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[54] **TUNING SLIDE FOR BRASS MUSICAL INSTRUMENTS**

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[51] **Int. Cl.** **G10d 7/10**

[58] **Field of Search** 84/387–394, 84/396

[56] **References Cited**

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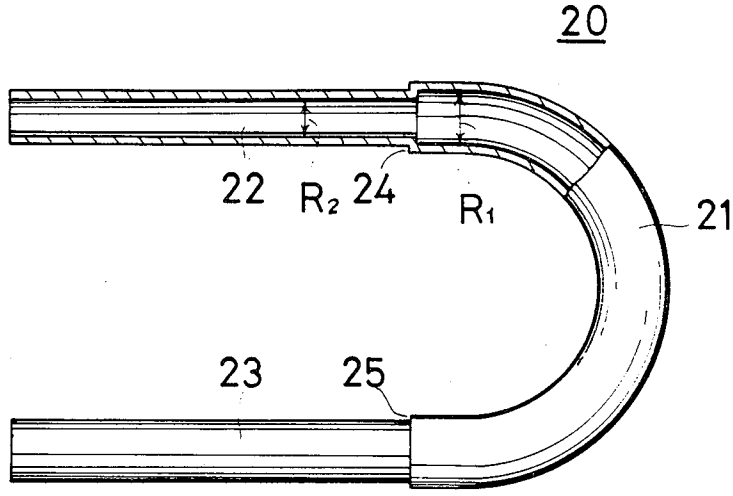
[57] **ABSTRACT**

In a tuning slide for brass musical instruments comprising a U-shaped hollow tube structure having a bight section and a pair of parallel straight sections each continuous to each end of the bight section to form a U-shaped wind passage therethrough, the bight and straight sections are made integral with each other as a one-piece member, and the inner diameter of the bight section is made greater than the inner diameter of the straight sections, whereby the mechanical strength at the connecting portion of the bight and straight sections is elevated, air leakage is completely prevented, and the tone passes easily and smoothly.

