Oct. 25, 1960 H. S. HILLYARD 2,957,381

VALVE PAD

Filed Dec. 14, 1953

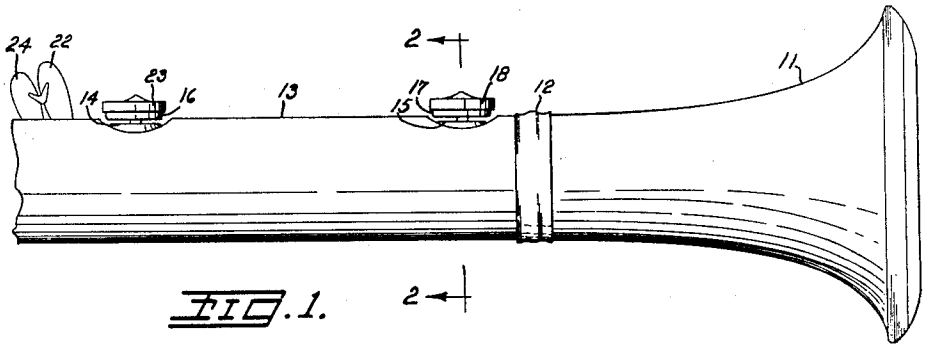


FIG. 1.

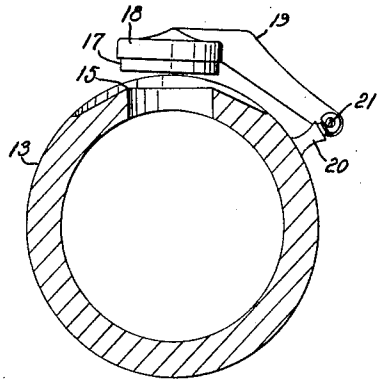


FIG. 2.

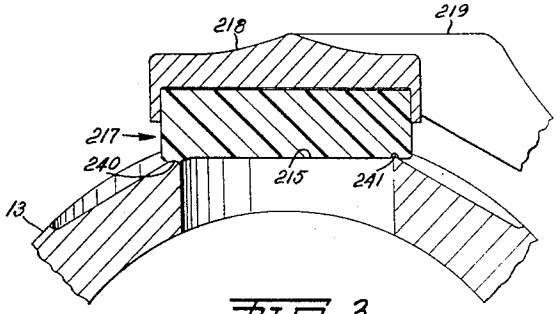


FIG. 3.

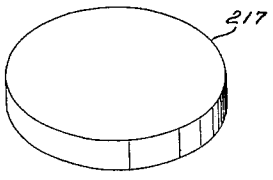


FIG. 4.

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VALVE PAD

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1 Claim. (Cl. 84—380)

This invention relates generally to pneumatic valves of the clapper type and more particularly to pads of the type carried by the valve clapper to seat on the valve seat for the purpose of shutting off the flow of air through the valve when the clapper is moved to its valve closed position.

Specifically this invention provides a valve pad for a musical wind instrument such as a clarinet, oboe, or flute, the valve pad being made of a material never before used for this purpose and which I have discovered to have unexpectedly advantageous properties for this use.

Throughout the history of this type of instrument as known to me, and I have been in the business of repairing and reconditioning these instruments for many years, the type of valve pad used has not changed. This traditional valve pad comprises a layer of card board backing on which is placed a layer of felt with the top and sides of the pad covered with a layer of fine gold-beaters skin. The valve clapper usually terminates over the valve seat in a cup like receptacle open towards the valve seat. The valve pad is glued into the receptacle with the skin cover of the pad facing the valve seat. When the valve arm or clapper is pressed to its closed position the skin cover of the pad backed by the somewhat resilient felt pad is pressed onto the relatively sharp circular valve seat where it is intended to seal against any leaking of air therethrough. Since the skin, the felt and the card-board are all more or less subject to change in physical dimensions and resilience with changes of humidity and temperature and also subject to deterioration varying with climatic conditions, age, and use, it is apparent that continuous and tedious attention must be given these pads if the instrument is to be kept in top playing order. Also it should be noted that the "feel" of an instrument to an experienced player will change with the condition of the valve pads and the quality of performance will be affected thereby.

Many materials have been tried in an effort to obtain a better wind instrument valve pad which will have and maintain the desired stiffness, resilience, "memory," resistance to change with atmospheric conditions, age, etc. I have myself made many investigations to find such a pad.

The pad of this invention discovered by me and here disclosed has ended a long series of unsuccessful attempts to make a successful pad from material seemingly indicated to have merit for this purpose.

It is then the principal object of this invention to provide for musical wind instruments a valve pad with the desirable qualities above described.

It is a second object to provide such a pad which is low in cost and easy to install.

It is a third object to provide such a pad of known materials produced by known processes and therefore sufficiently exactly reproducible for the required qualities from batch to batch to be indistinguishable by the user.

The above and other objects are accomplished by making the valve pad of this invention of a synthetic

plastic material such as one having about 100 parts polyvinyl chloride binder and a sufficient percentage of one of the common plasticizers compatible therewith such as about 250 parts of dioctyl phthalate together with about 50 parts of Kaolin clay and 3 parts of diabasic lead phosphite to give the resulting molding compound a hardness within the range of Durometer A numbers 8 to 18.

