiments of it, which, in practice, will give satisfactory and reliable results. It is, however, to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized, and my invention is not limited to the exact arrangement and organization of these instrumentalities as herein set forth.

Figure 1 is a side elevation of a musical instrument, embodying my invention.

Figure 2 is a top plan view.

Figure 3 is a sectional elevation on an enlarged scale of a portion of the instrument.

Figure 4 is a sectional elevation on an enlarged scale of a rotary valve, the section being taken substantially on line 4—4 of Figure 3.

Figure 5 is a section on line 5—5 of Figure 3, on an enlarged scale.

Figure 6 is a section taken substantially on line 6—6 of Figure 4.

Figure 7 is a section on line 7—7 of Figure 4 with the turntable removed.

Figure 8 is a perspective view showing a portion of a French horn valve and lever arrangement.

Figure 9 is a sectional view showing the turntable being actuated by a cord.

Figure 10 is an end elevation showing a rack and pinion valve control for a trumpet.

Figure 11 is a sectional view of a valve embodying my invention.

Figure 12 is a sectional view of another form of rotary valve embodying my invention.

Figure 13 is a sectional view of another form of bearing.

Figure 14 is a sectional view of another form in which the valve is mounted on a ball bearing at one end.

Figure 15 is a fragmentary section of another form of the invention.

Similar numerals indicate corresponding parts.

Referring to the drawings:

In Figures 1 to 7 inclusive, I have shown a novel construction and arrangement of a rotary valve trumpet which is adapted to be held in an upright condition, and in the same upright posi-

tion as trumpets having reciprocatory valves. The tube arrangement is such that the trumpet can be more readily grasped by the musician, as the fingers surround upright tubes instead of the valves. The arrangement of the tubing is such that the water condensed therein will pass to a single water key. The action is much shorter and faster than has heretofore been deemed possible in an upright trumpet.

1 designates a musical instrument shown for the purpose of illustration as a trumpet.

The mouth piece 2, mouth pipe 3, the tuning slide 4, and the bell 5 may be of any desired or conventional construction.

The valve tubing 6, 7 and 8 are disposed in an upright position and the tubing 6 and 8 are bent to lie between the mouth pipe 3 and bell 5.

I employ a novel construction and arrangement of rotary valves 9 and their controls. Each valve 9 has a valve body 10 rotatably mounted in a novel manner within a cylinder 11.

Referring now more particularly to Figure 4, each valve has posts or trunnions 12 at opposite ends.

13 is an end cap fixed to the cylinder apertured to receive an internally threaded sleeve 14' which has a friction fit in the aperture. 14 is a jewel in threaded engagement with the sleeve and screwed in from the outside to its properly adjusted position with respect to a trunnion of the valve body. The jewel 14 has an aperture 15, through which it can be lubricated without affecting the adjustment. A cap screw 16 is threaded into the sleeve 14' and has a cylindrical portion 17 on which a turntable 18 is rotatably mounted. A pin 19, fixed to the turntable, travels in a curved slot 20 in the end cap 13. The pin 19 passes into an aperture in the valve body and has a slight clearance with the walls of said aperture. The extent of oscillation of the turntable is limited by a pin 21 fixed to the end cap 13 and extending into a curved slot 22 in the turntable. The pin 21 is encircled by a rubber sleeve 23 which acts as a silencer when the pin contacts with the ends of the turntable slot 22.

The opposite end of the valve body is mounted in a novel manner. A removable end cap 24 similar in construction to the end cap 13 is held in position by an outer end cap 25 having an annular flange in threaded engagement with the cylinder. A jewel 26 is slidably mounted in an aperture in the cap 24 and engages a trunnion 12. This jewel has a hole 27 for lubrication. The outer end cap 25 has a central bulge to provide space for a spring 28 which bears against the jewel 26. The end cap 24 has a removable plug 29 which can be removed when lubrication of the jewel and its post is desirable.

The rotary valves 9 are actuated by keys 30 having their stems guided in a bar 31 between which are the key springs 32. Links 33 are connected at their upper ends to the stems of the keys, and, at their lower ends, are pivotally connected by pins 34 to their respective turntables 18 which latter are recessed at 35 to provide clearance for movement of the links.

The valve slide 8 for the third valve is provided with novel means to actuate it, and the first valve may, if desired, be supplied with similar actuating means. A bracket 36 is fixed to the stationary tubes of the valve slide 8 and carries a pin or rod 37 on which a pinion 38 is free to revolve. An upper rack 39, fixed at one end to the valve slide 40, meshes with the pinion 38, and it is also provided with a spring 41 having one end fixed to a stationary point, thereby tending to retain the slide in its inward position. A lower rack 42 guided in a bracket 43, fixed to the stationary tubing, meshes with the pinion 38, and is provided with a trigger 44 to receive the index finger of the hand which holds the horn.