8 Claims, 5 Drawing Figures



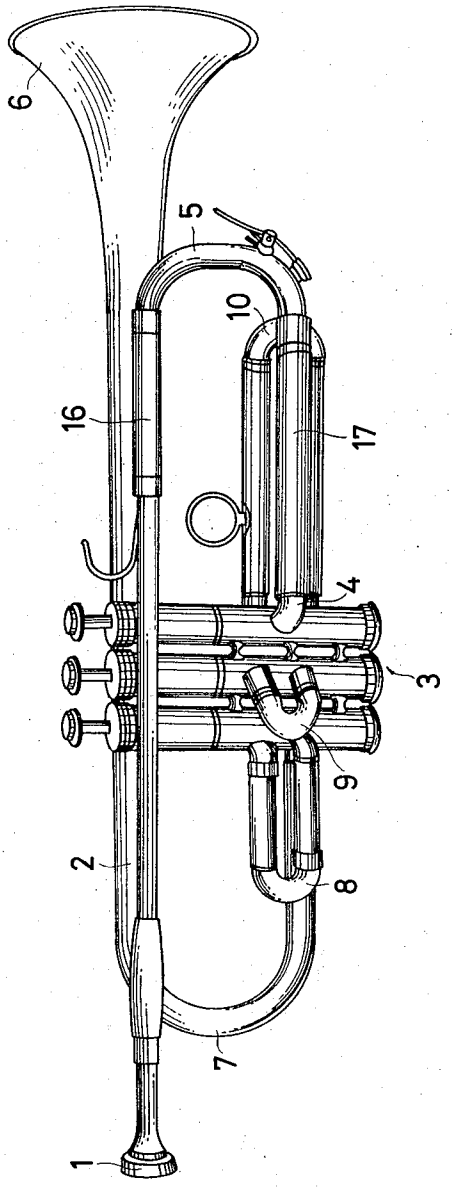


FIG.1 PRIOR ART

FIG. 2 PRIOR ART

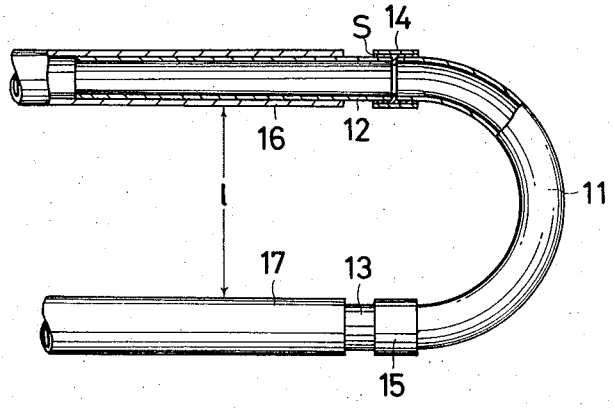


FIG. 3

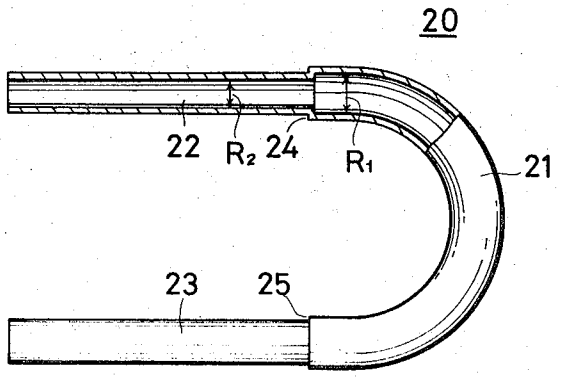
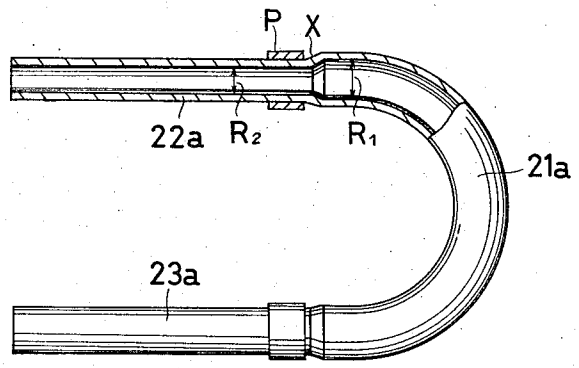


FIG. 4



TUNING SLIDE FOR BRASS MUSICAL INSTRUMENTS

BACKGROUND OF THE INVENTION

This invention relates to tuning slides for brass musical instruments such as trumpets and the manufacture of the same. More particularly, the invention relates to a tuning slide having a curved portion and a pair of parallel straight portions each integral with the respective end of the curved portion.

The pitch of brass musical instruments such as trumpets is subject to subtle changes depending upon the shape of the mouth of the player, the way of blowing, pressure on the mouthpiece and ambient conditions such as temperature and the moisture. Therefore, prior to each performance the instrument must be put into tune so that it can produce normal sound.

The tuning of the brass instruments such as trumpets and cornets is done by adjusting their effective length from the mouthpiece to the bell.

FIG. **1** shows an example of the prior art trumpet. In the Figure, numeral **2** designates a main tube provided with a mouthpiece **1** and coupled to a U-shaped main tuning slide **5,** which is in turn coupled to an inlet tube **4** of a valve assembly **3** having, for example, three valves whose outlet side is coupled to a belled tube **7** having a bell **6** at the outlet. U-shaped tuning slides **8, 9** and **10** are also coupled to the individual valves in the valve assembly **3.**

