March 28, 1944. W. H. AIKEN 2,345,443

APPARATUS FOR REMOVING DENTS

Filed April 21, 1943

Fig. 3.

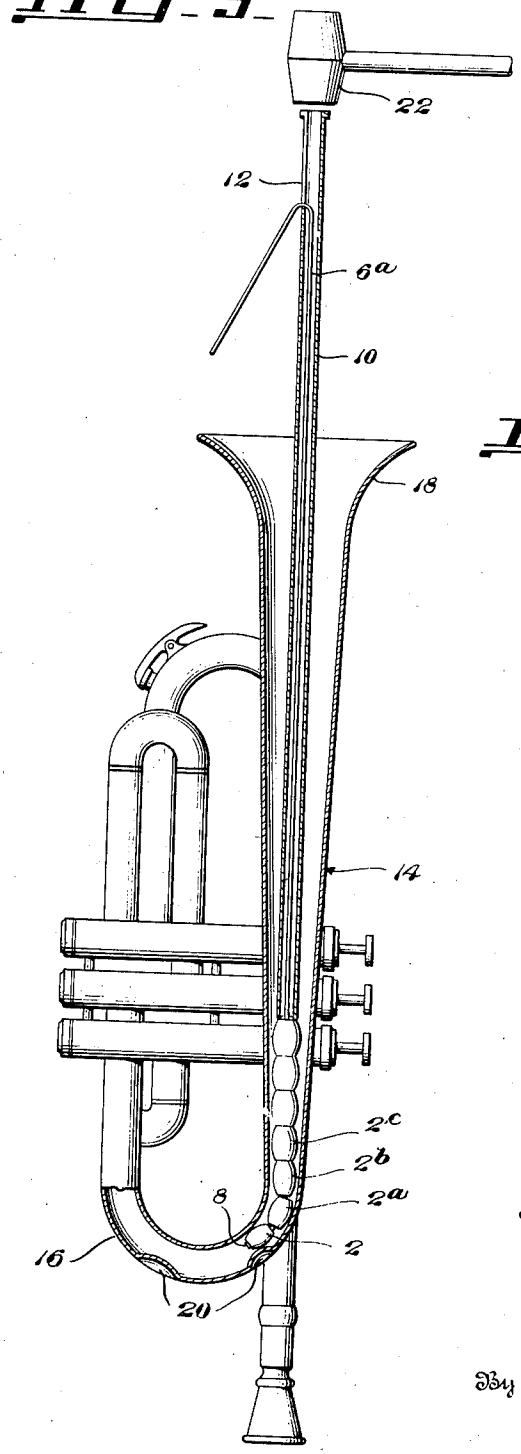


Fig. 2.

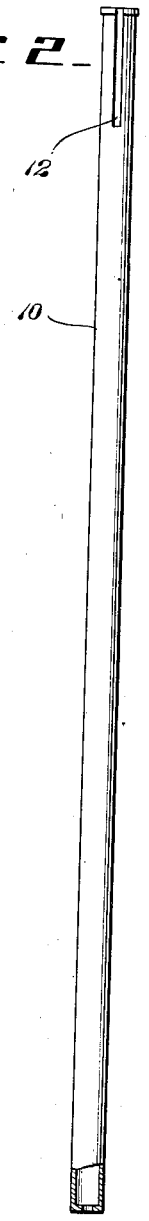
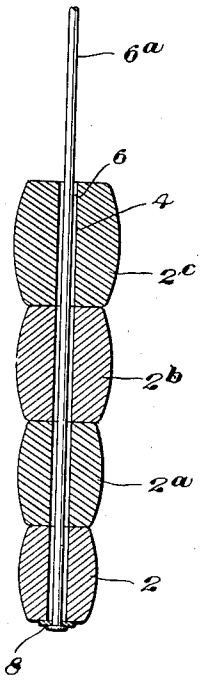


Fig. 1.



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APPARATUS FOR REMOVING DENTS

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2 Claims. (Cl. 153—36)

This invention relates broadly to an apparatus and method for removing dents from tubular workpieces and, more particularly, for removing dents and similar disfigurations from horns, trumpets, and the like musical instruments.

The primary object of this invention is to provide an apparatus and method for the quick removal of dents and the like by expanding the dented metal outwardly. The problem solved herein occurs particularly in horns or the like that have been dropped or otherwise struck so that the curved portion of a pipe becomes dented. Heretofore, the removal of dents in the curve of a horn pipe has been accomplished by forcing one or more individual expander elements, usually spherical or barrel-shaped, through the pipe. Since the individual expander elements had to be forced around a curve, the forcing thereof was usually accomplished by laboriously shaking a small weight against the expander element, and it was frequently necessary to remove the curved pipe from the remainder of the instrument in order to retrieve the expander and the weight after they had passed the dent. It is now intended to provide an expander comprising a flexible, continuous core which may be manipulated externally of the horn by insertion through the bell, and which may be driven around the curve in the pipe to remove dents, and retrieved without removing the dented pipe or otherwise dismantling the instrument.

