Dec. 31, 1929. G. F. TAYLOR 1,741,256

STYLUS FOR SOUND REPRODUCING MACHINES

Filed Feb. 17, 1928

Fig. 1.

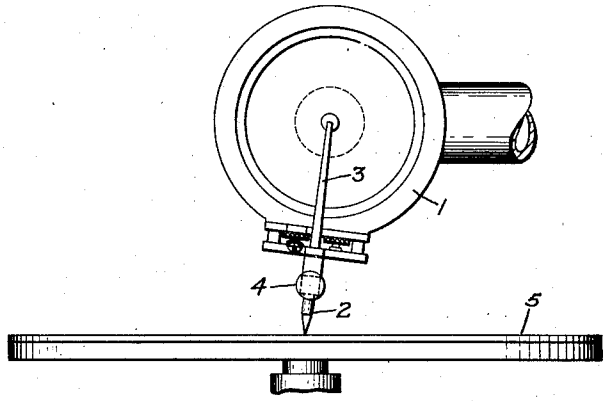


Fig. 2.

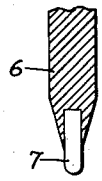
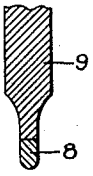


Fig. 3.

Fig. 4.



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UNITED STATES PATENT OFFICE

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STYLUS FOR SOUND-REPRODUCING MACHINES

Application filed February 17, 1928. Serial No. 255,145.

The present invention relates to styli or needles for sound reproducing devices. Heretofore such needles have generally been made from fiber, steel or tungsten. The use of fiber or steel for this purpose has been somewhat objectionable however, due to the fact that these materials wear away relatively quickly and thereby cause injury to the record which is being reproduced. Although the point of a tungsten needle will wear for a longer period of time than the point on a fiber or steel needle the tungsten needle has certain limitations. For example, tungsten needles when examined under the microscope are seen to be composed of fibers having sharp pointed ends which cut into and injure a record until the fibers become rounded by wear against it. When employed with a record the needle is inclined at an angle to it. After the tungsten point on the needle has worn away slightly, the steel shank will ride on the record and ultimately cause its destruction unless the needle is renewed.

According to the present invention I have provided a metallic needle which will play a very large number of records without showing any appreciable wear, the point of the needle having a hardness comparable with that of a diamond. The improved needle reproduces records with great fidelity and without causing any injury to them.

In carrying out the invention I employ a composition consisting largely of an element of the sixth group of Mendelejeff's periodic table, such as tungsten or molybdenum but containing carbon and an element of the iron group, such as cobalt, iron, nickel or a mixture of these latter elements. The cobalt or iron group content may vary from about 3 to 25 per cent of the total content of the composition, the carbon from about 3 to 10 per cent, while the tungsten constitutes the remainder of the composition. I have obtained particularly good results with needles consisting of about 13 per cent cobalt, about 5.2 per cent carbon and about 81.8 per cent tungsten.

The needles may be formed in various ways, for example, the materials employed may be mixed with a suitable binder and extruded in the form of a thin wire and then sintered, or the powdered materials may be simultaneously pressed and heated to form a compact mass. In the latter case the needle may be pressed to approximate size and then ground to shape or if desired a small piece of hot pressed material may be silver soldered to a steel or other suitable shank and the needle then ground to the desired shape.

When the needles are extruded I mix powdered tungsten, cobalt and carbon in the above proportions with an organic binder, for example ordinary flour, the amount of flour employed being equal to about 1½ to 2 per cent of the total mixture. The flour is moistened with water and a small amount of sodium hydroxide to provide an alkaline paste. The mixed materials are placed in an extruding machine and pressure applied thereto. The opening in the extruding machine is somewhat larger than the diameter of a needle in its final form in order to allow for shrinkage of the needle when later heated. The extruded material, which is in the form of a thin wire, is allowed to dry and becomes quite hard so that it may be handled easily and broken into desired lengths. The wire thus formed is embedded in alumina powder, placed in a graphite cylinder, and fired in a hydrogen furnace at a temperature of about 1400° C. At this temperature the wires or rods become sintered into hard steel-like forms. These forms are cut into desired lengths and ground so as to have sharp pointed ends. After the needle has been ground to approximately the desired shape, diamond dust may be advantageously employed in the final grinding step. When ground in this way, the needles will have a very smooth point when examined under the microscope.

