United States Patent

[11] 3,631,755

[72] Inventors **Alvin Glantz**
Las Vegas, Nev.;
Arvid Walters, Elkhorn, Wis.

[21] Appl. No. **35,062**
[22] Filed **May 6, 1970**
[45] Patented **Jan. 4, 1972**

[73] Assignee **G. Leblanc Corporation**
Kenosha, Wis.

[54] **BASS TROMBONE VALVE MECHANISM**
5 Claims, 8 Drawing Figs.

[52] **U.S. Cl.** **84/388,** 84/390, 84/394, 84/396
[51] **Int. Cl.** **G10d 7/10,** G10d 9/04
[50] **Field of Search** 84/387–396

[56] **References Cited**

UNITED STATES PATENTS

2,484,408	10/1949	Hubley	84/390

FOREIGN PATENTS

129,533	1901	Germany	84/394
1,003,389	1965	Great Britain	84/396

Primary Examiner—Richard B. Wilkinson
Assistant Examiner—John F. Gonzales
Attorney—Olson, Trexler, Wolters & Bushnell

ABSTRACT: A slide valve bass trombone of the usual type is disclosed herein and includes conventional upper and lower rotary valve assemblies for extending the range of the instrument. The trombone is further provided with a unitary valve actuator assembly which is mechanically linked to both of the valve assemblies so that an operator may alternatively actuate a predetermined one of said assemblies or both of the assemblies simultaneously, depending upon the manner in which the operator manipulates the unitary actuator.

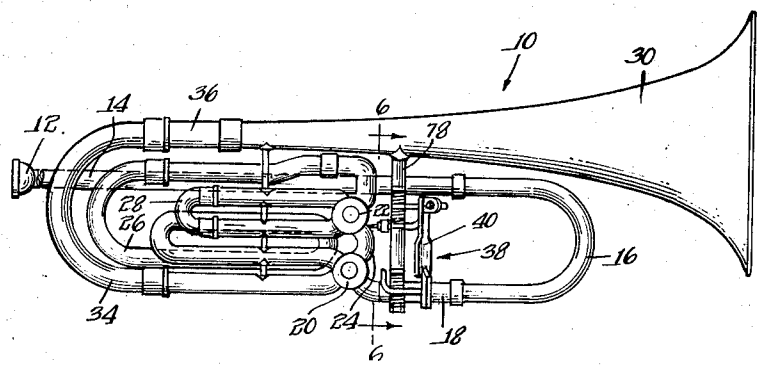


Fig. 1.

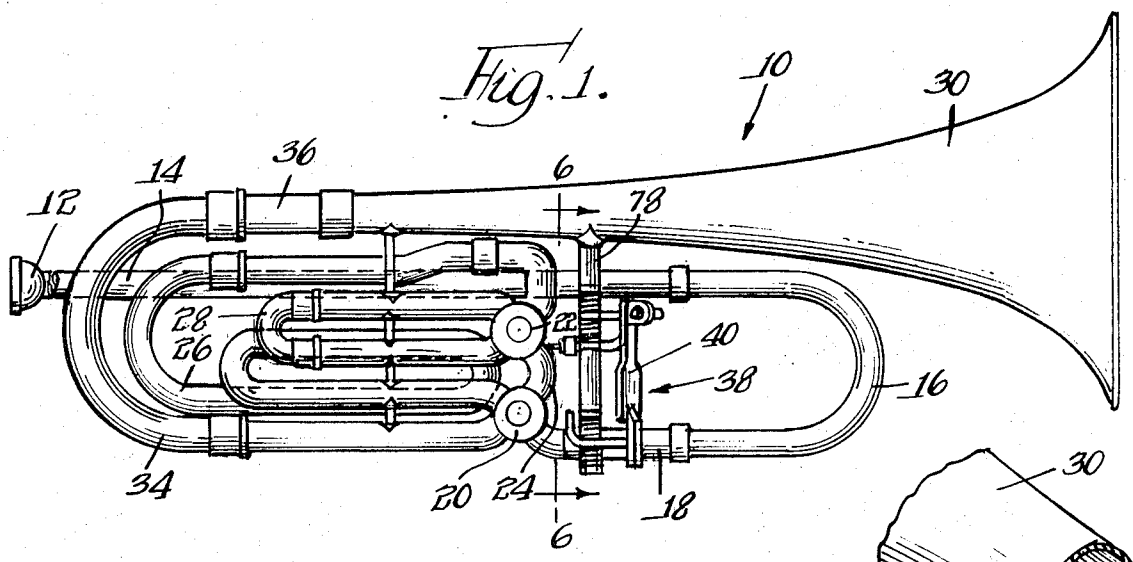


Fig. 6.

