

# PATENT SPECIFICATION

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## PROVISIONAL SPECIFICATION.

### Improvements in or relating to Electro-magnetic Gramophone Reproducers.

We, GRAHAM AMPLION LIMITED, of 25—26, Savile Row, in the County of London, W. 1, a British company, and JOHN DOUGHTY DUNTHORNE, of St. Andrew's Works, Crofton Park, in the County of London, Brockley, S.E. 4, a British subject, do hereby declare the nature of this invention to be as follows:—

This invention has reference to electro-magnetic gramophone reproducers of the kind wherein an armature is caused to vibrate in the neighbourhood of the poles of an electro-magnet.

Such an instrument, as is well-known, can be caused, when used in conjunction with a gramophone record, to generate telephonic currents adapted to be supplied to telephonic reproducing means or when used with a wax disc or blank, to have telephonic currents applied thereto, from a telephone transmitter, in order to cause the armature to actuate a cutting stylus for cutting a record track.

Now the object of this invention is to provide an instrument, of the type above set forth, embodying improvements in its general construction whereby inter alia ease of manufacture and ready adjustment of the armature can be effected.

According to the invention a permanent magnet of U or similar shape is adapted to have attached to its polar ends polar extensions each carrying a telephonic coil, presented one to the other and lying in the plane of the magnet. The permanent magnet is adapted to constitute a seating and holding and spacing means for an enveloping casing made in two halves, one half being adapted to carry the armature, armature adjusting means and a tubular extension for attachment to a gramophone tone arm, whilst the other half is provided with terminals and an aperture through which the stylus and stylus clamping means can project.

According to one construction the permanent magnet is of L shape and of square cross section, the two polar ends of the magnet each carrying a soft iron pole piece adapted to extend toward each other in a plane parallel with that containing the U-shape faces of the magnet, said soft iron poles each carrying a telephone coil.

[Price 1/-]

A casing formed from moulded insulating material is constituted by two plane halves each of which is thin but ribbed to give rigidity and has its boundary, conforming in shape to that of the outer edge of the magnet, extended inwardly and at right angles to itself. Each half is held in place by screws passing through holes in the case and engaging with screw threaded holes in the magnet. The boundaries of the half portions of the case are adapted to engage one with the other. One half has a flange-like rib extending round its boundary adapted to engage with and overlap the boundary of the other half. One portion of the case is provided with a screw-threaded metal bush disposed intermediate of the terminations of the pole pieces but displaced laterally therefrom in such manner that the armature can be held at one end by means of a screw passing therethrough in order that the other end can vibrate before or, in other words, move to or from the said pole faces. On the outside of the casing a tubular extension of rubber or like sound absorbing flexible material, adapted to form a coupling to the tone arm of a gramophone, having one closed end is carried by means of a screw or screws passing through a metal plate adapted to bear against the closed end of the tubular rubber extension and engage with the before-mentioned screw threaded bush carried by the casing.

The armature extends over the faces of the polar extensions and is adapted to lie very close thereto. Immediately behind the free end of the armature a metal bush having a screw-threaded hole through it is moulded into the casing and is adapted to accommodate a screw the end of which is adapted to engage a movable metal plate which in turn causes a rubber or like flexible cushion to press against one side of the end of the armature. Adjustment of the pressure of the cushion, as is obvious, can be effected by either screwing or unscrewing the screw referred to.

The other half of the thin ribbed casing is held down to the magnet and in association with the other half of the casing by means of screws and in a manner similar to that previously described. This half

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carries the terminals and is provided with an aperture adapted to register with the stylus clamping screw and the free end of the armature whereby free movement of the armature can take place.

In a modification the tubular flexible extension carries a metal bush adapted to be detached readily from its holding means. Such bush is of greater axial length than its flexible surrounding sleeve and is useful as an alternative means of connection to a tone arm.

According to a modification the armature is adapted, when actuated in one direction, to be moved away from the electro-magnet poles against the action of spring restoring means.

In one example a blade spring is employed which has one end secured to the armature holding means whilst the other end is formed as a lip having a rubber sleeve surrounding it, the curved portion of the lip being adapted to press tangentially against the back face of the free end of the armature.

Dated the 5th day of December, 1927.

GRAHAM AMPLION LTD.,  
For Graham Amplion, Limited,  
J. M. RICHARD,  
W. J. RICKETS,

Directors.