Still another object is the provision of a flexible core comprising a series of expander elements strung along a flexible wire, or otherwise articulated together, the elements being graduated in size from the first, or smallest, one at the head of the core, gradually and progressively increasing in size. More specifically, it is proposed that the first element of the core be but slightly larger than the minimum internal dimension of the pipe at the dent, the second element being slightly larger than the first, and the largest element in the series being equal in size to the desired inner diameter of the tube at the dented portion. The graduation in size of the core elements accomplishes the triple function of removal of the dents without piercing, creasing, or cracking the pipe, of allowing work on pipes which themselves gradually increase in size towards the bell, and of simultaneously removing several dents of varying size by a single operation.

Yet again it is an object to provide, in combination with the core, a tubular tool for transmitting driving force to the core, the tool and the core forming an unitary assembly. In furtherance of this object, the articulating element, or wire upon which the expander elements are strung, is provided with an elongated end, or tail leading from the rearmost element, and a tube is provided through which the end is passed, the rear end of the tube being notched to accommodate the end of the wire so that, when the rear end of the tube is hammered to drive the core through the dented tube, the wire will not be damaged.

A further object is the provision of a flexible core graduated in size from front to rear, the length of which may be adjusted to any desired size for working on different types and sizes of instruments, the core being adjustable with respect to the minimum and maximum sizes of the expander elements, and the graduation, or rate of increase in size from front to rear being likewise adjustable.

Other objects are the provision of an inexpensive apparatus which may be used without damage to the work, the teaching of a proved method to replace prior techniques and thus change an operation formerly requiring hours to a matter of minutes, and to accomplish the above and other beneficial results which will be apparent from the following specification and drawing, in which:

Figure 1 is an elevation, partially in cross-section, showing the flexible core element;

Figure 2 is an elevation, partially broken away, of the driving element; and,

Figure 3 is an elevation of a trumpet, partially broken away, illustrating the assembly in operation.

Referring first to Figure 1, the flexible core element comprises a series of expander elements **2**, **2***a*, **2***b*, **2***c*, etc., each being formed of metal, wood, or other rigid material, and being generally barrel-shaped. Each of the elements is provided with a hollow axial bore as indicated at **4**, slidably to accommodate a flexible articulating element which, in the form shown, constitutes a wire **6** having a stop **8** at one end, whereby to retain the expander elements thereon in the manner of beads. Wire **6** has an elongated free end **6***a* for reasons described below.

It should be particularly noted that the expander elements gradually and progressively increase in size from the front, or smallest one **2**, rearwardly, the element **2***a* being slightly larger than **2**, and **2***b* being larger than **2***a*. In some instances, however, it may be found desirable to string two or more expander elements of the

same size together so as to make the overall taper more gradual.

The driving element is illustrated in Figure 2, and comprises an elongated metal tube member 10 having a notch 12 at the upper, or rear end.

Figure 3 illustrates the assembly in operation for repairing a trumpet 14, conventionally having a curved bell pipe 16 with a bell 18 at its end, and dents 20 in the curve of the bell pipe. For removing the dents, a pair of calipers are used for measuring the size of the tube at the deepest dent, allowance being made, of course, for the thickness of the metal. Thereafter, an expander element 2 having a maximum diameter slightly larger than the dented portion is selected and strung on wire 6 next to stop 8. If the dent be sharp, or irregular so that creasing or piercing of the metal be a hazard, the next expander 2a should be only slightly larger than the first, and the succeeding expanders are likewise selected.

When the expander elements have been selected and strung, driving element 10 is slid down over the free end 6a of wire 6 until the rearmost expander is engaged, after which wire end 6a is bent over and led out through groove 12. The core and driver unit is then inserted into tube 16 through bell 18, as shown in Figure 3, and manually forced inwardly until the first expander 2 engages the first dent 20. It is assumed for purposes of the present illustration that the first dent 20 is the deepest. When the assembly is thus engaged, the rear end of driving element 10 is tapped lightly by a hammer 22, and as the core is driven through, the dented portions gradually are worked out. Preferably, when the dents have been worked out and while the core is still in place, the exterior of the pipe is lightly tapped, the core now functioning as an anvil or dolly. Finally, the core and driver unit is pulled back out of the instrument.

It is to be understood that the expander elements may be given various forms, and that various flexible elements may be used for selectively articulating the expanders together. These and other mechanical equivalents may be substituted without departing from the scope of the following claims.

I claim:

1. An apparatus for removing dents from the curved portion of a pipe, comprising an elongated flexible wire having a stop at the front end thereof, a series of barrel-shaped expanders having axial bores extending therethrough slidably strung on the front portion of said wire, the expanders forming said series being progressively graduated in size, with the smallest thereof engaging said stop, and a rigid tubular driver engaged over the rear portion of the wire, with the front end thereof abutting the rear of said series of expanders, the rear end of driver having a slot for allowing the rear end portion of said wire to pass therethrough.

2. A device adapted to be driven through a curved pipe for removing a dent therefrom, comprising a flexible, tapered core formed of a series of smooth-sided, barrel-shaped elements having axial bores therein, articulating means comprising an elongated flexible wire adapted to pass through said bores, a stop on one end of said wire, the first working element adjacent said stop being but slightly larger in cross-section than the smallest transverse dimension of said pipe at the dented portion, the next working elements progressively but gradually increasing in size to a maximum cross-section no greater than the maximum transverse dimension of the pipe at the dented portion, said wire extending rearwardly in an elongated, tail-like manner from said series of elements, and a hollow pipe adapted to be passed over the rear end of said wire for driving said elements, said pipe having a slot in the rear end thereof to allow said wire to be bent therethrough.

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