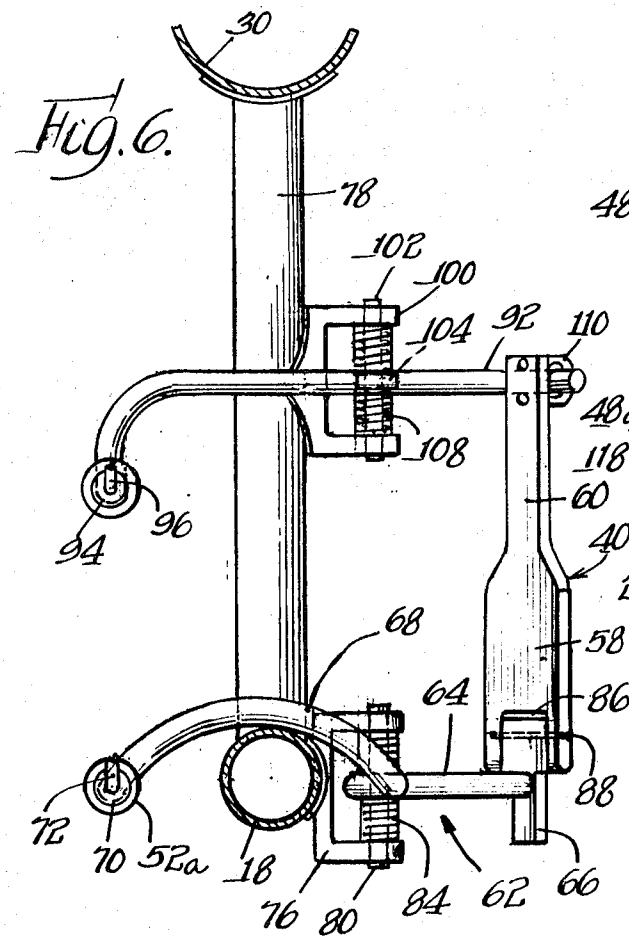
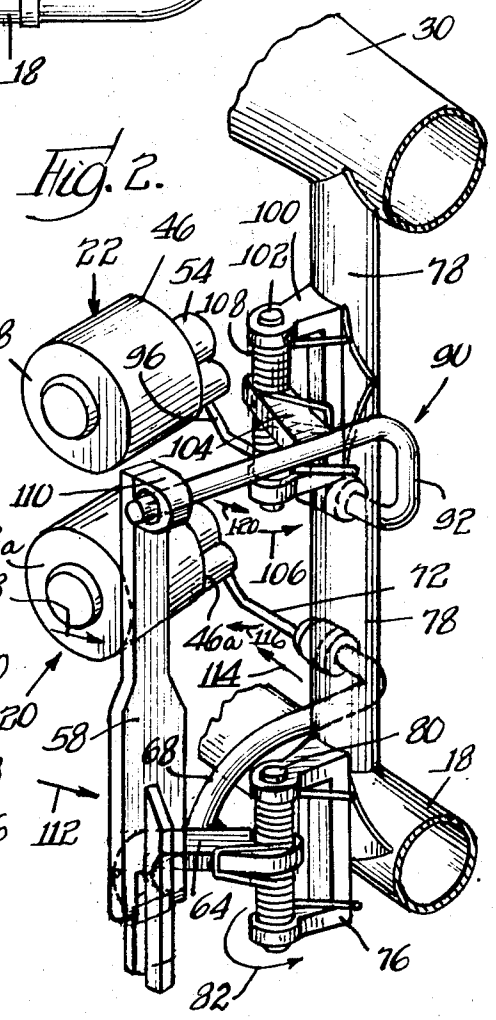


Fig. 2.



