June 19, 1951 W. H. HUTTER 2,557,350

PHONOGRAPH NEEDLE

Filed Sept. 13, 1946

Fig. 1

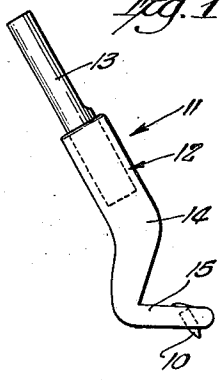


Fig. 2

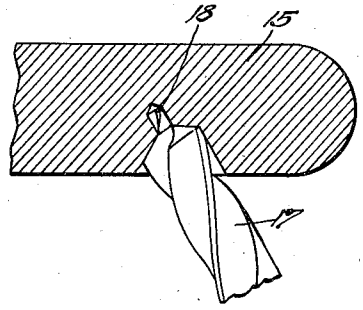


Fig. 3

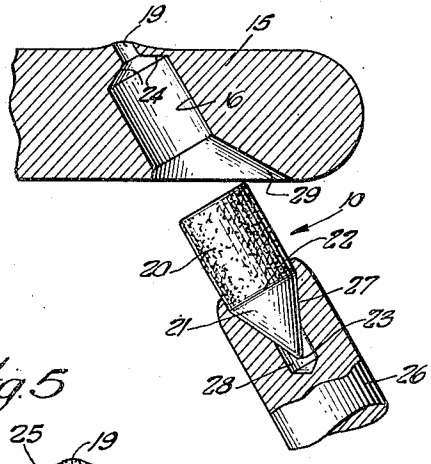


Fig. 4

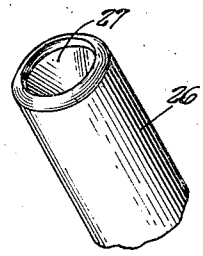
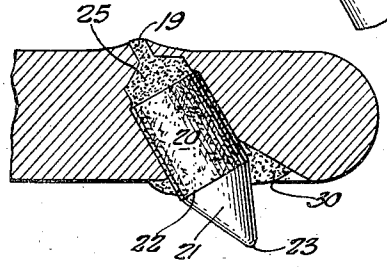


Fig. 5



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PHONOGRAPH NEEDLE

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2 Claims. (Cl. 274—38)

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This invention relates to phonograph needles, and in particular, to a construction for mounting a record engaging point, such as a sapphire stylus, in a plastic phonograph needle, or in a phonograph needle which includes a plastic member.

I have found that greatly improved acoustic properties are obtained by forming a phonograph needle, either in whole or in part, from a plastic material, such as nylon. However, in order to obtain the desired long needle life, it is necessary to provide a record engaging point which is formed from a suitable hard, long wearing material, such as sapphire or other jewels, or steel tipped with tungsten or osmium, or with alloys thereof.

In so mounting a record engaging point, the point must be securely associated with the plastic so that there is no play between the two elements, in order that the vibratory motion of the point will be transmitted to the crystal or other electromechanical conversion device with fidelity. Furthermore, since the weight of the tone arm is carried directly on the point, which may project from the lower surface of the plastic portion of the needle, by only .030 inch, more or less, it is essential that the point be so mounted that it will not be moved upwardly with respect to said plastic portion.

It is an object of this invention to provide a construction in which the longitudinal position of a record engaging point with respect to a plastic portion of a phonograph needle, is positively determined.

A further object is to provide an improved mounting for a record engaging point so that it will not become loosened during its useful life.

A still further object is to provide an improved method for mounting a record engaging point in a body of plastic material, and in particular, when a sapphire point, or a point of like brittle material is used, to provide a method for inserting the point which will not tend to crack or chip the same.

A still further object is to provide an improved method whereby the above mentioned parts may be fitted one into the other, by a press fit.

