

## PATENT SPECIFICATION



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### COMPLETE SPECIFICATION

#### Improved Tone Arm for Gramophones

We, **FABBRICA ITALIANA MAGNETI MARELLI**, an Italian Corporate Body, of 22, Corso Venezia, Milan, Italy, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

It is known that in tone arms for gramophones it is advantageous for the angle between the radius, of the disc bearing the sound recording, which extends through the point of contact between the reproducing needle and the said disc, and the orthogonal projection of the axis of the needle on to the disc to be as near as possible to 90°, and that during the playing of the disc recording the said angle should undergo a minimum variation during the travel of the needle from the outermost part of the groove to the innermost part of the groove of the recording on the disc.

Since, for practical reasons, the tone arm must be pivoted at a point near the disc for the movement which it carries out across the disc recording during the reproduction, the said angle undergoes a variation during the displacement of the arm, and tone arms have been proposed, in order to reduce this disadvantage to a minimum, in which the orthogonal projection of the axis of the needle on to the disc is considerably inclined with respect to the plane extending through the vertical axis about which the tone arm turns during the playing of the recording, and through the point at which the needle makes contact with the disc.

Under these conditions, the tone arm is asymmetrical and it is subjected, under the action of the oscillations of the needle, to uncompensated vibrations which comprise higher harmonics giving rise to noises in the sound reproduction.

Tone arms that are symmetrical with respect to the plane, perpendicular to the disc, which contains the axis of the needle, are known, but the pivoting of the arm for the deviation which it must make above the disc takes place around a vertical axis which is incident to, i.e. intersects, the longitudinal axis of the

arm. Such an arrangement does not permit the realisation of the necessary conditions for reducing to a minimum, during operation, the variation of the angle between the orthogonal projection of the axis of the needle on the disc and the radius of the disc which passes through the point of contact of the needle.

According to the present invention, the tone arm proper has a symmetrical form (as hereinbefore defined) and is mounted for movement about a horizontal axis which is separate from the longitudinal axis of the support on which the tone arm is so mounted that its longitudinal axis does not intersect the pivotal axis of said support.

The tone arm assemblage according to the invention has the further advantage that it takes up very little space.

A tone arm assemblage according to the invention is shown by way of example in the accompanying drawing, in which:

Figure 1 is a plan view,

Figure 2 is a partial section on the line 2—2 of Figure 1, and

Figure 3 is a section on the line 3—3 of Figure 1.

In the constructional form shown, the tone arm assemblage comprises a horizontal supporting arm 1 rotatably mounted by means of a pivot 2 rigidly connected thereto and by a bearing 3 which is secured to the motor board 4 near the periphery of the turntable, which is indicated at 5 and turns about its centre 0.

A vertical column 6 is secured to the extremity of the supporting arm 1, there being connected to the said column a stirrup 7 which carries a horizontal pivot 8, the axis of which is substantially parallel to, i.e. lies in the same general direction as, the arm 1. The tone arm proper 9 is rotatably mounted on the pivot 8 with its longitudinal axis perpendicular to the axis of the pivot 8. The said tone arm proper 9 is completely symmetrical with respect to the plane perpendicular to the disc which extends through the said longitudinal axis and contains the axis of the needle.

The axes of the pivots 2 and 8 have a

fixed relative position, and the longitudinal axis of the tone arm proper 9 and the axis of the pivot 2 are disposed a distance apart. During the reproduction, the tone arm proper 9, the pivot 8 of which forms a rigid whole with the arm 1, turns about the vertical axis of the pivot 2, and the orthogonal projection of the axis of the needle on to the disc is maintained at a substantially constant angle with respect to the radius of the disc which extends through the point of contact between the needle and the disc. Such a condition, combined with the conditions (a) that the tone arm proper 9 is symmetrical with respect to the plane, perpendicular to the disc, in which the axis of the needle lies, and (b) that it carries out vertical oscillations about the axis of the pivot 8 which is perpendicular to the said plane of symmetry of the tone arm proper 9, permits of creating the desired conditions of operation.

If necessary, the arm 1 may be situated below the motor board of the gramophone cabinet, the said motor board being in turn situated below the turntable. In such cases the motor board must have an arcuate slot having its centre on the axis of the pivot 2, in order to permit the passage of the column 6 and the displacement thereof about the axis of the pivot 2.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A gramophone tone arm mounted to rotate about a horizontal axis on a support pivotally mounted on a vertical

axis arranged in proximity to the edge of the turntable, characterised in that the tone arm proper has a symmetrical form (as hereinbefore defined) and is mounted for movement about a horizontal axis which is separate from the longitudinal axis of the support on which the tone arm proper is so mounted that its longitudinal axis does not intersect the pivotal axis of said support.

2. A gramophone tone arm as claimed in Claim 1, characterised in that the said support extends in a direction substantially parallel to, i.e. lies in the same general direction as, the horizontal axis about which the tone arm proper is pivotally mounted.

3. A gramophone tone arm as claimed in Claim 1 or Claim 2, wherein said horizontal axis is provided by a pivot mounted on a column which is carried by said support.