Inventors
Alvin Glantz
Arvid Walters

By: Olson, Trexler, Wolters & Bushnell attys.

Fig. 3.

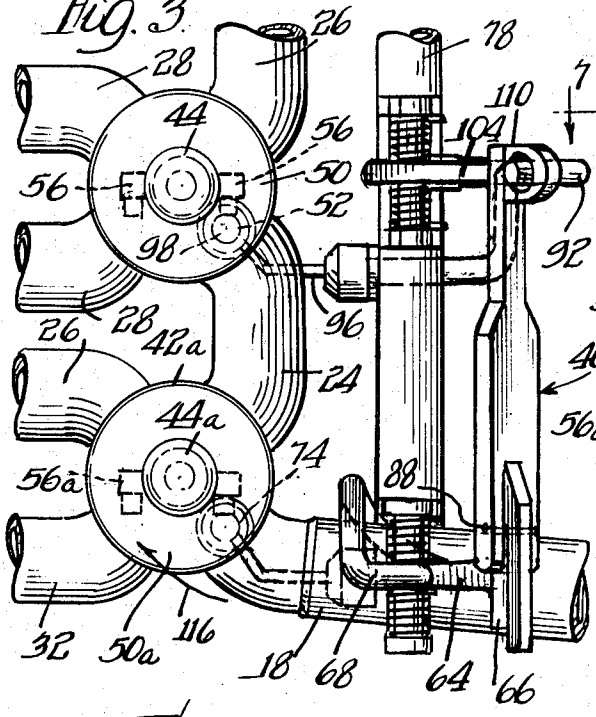


Fig. 4.

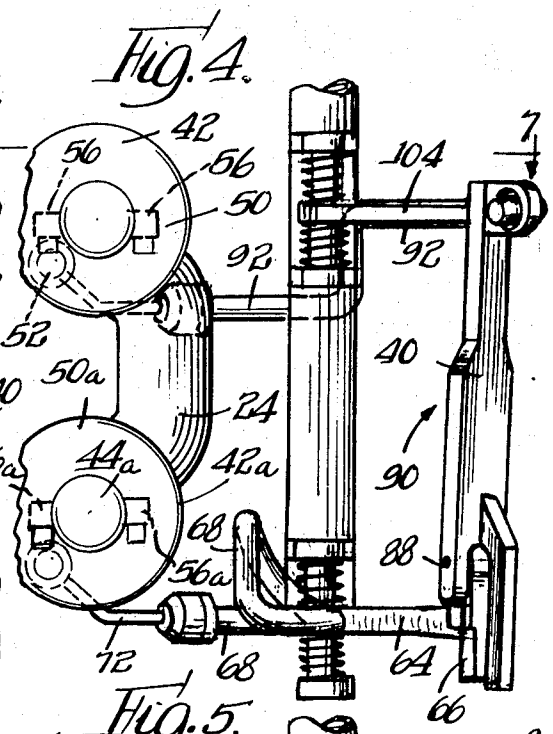


Fig. 5.

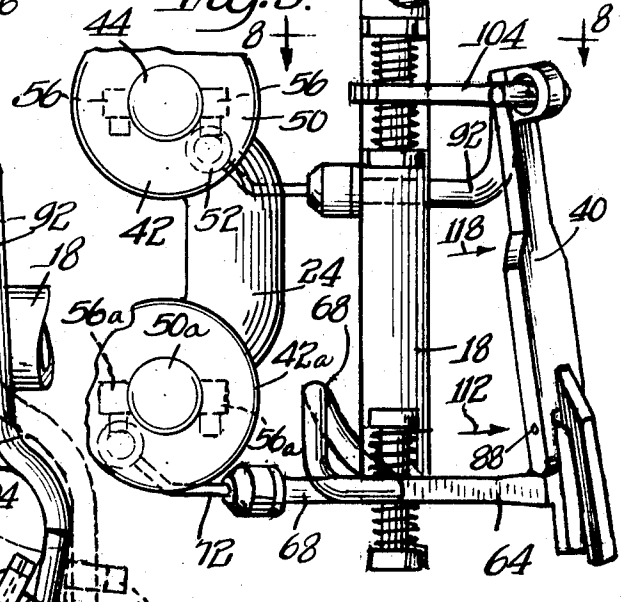


Fig. 7.