F. A. PHILLO,

Secretary.

J. D. DUNTHORNE.

## COMPLETE SPECIFICATION.

### Improvements in or relating to Electro-magnetic Gramophone Reproducers.

We, GRAHAM AMPLION LIMITED, of 25—26, Savile Row, in the County of London, W. 1, a British company, and JOHN DOUGHTY DUNTHORNE, formerly of St. Andrew's Works, Crofton Park, in the County of London, Brockley, S.E. 4, but now of St. Andrew's Works, Slough, in the County of Bucks, a British subject, 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:—

This invention has reference to electro-magnetic gramophone reproducers of the kind wherein an armature is caused to vibrate in the neighbourhood of the poles of an electro-magnet.

Such an instrument, as is well-known, can be caused, when used in conjunction with a gramophone record, to generate telephonic currents adapted to be supplied to telephonic reproducing means, or, when used with a wax disc or blank, to have telephonic currents applied thereto, from a telephone transmitter, in order to cause the armature to actuate a cutting stylus for cutting a record track, the instrument then forming a recording device.

Now the object of this invention is to provide an instrument of the type above set forth, embodying improvements in its general construction whereby, inter alia, ease of manufacture and ready adjustment of the armature can be effected.

For this purpose, in an instrument of the kind referred to, according to the invention, a permanent magnet of  $\square$  or similar shape is adapted to have attached to its polar ends soft iron polar extensions

or pole pieces presented one to the other and arranged in a plane parallel to that of the magnet, and each carrying a telephonic coil. The permanent magnet is adapted to constitute a seating and holding and spacing means for an enveloping casing made in two portions, one portion being adapted to carry the armature, armature adjusting means and a tubular device for attachment to a gramophone tone arm, while the other portion is provided with terminals and an aperture through which the stylus and stylus clamping means can project.

In the accompanying illustrative drawings, Figs. 1 and 2 are respectively a side elevation and an underside view showing one construction of instrument according to the invention. Fig. 3 is a similar view to Fig. 1 but with one part of the casing removed, Fig. 4 shows the instrument partly in horizontal section and partly in plan view. Fig. 5 is a section on the line V—V of Fig. 1. Fig. 6 is a similar view to part of Fig. 5 showing a modification. Fig. 7 is a similar view to Fig. 5 showing a further modification.

In the example shown in the drawings, the permanent magnet 1 is of  $\square$  shape and of square cross section, and has attached to its two polar ends  $1^a$   $1^b$ , two soft iron extensions or pole pieces 2,  $2^a$  that extend toward each other in a plane parallel with that containing the adjacent face of the magnet, and each carrying a telephone coil 3. The casing of the instrument is formed of insulating material is constituted by two portions 4 and  $4^a$  each of which comprises a thin plane part ribbed to give it rigidity and

a rim or boundary conforming in shape to that of the outer edge of the magnet and extending inwardly and at right angles to the plane part. Each portion 5 of the casing, which is thus of dished shape, is held in place against the magnet 1 by screws 5 passing through holes in the said portion of the casing and engaging screw threaded holes in the 10 magnet. The rims or boundaries of the two portions 4, 4<sup>a</sup> of the casing are adapted to engage one with the other. For this purpose, one portion, say 4<sup>a</sup> has a flange-like rib or bead 4<sup>b</sup> extending 15 round its rim or boundary adapted to engage with and overlap the rim or boundary of the other portion 4. The portion 4 of the casing is provided with a metal bush 6 disposed 20 intermediate of the terminations of the pole pieces 2, 2<sup>a</sup> but displaced laterally therefrom in such manner that an armature 7 can be secured thereto at one end, by means of a screw 8 in order that the 25 other end portion of the armature can vibrate in front of or in other words, move to and from the adjacent side faces of the pole pieces.

The armature 7 extends over the faces 30 of the pole pieces 2, 2<sup>a</sup> and is arranged very close thereto. Immediately behind the free end of the armature is an internally screw threaded metal bush that is moulded into the portion 4 of the casing and is 35 adapted to accommodate a screw 13 the inner end of which is arranged to engage a movable metal plate 14 which in turn causes a rubber or like flexible cushion 15 to press against the adjacent side of the 40 free end of the armature. Adjustment of the pressure of the cushion on the armature can, as is obvious, be effected by either screwing or unscrewing the screw 13, to a greater or less extent. The free 45 end of armature carries, as usual, a socket 16 for a stylus 17 and a clamping screw 18.