With reference now to the drawings, in which like reference numerals indicate like parts—

Fig. 1 is a view of a plastic needle having a metallic shank portion for engagement by the usual chuck of the pick-up, and also having a sapphire record engaging point;

Fig. 2 is an enlarged sectional view of the end portion of the plastic needle before the point is

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inserted, and illustrating the manner in which the bore is drilled;

Fig. 3 is a view similar to Fig. 2, but showing the completed bore, including the chamfer, and also showing the point being brought into position;

Fig. 4 is a detail view of the point holding tool; and

Fig. 5 is a view similar to Figs. 2 and 3, but showing the point in its final position.

In the practice of my invention, a sapphire point 10 is inserted into a nylon needle 11, of the type shown in Fig. 1. The nylon needle comprises a shank portion 12 having a metal insert 13, an intermediate portion 14 which is disposed at an angle to the shank portion, and a substantially horizontally disposed portion 15 into the end of which the point 10 is inserted.

A bore 16 is formed in the end of the horizontally disposed portion 15, by a drill 17 of .025 inch in diameter. Due to the resiliency of the nylon, the diameter of the bore will shrink three or four thousandths of an inch after the drill is withdrawn.

The drill 17 used is of the type having a lead 18, and the drill is inserted only to such an extent that the lead just breaks the upper surface of the horizontally disposed portion. Thus, a small vent 19 is provided which is surrounded by downwardly facing shoulders 24. It will be observed that the axis of the bore preferably intersects the lower surface of the substantially horizontally disposed portion at an angle, in this instance approximately 60°.

After the drill is withdrawn, the lower end of the bore may be chamfered as indicated by reference numeral 29, thus facilitating the insertion of the point.

The point 10 for purposes of description, may be divided into three portions. The major portion 20 of the sapphire point is cylindrical in shape and of a diameter of substantially .025 inch. The length of this cylindrical portion is somewhat less than the length of the bore. The second portion 21 is of conical shape, the included angle of the cone being substantially 45 to 50 degrees. The intersection of the conical surface with the cylindrical surface is indicated by a line bearing reference numeral 22. The third portion 23 of the sapphire point comprises the apex of the cone. Instead of going out to an absolute point, the end of the cone is somewhat rounded, the rounded portion having a radius from .0025 to .0030 inch.

Before inserting the sapphire point, a small

amount of lubricating cement 25 is placed in the hole. Due to the small dimensions of the hole, the cement is necessarily more or less smeared over the under surface of the nylon so that the surface of the chamfered portion, and the lower portion of the walls of the bore are well coated. A cement I have found to be very satisfactory is identified by the trade name and designation "Durez 12041, No. 7442." It is understood that this cement is a combination of phenolformaldehyde synthetic resin, together with a comparatively rapid accelerator. The characteristics of the cement are that it serves as a lubricant to facilitate the insertion of the sapphire into the bore and it sets in five or six hours at 70 degrees F.

Although the sapphire is of the same diameter as the drill which made the bore, due to the above mentioned shrinkage, the bore itself is a few thousandths of an inch smaller than the sapphire. Therefore, the sapphire must be inserted with a considerable force. For this purpose I provide a tool 26, shown in Figs. 3 and 4, which is apertured so as to provide a conically shaped opening 27, which corresponds in shape to the conically shaped intermediate portion 21 of the point. The lower portion of opening 27, however, is extended by a bore 28, so that when the sapphire is inserted into the tool 26, no part of the tool will contact portion 23 of the sapphire. When the sapphire is held in the tool as shown in Fig. 3, the blunt end of the sapphire may be pushed into the bore, this operation requiring a pressure of approximately 55 pounds. Thus, by the use of this tool, it will be seen that none of the pressure is placed on the rounded point portion 23 of the sapphire, and hence cracking or chipping of that portion of the sapphire which engages the record groove is avoided. I have also found that no cracking or chipping of the intermediate portion results when the sapphire is inserted in this manner. The blunt end of the sapphire, as it is being forced into the hole, acts as a plunger and forces the cement 25 upwardly in the bore. Sufficient cement is provided to completely fill the bore when the parts are in the final position (Fig. 5), and any excess cement is forced out through the vent 19, and may be wiped off. After the cement sets, it will be seen that the bore is completely filled, and the longitudinal position of the needle in the bore is determined by the plug of cement which bears against the blunt end of the sapphire and which in turn is confined by the downwardly facing shoulders.

