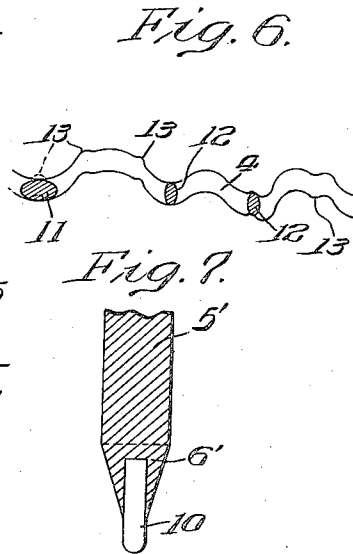
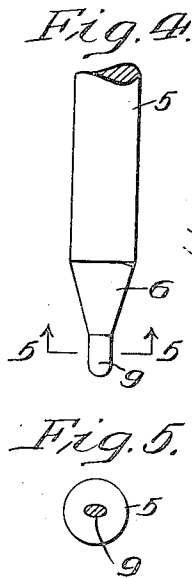
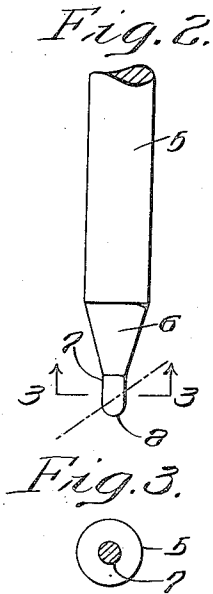
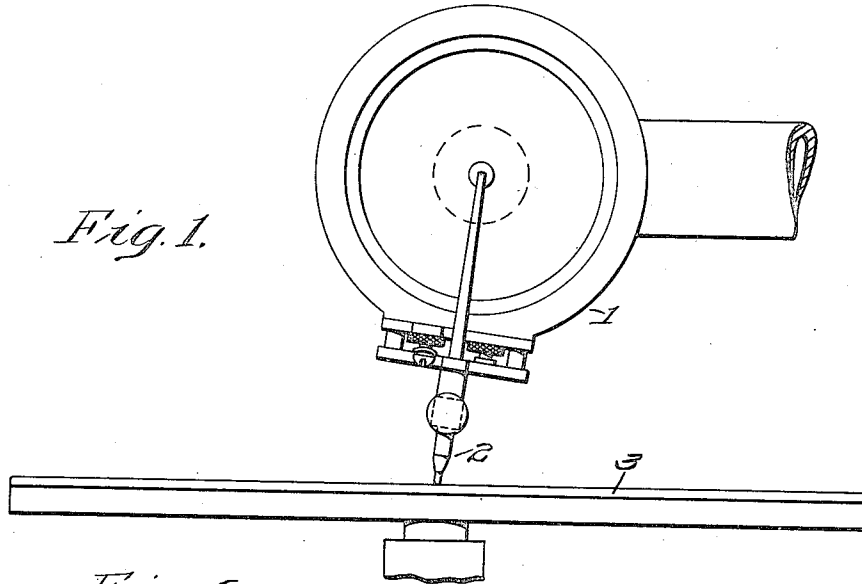


J. W. OWEN.
 STYLUS FOR SOUND REPRODUCING MACHINES.
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STYLUS FOR SOUND-REPRODUCING MACHINES.

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To all whom it may concern:

Be it known that I, JAMES W. OWEN, a citizen of the United States, residing in Lansdowne, county of Delaware, and State of Pennsylvania, have invented certain new and useful Improvements in Styli for Sound-Reproducing Machines, of which the following is a specification.

My invention relates to styli for sound reproducing machines and particularly to those styli or needles which are adapted to be used in talking machines to reproduce sound from commercial sound record tablets.

It is customary, in reproducing sound in a sound reproducing machine from sound record tablets with the use of an ordinary steel stylus or needle, to use the steel stylus but once, and when a steel stylus has once been employed in reproducing sound from a given tablet, it is usual to throw it away and to replace it with a new steel stylus to reproduce sound from the same or another tablet.