Referring now to Figure 8, I have shown a French horn valve with novel means for limiting the extent of movement of the rotary valve. The turntable 45 is similar to that shown in Figures 1 to 7 inclusive, except the pin and slot for limiting movement of the valve is omitted, and the link 46 is connected relatively to the valve body in the same way. The conventional finger lever 47 of a French horn is connected by a pin 48 with the link 46, having proper clearance in one of them. A stationary bar 49 has an upright member 49 which carries spaced cushion stops 50 which silently limits the extent of rotation of the rotary valve.

In Figure 9, I have shown the operating link 51 of a French horn connected by a cord 52 with the turntable. The cord 52 passes around a reduced neck 53 on the turntable around an offset screw 54 and its free ends are connected at 55 and 56 with the actuating link 51. The pin and slot connection 57 is the same as that shown in Figure 6.

This pin and slot connection is also shown in Figure 10 but the turntable has a pinion 58 fixed to it which meshes with a rack 59 on the actuating link.

In Figure 11, the turntable is turned by a cord as in Figure 9, but the valve body has cylindrical trunnions 60 mounted in bearings 61 to 62.

The bearing 61 is spring pressed while the bearing 62 is screwed into a sleeve 63 having a friction fit in an aperture in the end cap 64.

In Figure 12, the valve body has its trunnions formed by balls 65, the valve body being recessed to receive the balls. The ball at the left hand end cooperates with a spring pressed bearing member 66 recessed to form a seat for the ball. The ball at the opposite end cooperates with a bearing 67 recessed to form a seat for the ball and slidable in a sleeve 68 having a friction fit in an aperture in the end cap of the cylinder. A screw 69 in threaded engagement with the sleeve limits the outward movement of the bearing 67. The screw 70 is adapted to carry the turntable for operating the valve.

In Figure 13, a trunnion 71 of the valve body cooperates with a seat forming member 72 screwed into an aperture in the end cap of the valve cylinder.

In Figure 14, the rotary valve at one end is mounted on a ball bearing 73 carried by an end cap 74 secured to the valve cylinder.

An actuating arm 75 on the trunnion travels between cushioned stops 76 to limit the extent of rotation of the rotary valve.

The operation will now be apparent to those skilled in this art and is as follows:

Referring first to Figures 1 to 7 inclusive, when the operator presses down a key 30, its link 33 is moved downwardly and the valve body is urged to turn by a pressure applied at a radial point in proximity to the outer periphery of the valve body, see Figure 7. The link is connected with the turntable in proximity to its axis of rotation as this provides a shorter action. The turntable carries the pin 19 which has a loose fit in an aperture in the valve body to compensate for slight inaccuracy in commercial manufacture and assembly of the parts. The valve body has

its trunnions preferably mounted in anti-friction bearing and in such a manner that a fixed axis of rotation can be maintained. The valve body does not contact with its cylinder or end caps. A spring urges the seat for one trunnion of the conical valve body towards the valve body and urges the opposite trunnion towards a stationary or fixed seat. The pin and slot connection 21 and 22 limits the extent of movement of the turntable in a very silent manner. The turntable covers the slot 20 and prevents entrance of foreign material which would produce friction.

The upright tubes 6, 7 and 8 form a grasping portion which can easily be grasped by the hand of the player to hold the instrument in comfort and in an upright position.

The moisture flows by gravity to the water key.

Heretofore it has been necessary to take the instrument apart to remove a film of corrosion accumulating in the tubes from the moisture.

In my device, a brush on a flexible wire can be passed through the mouth pipe, tuning slide valves, and straight on through the bell, which are the parts in which the corrosive film collects.

The third slide valve is actuated by the index or trigger finger which provides a balanced pull on the slide, the pressure being applied at the center of the slide. The return movement of the third valve slide is effected by a spring so that there is no shock imparted to the lips of the player. This can also be applied to the first valve slide.

In the rotary valve action for a French horn seen in Figure 8, the stop for the turntable as shown in Figure 6 is eliminated and the cushioned stop action takes place at the upper end of the link in proximity to its actuating lever. A cushioned stop can be provided near the key if desired in the trumpet, baritone or tuba, using rotary valves. In some cases the separate stop for the turntable can be omitted.

In Figure 9, a French horn link arrangement has a cord connected to the turntable as also shown in Figure 11, the turntable being provided with a cushioned stop. This can be used for trumpets, baritones and tubas.