The other portion 4<sup>a</sup> of the casing carries the terminals 19 for the telephonic 50 coils 3 and is provided with an aperture 20 adapted to register with the stylus clamping screw 18 and the free end of the armature 7 whereby free movement of the armature with stylus can take place.

To the outside of the portion 4 of the casing is secured a tubular device 9 of rubber or like flexible sound absorbing material closed at one end and adapted to form a coupling for the tone arm of a 60 gramophone. The said device is fixed in position by means of a screw 10 passing through a metal plate 11 bearing against its said closed end and engaging with the screw threaded bush 6.

In the modification shown in Fig. 6,

the flexible tubular device 9 carries a metal bush 21 adapted to be readily detached from it. Such bush is of greater axial length than the flexible surrounding sleeve portion of the said device 9 and is 70 useful as an alternative means of connection to a tone arm.

According to a modification the armature is adapted, when actuated in one direction relatively to the pole pieces 2, 2<sup>a</sup> 75 to do so against the action of spring restoring means. For this purpose, in the example shown in Fig. 7, a blade spring 22 is employed one end of which is secured to the armature holding means 6 and 8 80 whilst the other end is formed as a curved lip 22<sup>a</sup> provided with a rubber sleeve 23, the curved portion of the lip being adapted to press tangentially against the adjacent face of the free end portion of 85 the armature 7.

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 90 claim is:—

1. An electro-magnetic instrument suitable for use as a gramophone reproducer, or as a gramophone recorder, comprising a permanent magnet, soft iron 95 extensions or pole pieces secured to the polar ends of the magnet and extending towards each other and arranged in a plane parallel to that of the magnet, telephonic coils carried by the polar extensions or pole pieces and a casing secured 100 to the said magnet which is adapted to constitute a seating and holding and spacing means therefor, the said casing being made in two portions one of which 105 carries the armature, armature adjusting means and a tubular device for attachment to a gramophone tone arm, while the other portion is provided with terminals for the coils and with an aperture through 110 which the free end portion of the armature with stylus and stylus clamping means project.

2. An instrument according to the preceding claim, wherein the permanent 115 magnet is of  $\square$ -shape and of square or rectangular cross section and the casing is constituted by two moulded dish-shaped pieces of insulating material secured to the opposite sides of the said magnet, 120 substantially as described.

3. An instrument according to Claim 1 or 2, wherein one portion of the casing is provided with a metal bush disposed 125 intermediate of the terminations of the polar extensions or pole pieces but displaced laterally therefrom in such manner that the armature can be held at one end by means of a screw passing therethrough and engaging the bush in order that the 130

free end portion of the armature can vibrate in front of the adjacent faces of the polar extensions or pole pieces.

4. An instrument according to Claim 1 or 2, wherein the adjusting means for the armature comprise an internally screw threaded metal bush fixed in the said portion of the casing, a flexible cushion carried by the said portion of the casing and bearing against one side of the free end portion of the armature and an adjustable screw carried by the bush and adapted to act against the cushion, substantially as described.

5. An instrument according to Claim 1, wherein the tubular device carried by one portion of the casing is formed of flexible sound absorbing material and adapted to

carry a readily detachable metal bush, substantially as described.

6. An instrument according to Claim 1, wherein the armature is arranged to move in one direction relatively to the soft iron polar extensions or pole pieces against the action of spring restoring means, substantially as described.