After a steel stylus has been used to reproduce sound from a sound record tablet, the tip or point of the stylus is always worn to an appreciable extent and a sharp edge is generally formed thereon which tends to cut or unduly wear away the walls of the groove of another tablet, especially when that groove of the second tablet is not exactly of the same shape and size in cross-section as that of the first tablet, and particularly if that worn stylus would be placed at any other angle or in any other position than that which it occupied during the reproduction of sound in the first sound record tablet.

The object of my invention is to obviate the necessity of changing the stylus for each reproduction of sound from a sound record tablet, and to provide a stylus which may be used to reproduce sound from a large number of different tablets without substantial injury to the tablets. I have discovered that when a sound reproducing stylus is composed of tungsten, that stylus may be used repeatedly in reproducing sound from different sound record tablets without the necessity of re-forming the

point of the stylus and without substantial injury to the walls of the sound groove.

Tungsten is considerably softer than steel, and, generally speaking, would be expected to exhibit a much greater wear during the reproduction of sound from a sound record tablet, due to the abrasive action of the material of the sound record tablet upon that portion of the stylus in engagement with the tablet, than would steel. I have discovered, however, that when a stylus is made of tungsten and is used in reproducing sound from a commercial sound record tablet, it exhibits peculiar and unexpected properties. Thus, during the first few revolutions of a sound record tablet, the groove of which is in engagement with a stylus made of tungsten, a new tungsten stylus wears more rapidly than does a steel needle of the same size and shape, but after that, the tungsten stylus wears much more slowly than such a steel stylus does. As a matter of fact, after the first few revolutions of the sound record tablet, and the first wear has appeared on the surface of the stylus, the stylus wears so slowly as to be substantially negligible. The amount of wear which a tungsten stylus exhibits during the reproduction of sound from commercial sound records may be more readily understood when it is stated that when a steel needle is run only two or three times across a record, the point of the steel stylus generally wears down sufficiently to form a shoulder and will injure the surface of the sound record groove to such an extent as will often render the reproduction of sound from the record very indistinct. A tungsten stylus, however, may be run over the same record 300 or 400 times before the reproduction begins to get indistinct.

After the tip of a tungsten stylus under the abrasive action of the material forming the sound record tablet has worn sufficiently to substantially fit the groove, the wear on the tip of a tungsten stylus is very slight. It would appear that after a certain amount of bearing surface between the end of the stylus and the walls of the sound record groove has once been obtained, the wear of the tungsten stylus is exceedingly slow.

In the drawings forming a part of this application and in which the same reference characters are employed to designate the same parts throughout the various views, 5 Figure 1 represents the sound box of a sound reproducing machine provided with a stylus of tungsten in engagement with a sound record tablet, the stylus being shown on an enlarged scale for the sake of clear- 10 ness; Fig. 2 is a greatly enlarged view of one form of my improved tungsten stylus; Fig. 3 is a cross-sectional view through the tip of the stylus shown in Fig. 2; Figs. 4 and 5 show a modified form of tungsten 15 stylus, in which the tip is elliptical in cross-section; Fig. 6 is a diagrammatic view indicating a sound record groove, on a greatly enlarged scale, and a cross-sectional view of the tips of the two forms of styli shown in 20 Figs. 2 and 4 in the plane of the surface of the sound record tablet, and Fig. 7 is a further modified form of stylus.

The sound box 1 may be of any improved shape provided with my improved stylus 2, 25 and the tablet 3 may be any standard commercial sound record tablet, preferably one in which the record of sound is in the form of an undulatory groove 4 of substantially even width and depth arranged 30 spirally in the face of a sound record tablet, the side walls of which groove are parallel and contain undulations corresponding to sound waves; but this invention is not to be construed as being limited for use only with 35 this type of record inasmuch as a stylus formed of tungsten or tungstenic material may also be used to cooperate during the reproduction of sound with records in which the undulations are in the bottom of the 40 groove; that is to say, with records commonly known as of the "hill and dale" type. The groove 4 of such a tablet is diagrammatically indicated in Fig. 6.

