April 27, 1926. 1,582,473

F. KAY ET AL

SOUND RECORDING AND SOUND REPRODUCING INSTRUMENT

Filed May 24, 1924

Fig.1.

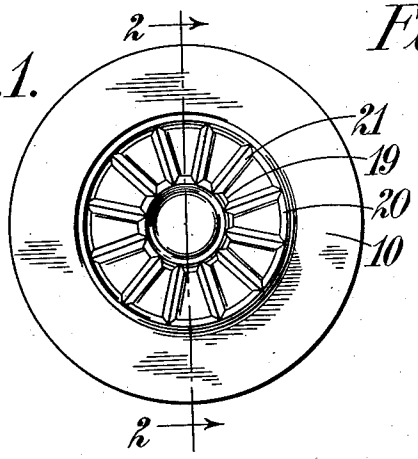


Fig.2.

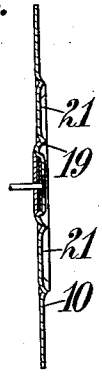


Fig.3.

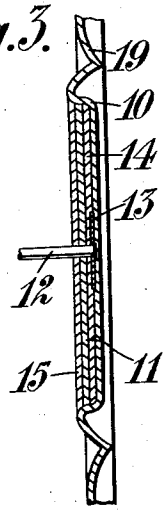


Fig.4.

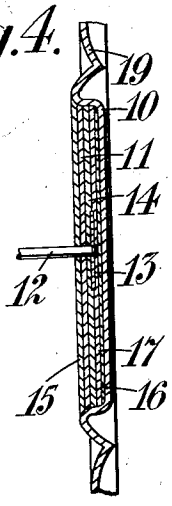


Fig.5.

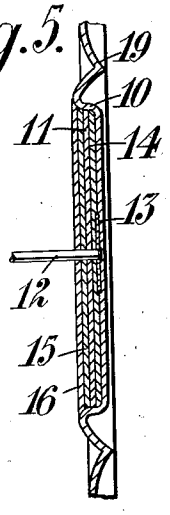


Fig.6.

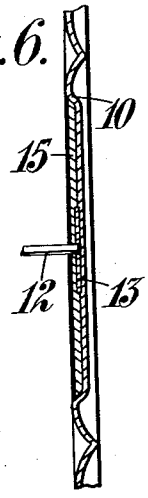


Fig.7.

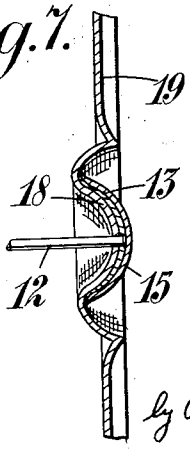


Fig.8.



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by Byrnes, Stebbins & Pannell,
their Attys.

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UNITED STATES PATENT OFFICE.

FRED KAY, OF PECKHAM, LONDON, AND WILLIAM ERNEST CLIFTON, OF LONDON, ENGLAND, ASSIGNORS TO CLIFTOPHONE LIMITED, OF LONDON, ENGLAND, A BRITISH COMPANY.

SOUND-RECORDING AND SOUND-REPRODUCING INSTRUMENT.

Application filed May 24, 1924. Serial No. 715,605.

To all whom it may concern:

Be it known that we, FRED KAY, a subject of the King of England, residing at Peckham, London, England, and WILLIAM ERNEST CLIFTON, a subject of the King of England, residing at London, England, have invented new and useful Improvements in Sound-Recording and Sound-Reproducing Instruments, of which the following is a specification.

This invention consists in improvements in or relating to sound-recording and sound-reproducing instruments and has for its object to provide an improved construction of diaphragm for use in such instruments and improved means for attaching the stylus-bar connector thereto.

Sound-recording or sound-reproducing instruments of the type contemplated by the present invention, are well-known, for example in their use with gramophones and like machines. Such instruments consist broadly in a vibratory diaphragm held within a casing, and an oscillatory stylus-bar mounted with one end connected to the diaphragm and the other end formed with or constructed to receive a stylus or needle.

One feature of the present invention comprises the combination of a diaphragm-element having a pocket formed therein or thereon, a metal disc or part which is completely or substantially completely enclosed in said pocket, and a pin secured to or integral with said metal disc or part so as to extend outwardly from the surface of the diaphragm, with or without cementing material of the kind hereinafter referred to applied between the metal disc or part and adjacent surfaces of the pocket.

According to another feature of the invention, the metal disc or part is applied to a main diaphragm-element so as to overlie a part of the surface thereof, and means are employed to effect adherence between the metal disc or part and the diaphragm or an intermediate element disposed between the metal disc or part and the diaphragm. In such a construction there is preferably a celluloid or other cover overlying the metal disc or part and secured at its margins to the main diaphragm-element so as to enclose the said disc or part between it and the diaphragm. In a preferred form the cover is so applied that its edges merge smoothly into the surface of the main diaphragm-element.