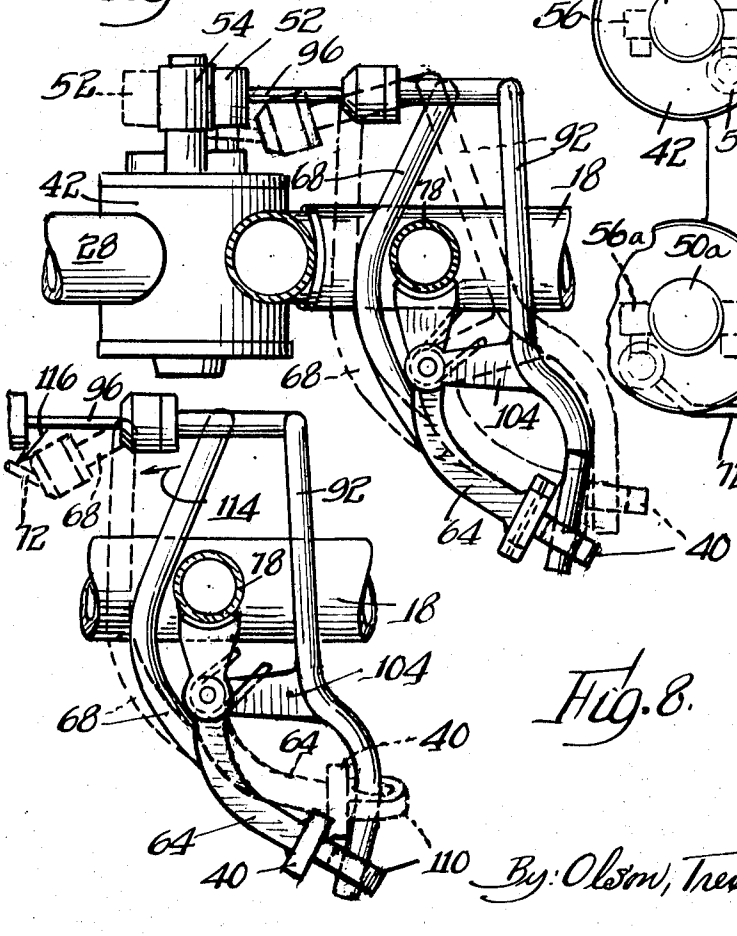


Fig. 8.

Inventors
Alvin Glantz
Arvid Walters
By: Olsen, Trexler, Wolters & Bushnell
Attys

BASS TROMBONE VALVE MECHANISM

SUMMARY OF THE INVENTION

This invention relates generally to musical wind instruments and more particularly to bass trombones.

DISTINCTIONS OVER THE PRIOR ART AND OBJECTS

The bass trombone, which is one of many musical brass wind instruments, is well known and generally includes a plurality of straight tubings interconnected with a plurality of coiled and curved tubings so as to define various airflow paths between the mouthpiece and sound output or bell of the instrument. The particular path through which the air passes determines, in part, the tonal quality of the trombone. In order to open such a path while maintaining other paths closed, the trombones of the prior art generally include a pair of valve assemblies which when appropriately manipulated accomplish this end.

In the past, this type of manipulation required the use of two, and sometimes three, actuating devices which had to be manipulated independently for closing the valve assemblies which in turn required the operator to use two, and sometimes three, fingers for accomplishing this end. Taking into consideration that one hand is required for moving the tuning slide, it becomes apparent that simplified manipulation is not only advantageous, but necessary.

Accordingly, a general object of the present invention is to provide an improved bass trombone valve construction which requires the use of only one finger for the manipulation of the valve assemblies thereof.

A more specific object of the present invention is to provide a new and improved unitary actuator assembly appropriately connnected to a pair of conventional valve assemblies of a bass trombone for, alternately, operating either both valves simultaneously or a predetermined one of said valves.

Yet a more specific object of the present invention is to provide a unitary actuator assembly of the above described type including a longitudinal thumb lever mechanism which when depressed at one end thereof causes operation of only one of the valve assemblies, whereas both valve assemblies are operated simultaneously when the mechanism is depressed near its other end.