The form of stylus shown in Figs. 1, 2 and 45 3, appears to operate very satisfactorily, and consists of a cylindrical body portion 5 of substantially the size of an ordinary steel needle or stylus used in sound reproducing machines, a conical portion 6, and a tip 7 50 cylindrical in cross-section, and in diameter slightly less than the distance between the top edges of the walls of a sound record groove to avoid forming a shoulder on the sides of the tip between the worn and un- 55 worn portions. The end 8 of the tip is preferably given the shape of the transverse cross-section of a sound record groove.

The modification shown in Figs. 4 and 5 differs only from that shown in Figs. 1 to 60 3 in the shape of the tip. In this form or embodiment of my invention, the tip 9 is elliptical in cross-section, and in using this stylus, the longer axis of the ellipse is placed transverse to the longitudinal axis of the 65 groove 3. For the reasons above stated, the

longitudinal axis of said ellipse should be slightly less than the distance between the top edges of the walls of a sound record groove. This form of stylus may be set at a lesser angle to the plane of the face of the sound record tablet than possibly may the stylus shown in Figs. 1 to 3 without bridg- 70 ing over the finer vibrations in the walls of the sound record groove.

In Fig. 7 is shown a further modification 75 in which the record engaging tip 10 of tungsten and the said tungsten tip is rigidly secured in the end of the conical portion 6' of the body portion 5' of the stylus.

It will be apparent from the foregoing, 80 that the only portion of the stylus which is in engagement with the sound record groove is the tip. When this record engaging tip, after having been used in the reproduction of sound from a great many records finally 85 does wear down to the end of the conical portion 6 or 6', the stylus must either be re-pointed by grinding or by any other suitable process to form a new tip when the stylus is made of tungsten throughout, or 90 the record engaging end must be removed and replaced with a new tip of tungsten, as in the modification shown in Fig. 7. It must be borne in mind, however, that it takes a large number of reproductions from sound 95 records to wear the record engaging tip of the stylus forming the subject-matter of this application down to the conical end of the stylus body, and that after the tip or record engaging portion of the stylus has 100 once been shaped by the abrasive action of the material of the tablet so that it conforms to the cross-sectional shape of the groove, the stylus is not substantially abraded by the material of the tablet during the reproduc- 105 tion of sound from said tablet.

In using a stylus composed of tungsten, I deem it preferable to set the stylus so that its axis is as near normal to the surface of the tablet as possible. There may be some 110 difficulty experienced in trying to use a tungsten stylus set at precisely an angle of 90° to the plane of the face of the record tablet. The small dimensions of the tip of the stylus tend to make the whole stylus 115 chatter or vibrate longitudinally of the groove when set at an angle absolutely normal to the plane of the sound record tablet. Good results may, however, be obtained when the angle which the stylus makes with 120 the surface of the tablet is between 80 and 88° as is indicated in Fig. 1.

As has been above stated, a stylus of tungsten appears to very rapidly shape itself to conform to the walls of a sound record 125 groove and in doing so, there is at first considerably more wear on the needle than that which is produced upon a steel needle and consequently, the cross-sectional area of the portion of the stylus in actual engagement 130

with the walls of the sound record groove may be considerably greater than that of a steel stylus of the same size. If, therefore, the stylus were to be set at a considerable angle to the plane of the sound record tablet, as for instance, at an angle of 45° the surface on the end of the stylus in engagement with the walls of the sound record groove might be considerably elongated in the direction of the groove, as indicated by the numeral 11 in Fig. 6 of the drawings. Such an elongated bearing surface might tend to bridge those portions of the sound record 3 containing the finer or rapid vibrations or undulations 13 and cause the stylus to rise upwardly out of engagement with the very bottom of the groove at those points where the amplitude and frequency of the vibrations are great. To overcome this tendency, the tip of a stylus may be transversely elliptical in cross-section so that the bearing surface 12 of the stylus in actual contact with the side walls of the groove may be as short longitudinally of the groove as possible, thus permitting the stylus to freely and readily follow even the finest vibrations in the walls of the sound record groove.

