T. A. EDISON.

PHONOGRAPH STYLUS.

APPLICATION FILED MAY 12, 1910.

1,041,983.

Patented Oct. 22, 1912.

Fig. 1

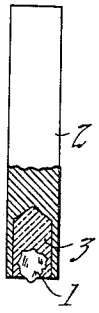


Fig. 2

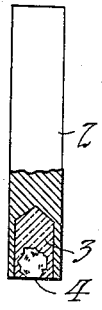


Fig. 3

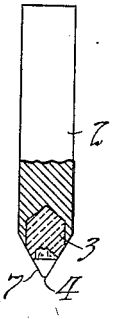


Fig. 4

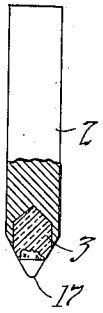


Fig. 5

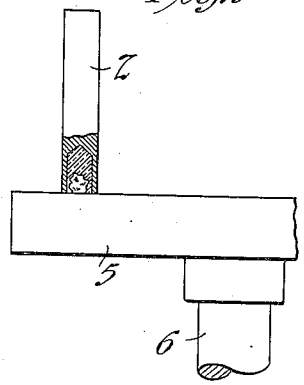


Fig. 6

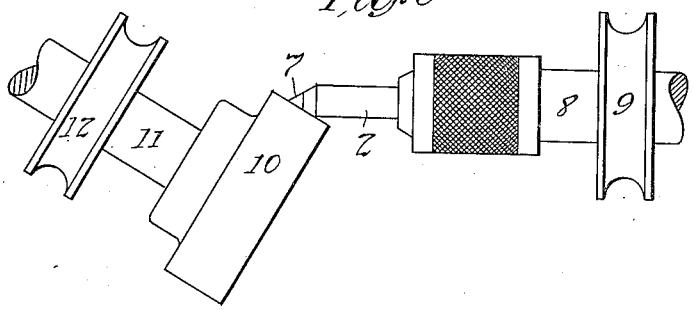


Fig. 7

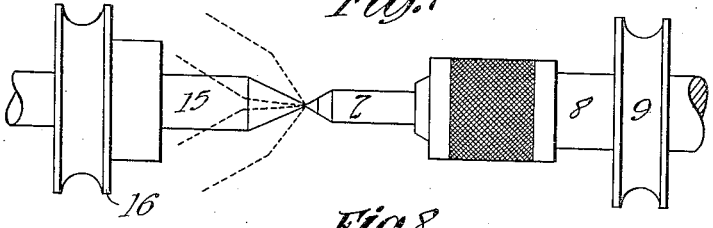


Fig. 8

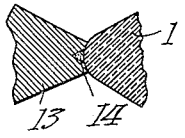
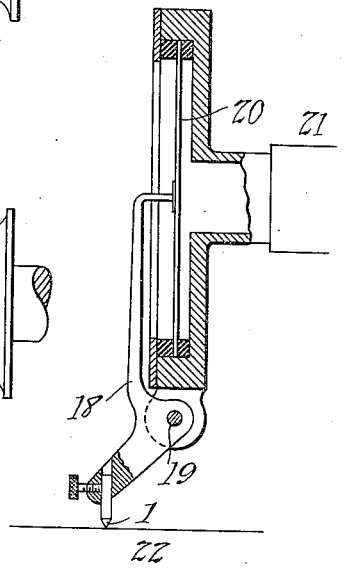


Fig. 9



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UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, WEST ORANGE, NEW JERSEY, ASSIGNOR TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PHONOGRAPH-STYLUS.

1,041,983. Specification of Letters Patent. Patented Oct. 22, 1912.

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To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, and a resident of Llewellyn Park, West Orange, Essex county, New Jersey, have invented a certain new and useful Phonograph-Stylus, of which the following is a description.

My invention relates to phonograph styluses.

My object is the provision of a reproducing stylus formed of boron, which stylus because of its hardness is capable of operating upon sound records formed from hard materials without wearing away or otherwise deteriorating.

Crystallized boron is a substance which I have discovered to be well suited for the manufacture of reproducing styluses, since it is of an exceeding hardness, being very much harder, in fact, than sapphire. I have found that an exceedingly hard record material, such as that disclosed in applications of Aylsworth Serial Nos. 496,060, Plastic composition and process of manufacturing the same, filed May 14, 1909; 543,238, Phenolic condensation product and method of preparing same, filed February 11, 1910, and 543,236, Sound records and process for making the same, filed February 11, 1910, wears away the usual sapphire stylus to a considerable extent. Such a record material, or one of equivalent or great hardness, harder, for example, than celluloid, is of the utmost value for the production of a molded phonograph record, since with a record formed of such material, a reproducer of considerable weight or provided with a heavy floating weight may be used with a consequent considerable improvement in the volume and quality of reproduction, if a stylus of sufficient hardness to withstand the wear caused by the hardness of the record is used therewith. A sapphire stylus is not appreciably worn when used in reproducing from such phonograph records, as are now on the market, of which those formed from celluloid are probably the hardest. When, however, the record material is substantially harder than celluloid, a sapphire stylus quickly wears out, and accordingly, I have constructed a stylus of crystallized boron which is adapted to coact with such a record and to withstand the consequent wear.

Boron is now formed in small crystals in the electric furnace, which crystals I propose to utilize in the manufacture of styluses in a manner to be described. In addition to its excessive hardness, boron has the advantages that it can be polished easier than diamond, and is not so fragile as the latter.