These and other objects and features of the present invention will become more apparent from a reading of the following descriptions.

Briefly, the above-stated objects are achieved and the prior art deficiencies are eliminated by the invention herein disclosed and claimed which provides for a single longitudinal actuating arm or thumb lever mechanism mechanically connected at one end to one valve assembly of a bass trombone and at its other end to a second valve assembly thereof. The mechanical linkage connecting the valve assembly thereof. The mechanical linkage connecting the valve assemblies and actuating arm is such that when the latter is depressed or manipulated near one end thereof, only the valve assembly connected thereto is repositioned. If it is desirable to have both valve assemblies simultaneously repositioned, which quite often is the case, the same actuating arm may be depressed or manipulated at the other end thereof. The difference in results is dependent solely upon the position of manipulation rather than the use of different actuating mechanisms.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention, both as to its structure and mode of operation, will be better understood by reference to the following disclosure and drawings forming a part thereof, wherein:

FIG. 1 is a side view of a bass trombone constructed in accordance with the present invention;

FIG. 2 is an enlarged perspective view of two valve assemblies and a unitary actuator connected thereto, all of which are utilized by the bass trombone of FIG. 1;

FIG. 3 is an enlarged side view of the valve assemblies and unitary actuator with both valve assemblies being shown in their biased rearward positions;

FIG. 4 is an enlarged side view of the valve assemblies and unitary actuator with both valve assemblies being shown in their depressed or forward positions;

FIG. 5 is an enlarged side view of the valve assemblies and unitary actuator with the upper valve assembly being shown in its biased rearward position and the lower valve assembly being shown in its depressed forward position;

FIG. 6 is a sectional view taken substantially along line 6—6 in FIG. 1, and on a substantially enlarged scale;

FIG. 7 is a sectional view taken substantially along line 7—7 in FIG. 4; and,

FIG. 8 is a sectional view taken substantially along line 8—8 in FIG. 5.

DETAILED DESCRIPTION

Turning now to the drawings, wherein like elements are designated by like numerals, and particularly FIG. 1, a bass trombone constructed in accordance with the present invention is shown and generally designated by the reference numeral 10. The trombone is of generally conventional construction, and includes a mouthpiece 12 and a first length of straight tubing 14 leading to curved tuning slide 16, which tuning slide is connected in turn to a length of straight tubing 18 leading to a lower valve assembly 20. The lower valve assembly is in turn connected to a similar upper valve assembly 22 by a length of curved tubing 24 and a length of coiled tubing 26, a second independent length of coiled tubing 28 being provided for and solely connected to the upper valve assembly. In addition, the lower valve assembly 20 is connected to the trombone's output or bell 30 through a length of straight tubing 32, curved tubing 34 and straight tubing 36.

It is to be understood, that the above-described straight, curved and coiled tubings are well-known components of a conventional bass trombone and do not per se form a part of the invention disclosed herein and claimed. It suffices merely to state that the tubings define a plurality of different airflow paths between the mouthpiece 12 and output or bell 30, each path providing a different tonal quality to the trombone as is well known. The specific paths through which the air travels is dependent upon the positions of both the upper and lower valve assemblies 22 and 20 respectively. While the actual movement or positioning of the valve assemblies will be described hereinafter, the particular paths they open and close will not be described since the same are conventional and per se form no part of the invention herein.

In accordance with the present invention, a unitary valve-actuating assembly 38 including a vertically extending longitudinal thumb lever mechanism 40 is mechanically linked to the upper and lower valve assemblies for manipulating the valve assemblies in a manner to be described hereinafter. It will now suffice merely to state that when an operator, utilizing his left thumb, presses on the thumb lever mechanism 40 at the lower end thereof, as viewed in FIG. 1, only the lower valve assembly 20 will reposition from its initial biased state. By rolling the thumb or by raising it slightly along the same lever mechanism both the upper and lower valve assemblies will reposition.