FIG. **2** shows one of the tuning slides **5** and **8** to **10.** As is shown, it has a U-shape consisting of a semi-circular or curved section **11** and straight sections **12** and **13** of the same inner diameter as that of the curved section **11** and abutting at one end on the respective end of the semi-circular section, the straight sections **12** and **13** being tied to the semi-circular section **11** with a ring joint fitted on each abutment portion and welded or soldered to the abutting members. In case of the main tuning slide **5,** for example, the tuning slide has one of its straight sections, namely section **12,** hermetically telescoped in an outer tube **16** coupled to the main tube **2** and its other straight section **13** hermetically telescoped in an outer tube **17** coupled to the inlet tube **4.** The straight sections **12** and **13** are slidable with respect to the associated outer tubes **16** and **17** for adjustment of the effective length of the instrument from the mouthpiece to the bell to permit the tuning according to the player's taste or in conformity to other musical instruments.

However, with this construction of the tuning slide with the straight sections **12** and **13** abutting end to end on the semi-circular section **11** joined thereto with joint rings **14** and **15** fitted on the abutment portions and secured to the abutting members by means of soldering, a gap is likely to result at the butt joint in manufacture. In such case, it is also likely that the solder S migrated into the gap would form irregularities in the inside air passage. Such irregularities act to disturb the air flow through the tube, thus making it difficult to obtain uniform tone quality and correct tone interval. The migration of the solder would also result from the formation of a gap between the joint ring and the inner member due to insufficient soldering. In another aspect, the soldering operation must be done by skilled workers since straight tube member and curved tube member are joined together. Further, the soldering operation is prone to the generation of thermal distortions.

Furthermore, with the tuning slide of the above contruction where the inner diameters of the straight section and curved section are substantially the same, the air flow is subject to a hitch in the curved section, tending to distort the air vibrations and make the pitch unstable. In addition, the difference of the resistance against air flow between the straight section and curved section is not desired from the standpoint of playing the instrument.

In still another aspect, since the straight sections **12** and **13** of the tuning slide are made slidable with respect to the respective outer tubes **16** and **17,** correct parallelism between the straight sections must be maintained in manufacture. However, this is very difficult because of the fact that the straight sections **12** and **13** are made to abut on the curved section **11,** giving rise to distortions if the abutting ends are not parallel. If the correct parallelism between the two straight sections is not effected, smooth movement of the tuning slide will not be obtained. Yet further, an imperfect joint would lead to leakage of air adversely affecting the stability and performance of the instrument. Therefore, in the assemblage of the prior art tuning slide very high precision is required, and nevertheless it has been very difficult to ensure uniform quality.

SUMMARY OF THE INVENTION

The primary object of this invention is to form a U-shaped tuning slide hollow tube structure having a pair of parallel straight sections and an intermediate bight section made continuous at both ends to, and integral as one piece with, the straight sections, thereby permitting uniform tone quality and correct tone interval to be obtained, preventing air leakage, eliminating the soldering step to simplify the manufacture, and improving the mechanical strength of the structure.

Another object of the invention is to form a U-shaped tuning slide hollow tube structure having a pair of parallel straight sections and an intermediate bight section integral as one piece with the straight sections, in which the inner diameter of the straight sections is made slightly less than that of the bight portion, thereby alleviating the hitch of air flow in the bight section to ensure steady propagation of air vibrations free from distortion and steady and satisfactory pitch.

A further object of the invention is to provide a method of manufacturing a tuning slide having a U-shaped integral, one piece hollow tube structure with the inner diameter of straight sections made slightly greater than that of an intermediate bight section, comprising loading a die with a thin tubular material, closing one end of the die and forcing pressurized oil or the like into the die from the other end thereof to cause expansion of the tubular material so as to form the tube structure.

A still another object of the invention is to ensure smooth sliding movement of the tuning slide by correctly maintaining the parallelism of the two straight sections of the tube structure formed in the aforementioned method.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side view showing a prior art trumpet.

FIG. **2** is a fragmentary side view, partly broken away and to an enlarged scale, showing part of a tuning slide in the same trumpet.