It should be understood that in practice this hardness is closely controllable by known methods in the production of the material and that for different instruments and for differently sized pads the pads can preferably be made of material of different hardness. It is however only necessary to request a material of a particular hardness from the manufacturer of the material to obtain it. Color of almost any desired specification can be provided by the manufacturer.

Having obtained the material from any of several well known manufacturers thereof the material can be softened with heat to be molded to the pad shape in any of several ways. The best way found is injection molding of the material at a temperature and with a time cycle and a pressure found to give the most uniform structure and the least scrap with the particular molding machine and die set use. This practice is common in the plastic molding art.

I have also found that the material can be cast in open molds by merely carefully heating the material to a pouring consistency and pouring in the molds. However pads molded in this way tend to be imperfect and to include air or gas bubbles although I have made many good pads this way.

The use of these pads is shown in the attached drawing in which

Fig. 1 is a fragmentary side view of a wood clarinet of well known make.

Fig. 2 is a view in partial section along the line 2—2 of Fig. 1.

Figure 3 is a fragmentary sectional view along the line 2—2 of Figure 1 with the valve pad of this invention.

Fig. 4 is a perspective view of the valve pad of this invention.

Like numerals refer to like parts in the several figures of the drawing.

Referring now to the drawings, in Figs. 1 and 2 are shown the outlet end or bell **11** of a wood clarinet joined at **12** to its main tube or stem **13** formed in the wall of which are two tone holes the walls of which terminate at their outer ends in valve seats **14** and **15** with which valve pads **16**, **17** respectively are adapted to cooperate to stop the holes in the well known manner when required by the music being played.

Valve pad **17** is cemented into the cup formed end **18** of clapper or lever **19** hinged at its other end on multiple hinge posts **20** by hinge rod **21** to the other end of which fingering lever **22** is secured. Levers **19** and **22** with rod **21** are spring biased towards the open valve position shown in Figs. 1 and 2 and the valve is closed by the finger movement of lever **22** when required. Similarly valve pad **16** is cemented into the cup formed end **23** of another lever similarly mounted and controlled by finger lever **24**. Posts **20** are secured on stem **13**.

Fig. 2 should be noted to understand that with the traditional pad which is not homogeneous and is of uniform resilience over its surface the installation of pad **17** into cup end **18** requires a skill only acquired after a considerable amount of experience, for at the instant of seating of pad **17** on valve seat **15** they must be almost exactly parallel. This required parallelism at the time of contact also requires that the angle at which the pad is seated in cup end **18** must compensate for any off

standard construction of lever **19** parts **20** and valve seat **15**, as well as for variations of angular positioning of posts **20** with respect to valve seat **15** and variations of thickness of pad **17**.

Again remembering that a minute leakage of air due to any imperfection of contact of pad and valve seat will mitigate against the production of good music quality and that these instruments have a possible long useful life which terminates when the valves do not close with the required completeness under the allowable small pressure, it will be understood that a damaged instrument using the traditional valve pads might have to be discarded if only the traditional pads were available for replacement but might be returned to full usefulness by the installation therein of the pads of this invention. In Fig. 3 is shown a fragmentary sectional view of a valve viewed as along line **2—2** of Fig. 1. As happens in use valve seat **215** is shown (exaggeratedly) to have a dent at **240** or a raised edge at **241** either of which could occur separately or both could occur at a single location on the valve seat due to rough or careless handling of the instrument. The pad **217** of this invention shown under similar use in Fig. 4 and in perspective in Fig. 4 is homogeneously resilient with a surface adapted to dent easily but to restore itself immediately denting pressure is removed. As shown at **240** and **241** the surface of pad **217** tends to mold itself in and around the valve seat imperfections and entirely exclude air from passing through the valve.

With the pads of this invention instruments which would be too expensive to rebuild for use with the traditional pad have been quickly restored at a low cost to full usefulness.

It is understood that other materials well known in the plastic arts such as synthetic rubber or acrylic esters or the cellulosics can be compounded to give the required physical properties of my valve pad and I intend to hold for my exclusive use the teaching of my invention here disclosed.

Having thus recited some of the objects of this invention, described and illustrated the characteristics and composition of a preferred form thereof and explained its use, I claim:

A musical wind instrument having valve pads formed of a synthetic thermoplastic homogeneous material comprising about 100 parts of a binder of polyvinyl chloride plasticized with about 250 parts of a compatible plasticizer such as dioctyl phthalate, and filled with about 50 parts of Kaolin clay to a hardness in the range of Shore Durometer A–2 numbers 8 to 30.

References Cited in the file of this patent

UNITED STATES PATENTS

1,786,833	Dytch	Dec. 30, 1930
1,816,578	Hammann	July 28, 1931
2,311,233	Jaenicke et al.	Feb. 16, 1943
2,490,247	Amberg	Dec. 6, 1949
2,514,427	Trimble	July 11, 1950
2,528,506	Foye	Nov. 7, 1950
2,577,899	Linton	Dec. 11, 1951

FOREIGN PATENTS

919,173	France	Nov. 18, 1946

OTHER REFERENCES

Zimmerman: "Rubber Age," vol. 68, No. 3, December 1950, "Compounding of Polyvinyl Chloride," pages 311 to 318.