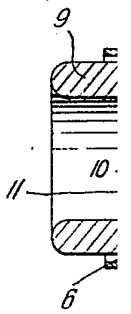
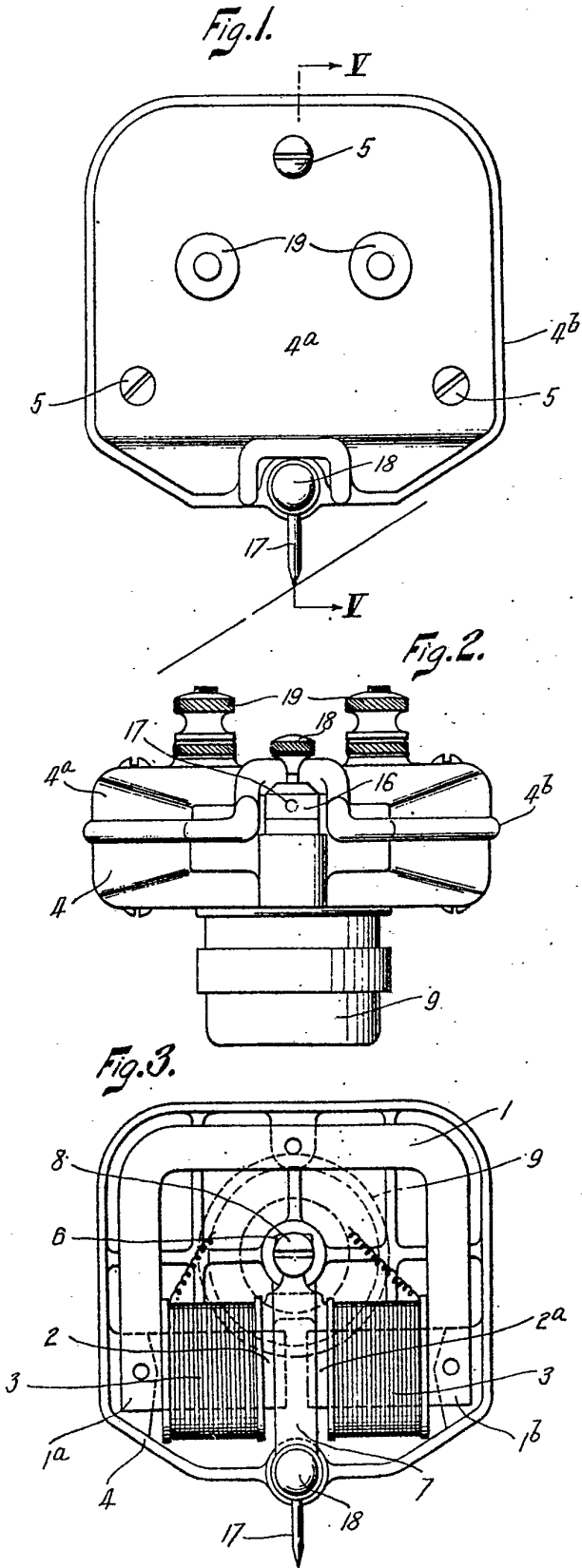
7. Instruments constructed, arranged and adapted for use substantially as hereinbefore described with reference to the accompanying drawings.