FIG. **3** is a view similar to FIG. **2** but showing an em-

bodiment of the tuning slide according to the invention.

FIGS. **4** and **5** are views similar to FIG. **3** but showing other embodiments of the tuning slide according to the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. **3** shows a partly broken-away side view of part of a tuning slide according to the invention. It has an integral, one-piece, thin-wall tube structure generally designated at **20** made from brass and having a wall thickness of about 0.5 millimeter, whereby a bore or wind way is defined throughout the tube structure **20.** This thin-wall tube structure is U-shaped, having a semi-circular bight or crook section **21** terminating at opposite ends in integral straight sections **22** and **23** parallel with each other. The bight and straight sections **21 – 23** are made of a continuous, one-piece member. The semi-circular bight section **21** has an inner diameter R_1 greater than the inner diameter R_2 of the straight section **22** or **23,** and shoulders **24** and **25** are formed at the opposite ends of the bight section **21** terminating in the straight sections **22** and **23.** For example, with a trumpet tuning slide, a satisfactory result is obtained by selecting the inner diameter R_1 in 11.6mm and the inner diameter R_2 in 11.3mm; however the difference between the inner diameter R_1 of the bight section and the inner diameter R_2 of the straight sections may be 1 millimeter or somewhat greater in other cases.

FIG. **4** shows another embodiment of the tuning slide according to the invention. In this embodiment, semi-circular bight or crook section **21***a* of the U-shaped thin-wall tube structure has taper end portions X terminating in respective straight sections **22***a* and **23***a* parallel with each other. The bight section **21***a* is of course made integral as one piece with the straight sections **22***a* and **23***a*. The bight section **21***a* has inner diameter R_1, which is gradually reduced along the inclined end portions to R_2 which is the inner diameter of the straight sections **22***a* and **23***a*. A stopper ring P is fitted on each of the straight portions **22***a* and **23***a* at the end thereof adjacent the taper portions.

FIG. **5** shows a further embodiment of the tuning slide tube according to the invention. In this embodiment, semi-circular bight or crook section **21***b* of the U-shaped thin-wall bored tube structure terminate at opposite ends in respective integral, one-piece stopper sections T, which in turn terminate in respective straight sections **22***b* and **23***b*. The bight section **21***b* has inner diameter R_1 greater than that R_2 of each of the straight sections **22***b* and **23***b*. Each stopper section T has an inner diameter R_3 slightly greater than the inner diameter R_1 of the bight section **21***a*, and its inner diameter is reduced along portions adjacent its opposite ends.

We claim:

1. A tuning slide for brass musical instruments comprising a U-shaped hollow tube structure having a bight section and a pair of parallel straight sections each continuous to each end of said bight sections, said bight section being made integral as one piece with each of said straight sections, and the inner diameter of said bight section being greater than the inner diameter of each of said straight sections.

2. The tuning slide according to claim **1,** wherein the inner diameter of said bight section is greater than the inner diameter of said straight sections by about 1 millimeter.

3. The tuning slide according to claim **1,** wherein an outer circumferential shoulder serving as stopper is formed at the juncture between each straight section and said bight section.

4. A tuning slide according to claim **1,** wherein each end of said bight section is continuous to each of said straight section in a taper form so that the inner diameter of each end of said bight section is gradually reduced toward each joining straight section.

5. The tuning slide according to claim **4,** which further comprises a stopper ring fitted on each said straight section at an end portion thereof terminating in the bight section.

6. A tuning slide according to claim **1,** further comprising stopper sections each disposed between said bight section and each of said straight sections, each of said stopper sections being made integral as one piece with said bight section and each of said straight sections so that a bore is continuously formed throghout said straight, stopper and bight sections.

7. The tuning slide according to claim **6,** wherein each said stopper section has its inner diameter reduced along its opposite end portions.

8. The tuning slide according to claim **6,** wherein the inner diameter of each said stopper section is greater than the inner diameter of said straight sections.

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