Instead of mixing the powdered elements as above described tungsten carbide may be formed and then powdered and mixed with powdered cobalt and flour and sintered and pressed as before.

If desired the needle may be formed approximately to size by placing the powdered elements, tungsten, carbon and cobalt; or tungsten carbide and cobalt in a heat resistant mold, such as carbon, heating them to

the sintering temperature of the mixed powders and simultaneously applying pressure thereto as described in the copending applications of Samuel L. Hoyt, Ser. No. 181,536, and Emery G. Gilson, Ser. No. 187,328, filed April 6, 1927, and April 28, 1927, respectively and assigned to the assignee of the present application. When the needle is formed in this manner one of the electrodes employed in pressing the materials may be a refractory metal member such as tungsten which is pressed into the powdered mixture and firmly secured thereto to form a part of the needle. The needle may then be ground to the proper size.

It is not necessary however to form the pressed material to approximately the shape of the needle. The powdered materials may be formed in small pieces according to the processes outlined in the above applications and then silver soldered to a steel or other metal shank and ground to the desired form.

It has been my experience that the best needles are produced from the powdered materials which are hot pressed according to the method disclosed in the above Hoyt and Gilson patent application. Although the best needles have been formed from a composition consisting of tungsten, carbon and cobalt, satisfactory needles have also been obtained by employing a material consisting entirely of tungsten carbide.

In the drawing forming a part of the present application Fig. 1 represents the sound box of a sound reproducing device provided with my improved form in engagement with a sound record tablet, while Figs. 2, 3 and 4 are cross sections on an enlarged scale of a tungsten needle, my improved form of needle, and a modification of my improved form of needle respectively.

Referring more particularly to the drawing, I have indicated at 1 a sound box which may be of any desired type but which forms no part of the present invention. A stylus 2 constructed in accordance with my invention is secured to a transmission arm 3 by means of a set screw 4. The stylus engages a disc record or tablet 5 in which the sound record is in the form of an undulatory groove arranged spirally on the face of the tablet.

The well known form of tungsten needle comprises a steel shank 6 and a tungsten point 7 secured in a suitable manner to the shank, as indicated in Fig. 2. It will be seen that as the needle is inclined at an angle to the record any appreciable wear on the tungsten point will bring the steel portion of the shank into contact with the record.

The improved form of needle may consist entirely of a sintered mixture of tungsten, carbon and cobalt, as indicated in Fig. 3, or, if desired, only the record engaging tip of the needle may consist of the sintered material, as indicated in Fig. 4. In the latter case the point 8 is either silver soldered to a steel or other suitable metal shank 9 or secured thereto during the pressing and sintering operation as above described.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. A stylus for sound reproducing machines, said stylus having a record engaging tip consisting mainly of an element of the sixth group of Mendelejeff's periodic table but containing an appreciable amount of carbon and an element of the iron group.

2. A stylus for sound reproducing machines, said stylus having a record engaging tip consisting largely of tungsten but containing an appreciable amount of carbon and an element of the iron group.

3. A stylus for sound reproducing machines, said stylus having a record engaging tip consisting largely of tungsten but containing appreciable amounts of carbon and cobalt.

4. A stylus for sound reproducing machines, said stylus having a record engaging tip consisting largely of tungsten but containing carbon and from 3 to 25 per cent of cobalt.

5. A stylus for sound reproducing machines, said stylus having a record engaging tip consisting largely of tungsten but containing about 3 to 10 per cent carbon and from 3 to 25 per cent of cobalt.

6. A stylus for sound reproducing machines, said stylus having a record engaging tip consisting largely of tungsten but containing about 5 per cent carbon and an element of the iron group.

7. A stylus for sound reproducing machines, said stylus having a record engaging tip consisting of a sintered composition consisting largely of tungsten but containing an appreciable amount of carbon.

8. A stylus having a tip portion consisting largely of tungsten-carbide but containing an appreciable amount of cobalt.

9. A stylus having a tip portion consisting mainly of a carbide of an element of the sixth group of Mendelejeff's periodic table and an appreciable amount of metal of the iron group.

In witness whereof, I have hereunto set my hand this 16th day of February, 1928.

GEORGE F. TAYLOR.