In addition to this positive determination of the position of the sapphire, the coating of cement along the walls of the bore assists in maintaining the needle in proper position. Furthermore, the accumulation 30 of cement between the chamfer 29 and the sapphire 10 is of assistance in this connection.

In wiping off any excess of cement from the lower portion of the needle, there will be a substantial accumulation of cement not only between the chamfer and the needle, but also surrounding the intermediate conical portion of the sapphire. This accumulation serves as a positive means of preventing the sapphire from dropping out of the bore.

The characteristics of a ground sapphire of this type are such that the cylindrical surface is somewhat roughened, and this permits the cement which lines the wall of the bore to obtain a secure grip on the sapphire.

The practice of my invention is not limited to

needles of any particular type. For instance, it is often desired to mount a sapphire or metallic point at the end of a flexible metallic member which forms a part of a needle. In such a case, a small piece of plastic material, such as nylon, may be secured to the flexible metallic member, as by moulding the plastic around the metallic member, and the point inserted into the plastic material as described herein.

I have found nylon and plastic materials having characteristics similar to nylon, to be particularly advantageous in the practice of my invention for the reason that they will retain their elasticity, and hence their grip on the point, practically indefinitely; whereas, certain other plastics tend to lose their grip after a certain length of time, due to cold flow.

If desired, the chamfering operation may be combined with the drilling operation by the provision of a drill having a chamfering tool integrally formed with the drill portion. Also, instead of providing a lead portion 18, a somewhat sharper point can be provided on the drill, and the drill withdrawn just as the point breaks the upper surface of the plastic, thus providing the vent.

Although only a preferred embodiment of my invention is shown and described herein, it is understood that various modifications and changes may be made therein without departing from the spirit of my invention.

I claim:

1. A phonograph needle including a substantially horizontally disposed portion of resilient organic plastic material, a bore in the under surface of said plastic portion, said bore being provided with a downwardly facing shoulder and having a substantially centrally located vent which communicates with the upper surface thereof, said bore being provided with a chamfer at the point where it intersects said lower surface, a record engaging point comprising a cylindrical member disposed within said bore and having a conical portion projecting from said lower surface for engaging a record groove, and a plug of cement confined between the upper end of said cylindrical member and said downward facing shoulder to determine the longitudinal position of said record engaging point with respect to said bore, the diameter of said bore being normally smaller than the diameter of said cylindrical portion whereby said plastic portion is expanded when said point is forced through said bore.

2. The method of inserting into a plastic portion of a phonograph needle, a record engaging point having three portions, a rounded tip portion adapted to engage a record groove, a conical portion merging with said rounded tip portion, and a cylindrical portion of the same diameter as the base of said conical portion comprising the steps of forming a bore in said plastic portion, said bore having a diameter less than the diameter of said cylindrical portion, forming a vent of smaller diameter than said bore between the end of said bore and the surface of said plastic portion opposite to that surface in which said bore is formed, providing a chamfer where said bore intersects the surface of said plastic body portion, inserting the blunt end of said cylindrical member into said chamfer, placing an amount of a lubricating cement in said bore sufficient to fill at least the lower portion of said bore, applying pressure in an axial direction to the surface of said conical portion whereby said record engaging point is forced, blunt end first, into said bore without the

application of pressure to said rounded tip portion and excess cement is forced out through said vent, and allowing said cement to set, whereby the space between the blunt end of said point and the end of said bore is completely filled by hardened cement.

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