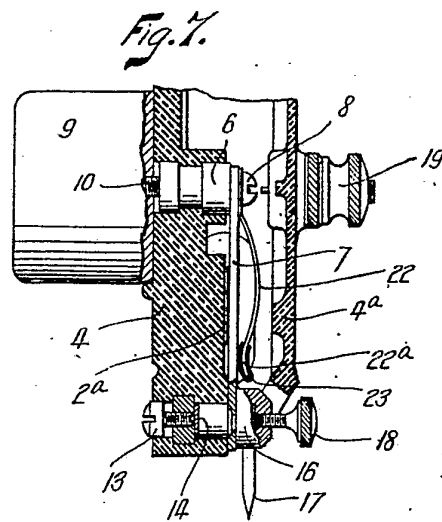
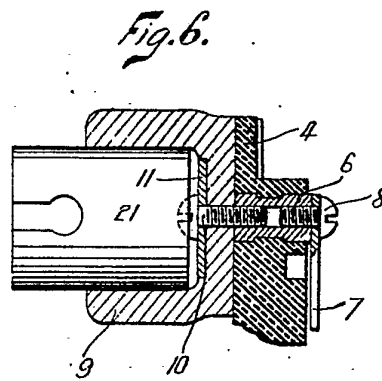
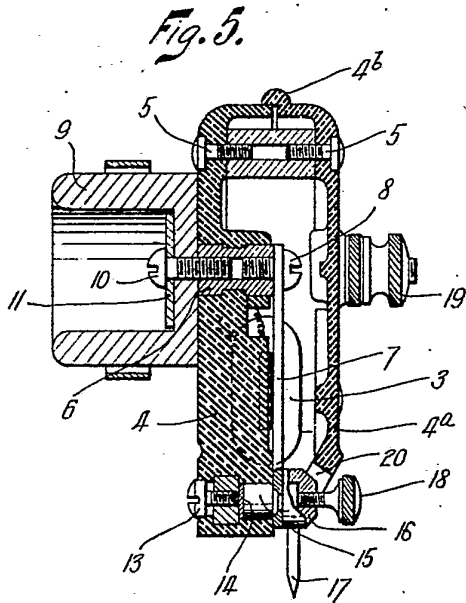
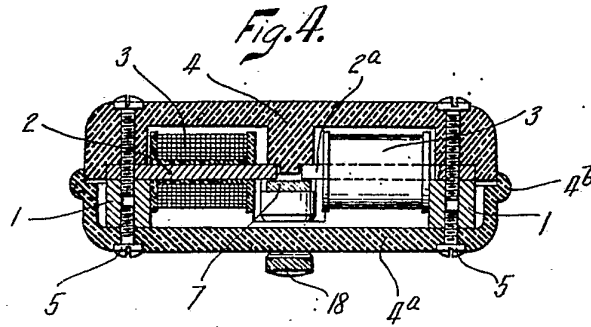
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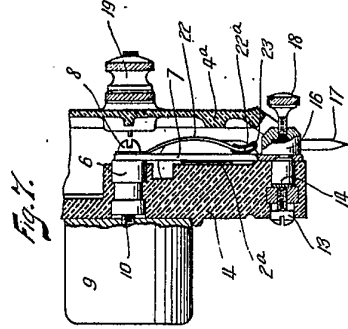
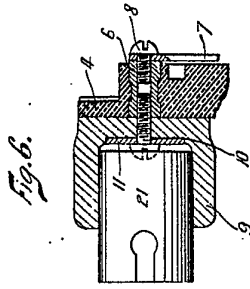
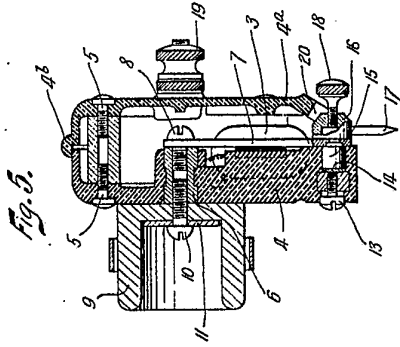
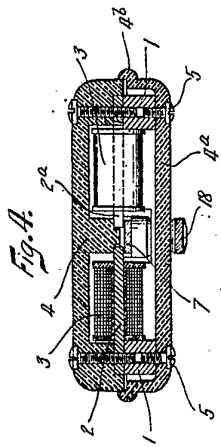
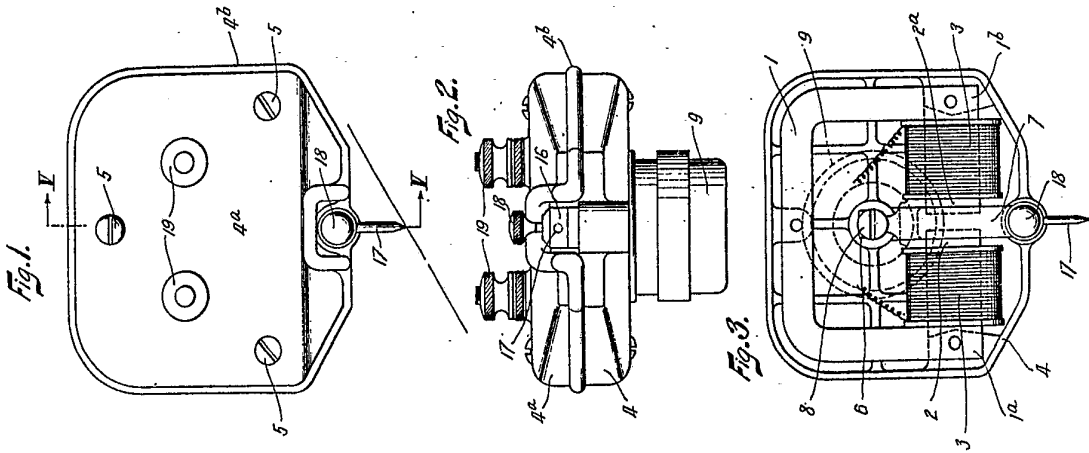
For the Applicants,

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