Reference is hereby made to the accompanying drawings forming part of this specification and in which—

Figures 1 to 4 inclusive represent side elevations, partly in section, of a holder of brass or other relatively soft material in the end of which a boron crystal is secured, Fig. 1 showing the rough crystal thus secured, Fig. 2 showing the crystal and holder after the lower end thereof has been lapped to a plane surface, Fig. 3 representing the crystal and holder ground or lapped to a taper, and Fig. 4 showing the same with the blunt end of the taper rounded. Fig. 5 represents diagrammatically in side elevation the process of lapping the flat end upon the crystal and holder. Fig. 6 similarly represents the process of lapping the crystal and holder to a cone shape, and Fig. 7 similarly represents in plan view the process of rounding the end of the crystal. Fig. 8 is an enlarged sectional detail view showing the method of grinding the rounded surface upon the end of the boron stylus. Fig. 9 is a partial cross section through a reproducer provided with my improved boron stylus traveling in the record groove of a suitable sound record formed of hard material such as described above.

It will be understood that the process by which my improved stylus is formed may be carried out by various apparatus, and is not limited to the particular mechanism described.

Referring to the drawings, my improved stylus is formed from a crystal of boron such as indicated at 1. A small boron crystal of irregular shape is secured within a holder 2 of brass or other relatively soft material by any suitable means as cement 3. The rough lower edge of crystal 1 is then lapped to a flat surface indicated at 4 in Fig. 2. This operation is indicated diagrammatically in Fig. 5 in which the lap wheel 5 which rotates about the spindle 6 may be used for producing the plane sur-

face 4 upon crystal 1. The next operation is grinding the sides of the crystal to a taper, resulting in the production of a conical surface 7 upon the lower end of the crystal 1 as indicated in Fig. 3. This operation is indicated diagrammatically in Fig. 6 in which the holder 2 in which the crystal 1 is secured is chucked in a lathe in which the spindle 8 is rotated by means of a belt passing over wheel 9 or by other power connection. While the crystal 1 is being rotated, it, together with the adjacent end of the brass holder in which it is mounted, is ground at a suitable angle, preferably of approximately 30 degrees by means of the lap wheel 10 which is charged with diamond dust and mounted upon shaft 11 which may be adjusted at any suitable angle and rotated by any suitable means indicated diagrammatically by the belt wheel 12. If desired, the two steps of the process so far described may be transposed, and the sides of the crystal adjacent to the end first ground to a taper and the rough end surface remaining then flattened. After the end portion of the crystal has been reduced sufficiently so that the blunt point of flat surface 4 is of sufficiently small area, the latter is rounded and polished by any suitable means, such as the ball polishing machine shown diagrammatically in Fig. 7. As here shown, the crystal 1 secured in a holder 2 is chucked in a lathe having a rotating spindle 8 rotated from belt wheel 9. The end surface 4 of crystal 1 is rounded and polished by means of the grinding tool 13 which is provided with a concave surface of the shape and size to which it is desired to round the end of the stylus. The grinding surface of the tool 13 may be charged with diamond dust mixed with oil, as indicated in Fig. 8 at 14. Either the stylus or the tool grinding the same should partake of an oscillatory movement during the rotation of the stylus.

In the drawings I have illustrated the grinding tool 13 as suitably mounted in a spindle 15 which is revolved by means of belt wheel 16, the spindle and belt being mounted in a holder which is pivoted directly beneath the end of the stylus being rounded, so that during the grinding operation the spindle 15 may oscillate about the surface being ground, as indicated by the position of the spindle 15 shown in dotted lines in Fig. 7. The end of the stylus when rounded is shown in Fig. 4 at 17, the said figure illustrating the completed stylus which is still secured within holder 2. The curve 17 should be of the proper dimensions to travel within the exceedingly minute sound record groove, the conical surface 7 of the boron crystal preferably running smoothly into the curve 17 of the record engaging surface of the stylus. The stylus thus formed may now be removed from holder 2 and suitably secured in a stylus lever or otherwise mounted to reproduce from a sound record.

In Fig. 9 I have illustrated a stylus 1 connected by lever 18 pivoted at 19 to diaphragm 20 of reproducer 21. The boron stylus may be secured directly in the stylus lever or it may be mounted within a suitable holder which is secured in the end of the stylus lever as shown. The reproducer 21 illustrated is preferably of considerable weight as, for example, from 3 to 5 ounces or more, which weight holds stylus 1 firmly in engagement with the record groove of record 22 which is preferably formed of the hard record material above referred to.

Having now described my invention, what I claim and desire to protect by Letters Patent is as follows:

1. As a new article of manufacture, a stylus for talking machines formed of crystallized boron, substantially as described.

2. As a new article of manufacture, a stylus for talking machines formed of a substance containing crystallized boron, substantially as described.

3. As a new article of manufacture, a boron stylus having a conical end with rounded point adapted to travel in the groove of a sound record, substantially as described.

4. As a new article of manufacture, a boron stylus having irregular contour and a lapped tapered end with rounded point adapted to travel in the groove of a sound record, substantially as described.

5. As an article of manufacture, a boron stylus having irregular contour and a tapered end with a rounded point adapted to travel in the groove of a sound record, substantially as described.

This specification signed and witnessed this 2d day of May 1910.

THOS. A. EDISON.

Witnesses:
FRANK L. DYER,
DYER SMITH.