Referring now to FIGS. 2 through 5, the upper and lower valve assemblies are shown in detail. Since the valve assemblies are at least externally identical in construction, only the upper valve assembly 22 will be described herein. Like components of both assemblies will be designated by like numerals with the suffix "a" designating those components of lower valve assembly 20. The upper valve assembly comprises two concentric cylinders, an outer cylinder 42 and an inner cylinder 44, which are closed at both ends thereof by end plates 46 and 48 so as to define an arcuate compartment or valve chamber 50 therebetween. A valve closing member or crank 52 is positioned outside the chamber adjacent end plate

46 and is connected to a center lug 54 (FIG. 2) which is in turn connected to conventional internal components (not shown) of the valve assembly. The valve closing member is moveable between a position, which for convenience will be designated as the rearward position, as seen in FIG. 3, and a position, which will be designated as the forward position as viewed in FIG. 4. This movement drives the center lug 54 about its own longitudinal axis which in turn appropriately actuates the internal components of the valve assembly.

In order to limit the movement of valve-closing member 52 between its rearward and forward positions, a pair of horizontally aligned stopper elements 56 are mounted to the outer surface of end plate 46 and positioned in a horizontal plane extending through the center of the concentric cylinders.

As stated above, the precise function of the valve assemblies 20 and 22, that is, the opening and closing of the various airflow paths defined by the tubings, is conventional and will not be described herein. It suffices merely to state that the tonal quality of the trombone will vary in accordance with the positions of valve members 52 and 52*a*, as seen in FIGS. 3,4 and 5. It should be noted, of course, that the tonal quality of the trombone is not solely dependent upon the positions of the valve members but rather depends upon the location of tuning slide 16 in conjunction therewith.

As stated above, the unitary valve-actuating assembly 38 includes a thumb lever mechanism 40 which can best be seen in FIG. 6. The thumb lever mechanism extends vertically and includes a bottom portion 58 which abruptly tapers inwardly so as to extend into a thinner upper portion 60.

A lower mechanical linkage assembly 62 connects the lower end of thumb lever mechanism 40 to the valve-closing member 52*a* so that the latter may move in the manner described above in response to the manipulation of the thumb lever mechanism which will be described hereinafter. The linkage assembly comprises a horizontally extending hook-shaped first link 64 which is connected at one end to a vertically extending lug 66 and at its other end to a second link 68 which curves over tubing 18 and terminates on the opposite side thereof. A ball bearing 70 is provided at the otherwise free end of link 68 for pivotable movement relative thereto. The ball bearing is, in turn, connected to a third link 72 which also terminates with a ball bearing 74 connected thereto, the ball bearing 74 being shown best in FIGS. 3 through 5. This last-mentioned ball bearing is mounted for rotation within valve closing member 52*a*.

A vertically extending bracket 76 is mounted to the tubing 18 at a point adjacent to a vertically extending brace member 78 which connects the tubing 18 to a rearward portion of the bell 30 of the trombone, as can best be seen in FIG. 2. The bracket includes a vertical pin 80 which pivotably supports the first link 64 for movement around the pin's longitudinal axis as indicated by the arrow 82. A spring mechanism 84 biases the first link 64 in a position shown in FIGS. 2 and 3, which in turn maintains the valve closing member 52*a* in its rearward position.

The bottom of thumb lever mechanism 40 includes a channel 86 which receives the top of lug 66, the thumb lever mechanism being pivotably connected thereto by a pivot pin 88 for pivotable movement between a substantially vertical position, as seen best in FIGS. 2 and 6, to a slightly inclined position, as seen best in FIG. 5.

An upper mechanical linkage assembly 90 is provided for connecting the top of thumb lever mechanism 40 to valve-closing member 52 so that further manipulation of the thumb lever mechanism, in a manner to be described hereinafter, will cause the valve-closing member 52 to move from its rearward position to its forward position in the manner described above. Assembly 90 comprises a link 92 which first extends in a horizontal direction, then in a vertical direction and finally terminates in a horizontal direction directly below and substantially perpendicular to the first horizontal portion. A ball bearing 94, which can best be seen in FIG. 6, is pivotably connected to the end of the second-mentioned horizontally extending portion of link 92 and is in turn connected to one end of a second link 96 which has a second ball bearing 98 connected to its otherwise free end, as seen in FIGS. 3 through 5. The ball bearing 98 is pivotably mounted within valve-closing member 52.