The rack and pinion control in Figure 10 can be used in trumpets, baritones, cornets and tubas, and also French horns.

In Figures 11, 12 and 13, I have shown means for mounting the valve body with a fixed axis of rotation.

Any desired combination of trunnion mountings shown may be used.

In Figure 14, I have shown one end of the valve body being journalled in a ball bearing which reduces friction.

The driving connection between the turntable and the valve body may be fixed to the turntable and have a loose fit in the valve body or it may, in broad scope of the invention, be as shown in Figure 15, fixed to the valve body, pass through a segmental slot in the juxtaposed end cap and have a loose fit in a recess in the turntable.

Referring now to Figure 15, a driving member 17 fixed to the valve body passed through a curved or segmental slot 18 in the juxtaposed end cap and has a loose fit in an aperture 19 in the turntable. An oil hole 30 is provided through the periphery of the turntable for the driving member.

It will be apparent that I have shown in different embodiments different practical ways in which the valve body can be mounted to maintain a fixed axis of rotation with a minimum of friction, and the pressure exerted when a key is pressed downwardly is directly applied in a novel manner in proximity to the outer periphery of the valve body. I have illustrated different forms of trunnion seats but have not attempted to show all of the possible combinations as those shown can be used at either end or both ends of a valve body.

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

1. In a musical instrument, the tubing, a rotary valve therefore having its valve body mounted to provide a fixed axis of rotation without axial movement, a turntable to apply a turning force to said valve body at a radial point near the outer periphery of such body, and means to limit the extent of rotation of the valve body.

2. In a musical instrument, the tubing, a rotary valve therefore, having trunnions mounted to provide a fixed axis of rotation for the valve body, a manually actuated turntable, means to apply the turning force of the turntable to the valve body at a distance from its trunnions, and means to limit the extent of turning movement of the valve body.

3. In a musical instrument, a revoluble valve comprising a valve cylinder having end caps, one of which has a curved slot, a valve body having trunnions, seats in the end caps for the trunnions, a turntable rotatably carried by the slotted end cap, a driving connection from the turntable extending through said slot to revolve the valve body, and manually actuated means to revolve the turntable during playing.

4. In a musical instrument, a revoluble valve comprising a valve cylinder having end caps, one of which has a curved slot, a valve body having trunnions, seats in the end caps for the trunnions, a turntable rotatably carried by the slotted end cap, a driving connection from the turntable extending through said slot, to revolve the valve body, manually actuated means to revolve the turntable during playing, and means to limit the extent of rotation of the turntable.

5. In a musical instrument, a rotary valve, a link to turn the valve, a manually actuated lever for the link, and spaced cushioned stops to limit the movement of the lever.

6. A musical instrument having a rotary valve, a turntable to effect turning of the valve and connected to the valve at a distance from its axis of rotation, and an actuating member for the turntable having a cord connection with it to actuate it.

7. A musical instrument having a rotary valve, a turntable to effect turning of the valve and connected to the valve at a distance from its axis of rotation, and an actuating member for the turntable having a rack and pinion connection with the turntable to actuate it.

8. A musical instrument having a rotary valve, a turntable to move the valve and connected to the valve at a distance from its axis of rotation, an actuating link, and a pin connecting the link to the turntable.

9. In a musical instrument, the tubing, a rotary valve therefor having a casing with end walls, one of which has a segmental slot and having a valve body mounted on the end walls to provide a fixed axis of rotation for such valve body, a manually actuated, rotary member connected through said slot with said valve body to

turn the latter and to seal said slot to prevent air leakage, and means to apply a turning force to said member.

10. In a musical instrument, the tubing, a rotary valve therefor having a casing with end walls, one of which has a segmental slot and having a valve body mounted on the end walls to provide a fixed axis of rotation for such valve body, a manually actuated, rotary member connected through said slot with said valve body to turn the latter and to seal said slot to prevent air leakage, and means to apply a turning force to said member, the end walls of said slot limiting the turning movement of said valve body.

11. In a musical instrument, the tubing, a rotary valve therefor, having a casing with a ported valve body mounted to provide a fixed axis of rotation without axial movement, a member rotatably mounted, connected with the valve body at a distance from its axis and acting as an air seal for one end of the valve casing, and means to apply a turning force to said member.

12. In a musical instrument, an end cap member for a valve casing, a valve member rotatably mounted in the casing, one of said members having a pin and the other of said members having a curved slot the end walls of which form a limiting stop for the pin, and said pin and slot being concealed.

13. In a musical instrument, a valve casing, having an end cap, a valve rotatably mounted, a turntable operatively connected with the valve to turn it, and a concealed pin and slot connection between the turntable and end cap to limit turning movement of the valve.

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