The quality of the sound reproduced by the use of a stylus constructed and operated in the manner indicated and above described, is substantially the same as that attained by the use of a steel needle of the same size and proportions. If there is any substantial difference in the quality of the tone or sound produced by the use of the styli composed of tungsten and that composed of steel, that difference consists mainly in a production of less scratch or hiss during the reproduction of sound when the tungsten stylus is used than when steel is employed as a stylus.

A further characteristic or peculiarity which tungsten exhibits when used as a stylus for use in connection with the reproduction of sound from commercial records of sound and which I have discovered is, that instead of wearing the walls of the groove of the sound record tablet, tungsten appears to burnish the walls of the groove. The walls of the sound record groove do not appear to be substantially worn or injured by reason of the engagement of the tungsten stylus therewith during the reproduction of sound from the record, but rather appear to be smoothed and burnished.

Inasmuch as one of the chief characteristics of tungsten as a material for styli for use in connection with sound reproducing machines is that it rapidly wears until its tip conforms to the shape of the walls of the sound record groove and having attained that shape wears so slowly that it may be used a very great number of times in reproducing sounds from sound record tablets before the tip is worn away, my invention

contemplates and embraces any material which exhibits substantially the same properties as does tungsten under like or similar conditions, and any material which exhibits these properties or characteristics and which is suitable for a sound reproducing needle or stylus, is fully within the aim and scope of my invention.

It is well known that tungsten is a material which readily unites or forms alloys with various other metals and imparts to such alloys certain of the characteristics of tungsten. It is also well known that tungsten is closely allied to and is a member of the same chemical group as molybdenum and uranium. These metals and alloys including tungsten may, for the sake of brevity, be termed tungstenic or tungstic materials. The use of any of these metals, or the alloys thereof, is fully contemplated by me and is within the aim and scope of my invention in so far as such materials or alloys exhibit characteristics similar to those above pointed out with respect to tungsten in connection with the use thereof in styli for sound reproducing instruments. It may also be stated that a further and an important advantage which results from the use of a tungsten stylus over a steel needle during the reproduction of sound from a record, resides in the fact that with a tungsten stylus the quality of the reproduction of sound remains clear from the beginning to the end of the record groove. A steel needle, as ordinarily used in reproducing sound, may become so worn as to form on the tip of the stylus a flat surface of considerable extent longitudinally of the groove, during the reproduction of sound from a long record, and the long surface so formed is liable to bridge over and across the finer curves in the walls of the groove. A tungsten stylus, however, is not subject to such wear. A relatively short bearing surface on the tip of the tungsten stylus is maintained, and does not prevent the stylus from accurately following the said finer vibrations. The result is that with a tungsten stylus, the quality of the reproduction of sound obtained at the finish end of the sound record groove is substantially the same as that obtained at the beginning.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States is:

1. A stylus for sound reproducing machines composed of tungstenic material.
2. A stylus for sound reproducing machines having a record engaging tip composed of tungstenic material.
3. A stylus for sound reproducing machines having a record engaging tip composed of tungsten.
4. A stylus for sound reproducing machines composed of tungsten.

5 5. A stylus for sound reproducing machines having a tip substantially elliptical in transverse cross-section, having an end adapted to engage and cooperate with a sound record groove and composed of a tungstenic material.

6. A stylus for sound reproducing machines having a record engaging tip or end composed of tungsten, the greatest diameter

of said tip being slightly less than the distance between the top edges of the side walls of a sound record groove. 10

In witness whereof, I have hereunto set my hand this fourth day of June, 1913.

JAMES W. OWEN.

Witnesses:

FRANK B. MIDDLETON, Jr.,
CHARLES F. WILLARD.