The upper mechanical linkage assembly 90 further includes a bracket 100 which is mounted to brace member 78 directly above bracket 76. The bracket 100 includes a vertical pin 102 which pivotably supports one end of a third link 104 for movement around the longitudinal axis of the pin as indicated by the arrow 106 and seen in FIG. 2. The other end of link 104 is connected to the first-mentioned horizontal portion of link 92 which responds to the movement of link 104 in a manner to be described hereinafter. A spring mechanism 108 biases the link 104 and therefore the remainder of the upper mechanical linkage assembly in the position shown in FIGS. 2 and 3.

The thumb lever mechanism 40 includes, at its top end thereof, a Delrin or other suitable bushing 110 which slidably supports the free end of link 92 in a manner to be described below.

Operationally, prior to the manipulation of thumb lever mechanism 40, the unitary valve-actuating assembly 38 is positioned as shown in FIGS. 2 and 3, so that valve-closing members 52 and 52*a* are in their respective rearward positions. The assembly, as disclosed, is positioned on the remainder of the trombone construction such that manipulation of the thumb lever mechanism requires the use of only the left thumb, the right hand being completely free to move the tuning slide 16 in the conventional manner. It is to be understood, however, that the assembly may be positioned such that the right thumb is utilized for manipulation, leaving the left hand free for moving the tuning slide.

When the operator presses his thumb against the bottom portion 58 of the thumb lever mechanism at the point and in the direction indicated by arrow 112, as seen in FIGS. 2 and 5, the link 64 is caused to rotate around the pivot pin 80 in the direction indicated by arrow 82, as stated above. This, in turn, causes the link 68 to move from a position indicated by solid lines in FIG. 8 to a position indicated by dotted lines, an arrow 114 being utilized to indicate this movement. Simultaneously therewith, the link 72 moves from a position directly under link 96, as seen in FIG. 8, to a position indicated by dotted lines, this movement being indicated by an arrow 116. As this latter link moves in the manner just indicated, it drives the valve-closing member 52*a* from the position shown in FIG. 3 to the position shown in FIGS. 4 and 5. It should be noted that the direction of movement of the valve closing member is arcuate rather than straight and therefore requires link 72 to move in a like manner as opposed to the straight line movement of link 68. Actually, link 72 not only moves in an arcuate manner, as indicated by arrow 116, but also pivots slightly, about a horizontal axis which is perpendicular to the longitudinal axis of link 72 and approximately in the middle thereof, the complex movement being provided for by ball bearings 70 and 74.

As the thumb lever mechanism 40 moves from the position shown in FIGS. 2 and 3, to the position shown in FIG. 5, as indicated by arrow 112, it simultaneously therewith pivots about pivot pin 88 in a clockwise direction, as viewed in FIG. 5. This latter pivoting movement allows the Delrin bushing to move from its solid line position, as indicated in FIG. 8, to its dotted line position without ever engaging the link 92. That is, as the thumb lever mechanism is forced to move in the manner indicated by arrow 112, the link 92, which as stated is connected to the upper valve assembly 22, slides through the bushing 110 without being affected in any manner. This in turn allows the lower valve assembly 20 to be operated without changing the position of the upper valve assembly.

If the operator wants to actuate both valve assemblies simultaneously, he merely rolls his thumb or raises it slightly to a point on the thumb lever mechanism such as indicated by arrow 118 and thereafter depresses the mechanism in the direction indicated thereby so that the mechanism moves from

the position shown in FIGS. 2 and 3 to the position shown in FIG. 4. The lower mechanical linkage assembly 62 is caused to move in the same manner as indicated above so as to operate on lower valve assembly 20. Therefore, this movement will not be described here, and reference is made to the above discussion thereof. However, the movement of upper mechanical linkage assembly 90 is quite different from that described above, and therefore will be discussed directly below.