4. A gramophone tone arm as claimed in Claim 3 characterised in that, in the assemblage on the gramophone cabinet, said support is disposed below the motor board of the cabinet, which board has an arcuate slot the centre of which lies on the pivoting axis of the supporting arm so as to permit the passage of the column and the displacement thereof about the said axis.

5. A gramophone tone arm substantially as shown in the accompanying drawing.

Dated this 14th day of September, 1939.

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[This Drawing is a reproduction of the Original on a reduced scale.]

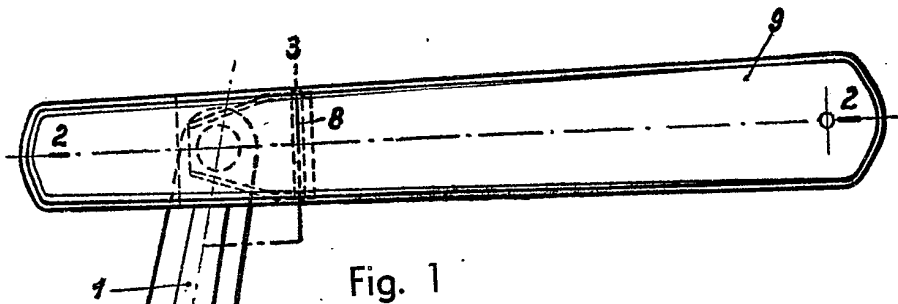


Fig. 1

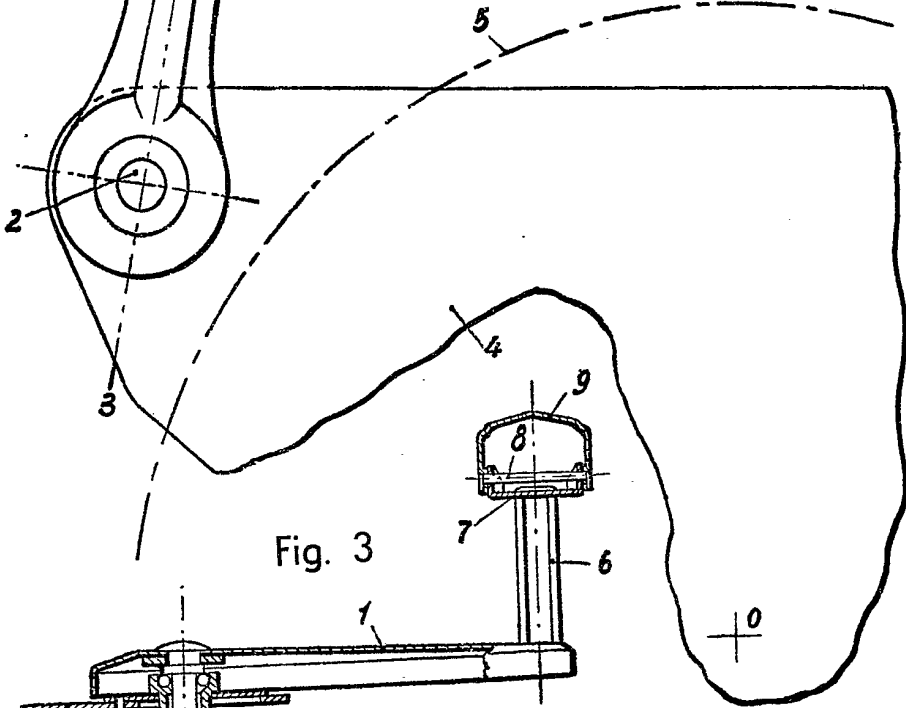


Fig. 3

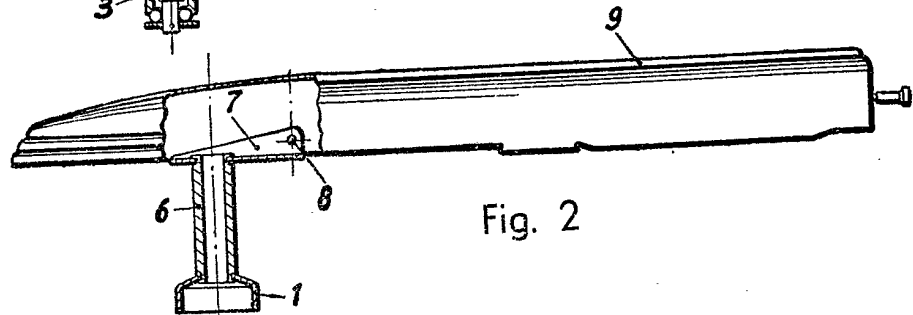
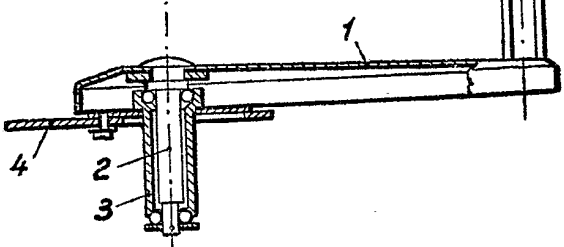


Fig. 2