It is firstly to be noted, that as the thumb lever mechanism 40 is moved in the direction indicated by arrow 118, it remains in a substantially vertical position at all times and does not pivot about the pin 88 as was the case above. This, of course, is due to the change in position of the thumb upon the thumb lever mechanism. Because the mechanism remains vertical, the Delrin bushing engages the free end of link 92 and forces it in the direction indicated by arrow 120 so that the link moves from a position indicated by solid lines in FIG. 7, to a position indicated by dotted lines. This, in turn, causes the entire link to pivot slightly about the pivot pin 102 through the link 104, as indicated by arrow 106. The link 96 is simultaneously therewith caused to move in substantially the same manner as that described with respect to link 72 of lower mechanical linkage assembly 62, so as to drive the valve-closing member 52 from the position indicated in FIG. 3 to the position indicated in FIG. 4. Upon release of thumb lever mechanism 40, the entire unitary valve-actuating assembly will automatically spring back to its biased position.

While a particular embodiment of the invention has been shown it should be understood, of course, that the invention is not limited thereto since many modifications may be made. It is therefore contemplated to cover by the present application any such modifications as fall within the true spirit and scope of the invention.

The invention is claimed as follows:

1. A musical wind instrument comprising: a first length of tubing including a mouthpiece on one end thereof for delivering air to said instrument; a second length of tubing for emitting sound from said instrument; a plurality of intermediate tubings connecting said first and second lengths of tubing for providing a plurality of airflow paths between said first and second lengths of tubing; upper valve means and lower valve means connecting said intermediate tubings for directing air along specific airflow paths depending upon the operative state of said valve means, a unitary actuator arm operatively connected to both of said valve means for operating said valve means and changing the course of said air through said intermediate tubings, a first mechanical linkage assembly connected to said unitary actuator arm and said lower valve means, said first assembly including means for operating said lower valve means when said unitary actuator arm is manipulated in either a first or second fashion, and a second mechanical linkage assembly connected to said unitary actuator arm and said upper valve means, said second assembly including means for operating said upper valve means simultaneously with the operation of said lower valve means when said unitary actuator arm is manipulated in said second fashion.

2. A musical wind instrument according to claim 1 wherein said unitary actuator arm is pivotably connected to said first mechanical linkage assembly for pivotable movement relative to said first assembly when said actuator arm is manipulated in said first fashion, said actuator arm remaining stationary relative to said first assembly when said actuator arm is manipulated in said second fashion, and wherein said unitary actuator arm is slidably connected to said second mechanical linkage assembly for slidable movement relative thereto when said actuator arm is manipulated in said first fashion and for fixedly engaging said second assembly when said actuator arm is manipulated in said second fashion.

3. A musical wind instrument comprising: first and second laterally spaced rotary valves; a unitary actuator arm operatively connected to both of said valves for operating said valves in a predetermined fashion, a first mechanical linkage assembly connected to said unitary actuator arm and said first rotary valve, said first assembly including means for operating said first valve when said unitary actuator arm is manipulated in either a first or second fashion, and a second mechanical linkage assembly connected to said unitary actuator arm and said second rotary valve, said second assembly arm including means for operating said second value simultaneously with the operation of said first valve when said unitary actuator arm is manipulated in said second fashion.

4. A musical wind instrument according to claim 3 wherein said unitary actuator arm is pivotably connected to said first mechanical linkage assembly for pivotable movement relative to said first assembly when said actuator arm is manipulated in said first fashion, said actuator arm remaining stationary relative to said first assembly when said actuator arm is manipulated in said second fashion, and wherein said unitary actuator arm is slidably connected to said second mechanical linkage assembly for slidable movement relative thereto when said actuator arm is manipulated in said first fashion and for fixedly engaging said second assembly when said actuator arm is manipulated in said second fashion.

5. A musical wind instrument comprising a first length of tubing including a mouthpiece on one end thereof for delivering air to said instrument, a second length of tubing for emitting sound from said instrument, a plurality of intermediate lengths of tubing connecting said first and second lengths of tubing for providing a plurality of airflow paths between said first and second lengths of tubing, first valve means and second valve means connecting said intermediate lengths of tubing with said first and second lengths of tubing for selectively directing air along specific airflow paths depending upon the operative state of said valve means, and a unitary actuator arm operatively connected to both of said valve means and operable in a first manner to operate a predetermined one of said valve means to the exclusion of the other, said actuator being operable in a different manner simultaneously to operate both of said valve means.

* * * * *