Preferably there is a celluloid or other cover overlying the said disc or metal part and secured at its margin to the main diaphragm-element so as to enclose the metal disc or part between it and the diaphragm.

The foregoing and other features of the invention will be more clearly understood from the following description of some preferred constructions, given by way of example only, with the aid of the accompanying drawings, in which—

Figure 1 is a plan of one form of diaphragm according to the invention;

Figure 2 is a section on the line 2—2 of Figure 1;

Figure 3 is a section similar to Figure 2 on an enlarged scale through the centre part only of the diaphragm;

Figures 4, 5 and 6 are again similar sections of modified constructions according to the invention;

Figure 7 is a still further modification of the invention; and

Figure 8 illustrates a modified detail of the invention.

Like reference numerals indicate like parts in the several figures of the drawings.

Referring to Figures 1–3, a disc 10 constituting the main diaphragm-element, is preferably composed of celluloid of, say, ten- to fifteen-thousandths of an inch in thickness. As will be seen more clearly from Figure 3, a stiffening-element 11, in the form of a disc (for example thin paper of approximately seven-thousandths of an inch in thickness) is positioned centrally in the disc 10. A short pin 12 passes centrally through the stiffening-element 11, and terminates in a small metal disc 13 with which it is integrally formed or to which it is rigidly secured, for example by soldering or welding. Between the disc 13 and the stiffening-element 11 a thin disc of celluloid 14 is interposed.

A circular cover-plate 15 is provided to enclose the elements 11, 13 and 14 and the end of the pin 12 and the parts are secured together by the application of heat and pressure in a suitably shaped mould. In order to cause a firm adherence between the several layers cementing material may be employed and conveniently the surfaces of the celluloid

parts, that is to say the diaphragm 10, celluloid disc 14 and cover-plate 15, are moistened with a celluloid solvent such as methyl-acetate so as to render those surfaces adhesive prior to the heating and pressing operation. Thus, the cementing material may be constituted by the moistened and partially dissolved surface of the celluloid parts and wherever reference is made herein to a cementing material it is to be understood as including a solvent or other agent which renders the parts adhesive. It is found that after the heating and pressing operation has been completed the parts adhere firmly together and the pressing operation is preferably carried out in such a manner that the junction between the margin of the cover-plate 15 and the diaphragm-disc 10 merge together in a smooth curve.

It may be preferred to apply a second stiffening element 16 (Figure 4) disposed on the other side of the metal disc and located between it and the diaphragm disc 10. A further celluloid disc 17 is interposed between the metal disc 13 and the second stiffening-element 16.

Alternatively, as shown in Figure 5, the second stiffening element 16 may be applied to the disc 15 on the opposite side to that on which the element 11 lies.

As an alternative construction, the stiffening element may be omitted as shown in Figure 6. In this figure the central portion of the diaphragm-disc is formed at 18 with a somewhat dome-like cavity and the metal disc 13 is shaped so as closely to overlie the dome so formed. The celluloid cover-plate 15 is pressed tightly over the metal disc 13 so as completely to enclose the metal disc between it and the portion 18 of the diaphragm. This form of diaphragm per se does not constitute part of the present invention but comprises the subject-matter of co-pending application in Great Britain No. 31421/23.

In order to permit a more ready yielding of the diaphragm, it may be formed as shown in Figures 1 and 2, with a circular corrugation 19 closely surrounding the central portion to which the disc 13 is applied. This corrugation 19 is shown also clearly in Figures 4, 5 and 6. There may be a second concentric corrugation 20 spaced from the first and disposed between the first and the outer margin of the diaphragm. Between the two circular corrugations additional (radial) corrugations such as 21 may be formed but it is to be understood that the particular form of the corrugation may be varied or may, if necessary, be omitted entirely. In all the constructions illustrated, some or all of the corrugations 19, 20 and 21 may be provided as found most desirable.

It is obvious that with the construction shown in Figures 1–5 the stiffening-elements such as 11, 16, 17 may be omitted if preferred, as shown for example in Figure 6, where the disc 13 is shown as contained directly between the main diaphragm-disc 10 and the cover-disc 15. It is often found advantageous when a flat central portion of the diaphragm is utilized, to employ one or more stiffening-elements such as are described above. It will be realized, however, that an important feature of the present invention is the manner in which the pin 12 is secured to the diaphragm and this differs from all previously known constructions. Risk of the pin 12 working loose in its connection with the diaphragm is found to be, for all practical purposes, eliminated by the present construction and the pin virtually constitutes an integral part of the diaphragm. Hitherto considerable difficulty has been experienced in maintaining pins such as 12 sufficiently tightly attached to the diaphragm. Riveting or the use of nuts screwing on to the end of the pin to clamp the latter to the diaphragm, sealing material applied to the head of the pin to secure it to the diaphragm, and many other means have previously been tried without the same degree of success as is obtained by means of the present invention.

In place of the metal disc 13, illustrated in the foregoing examples as a flat plate to which the end of the pin is secured, the disc may be formed by jumping up a head on the end of the pin. Alternatively, as shown in Figure 8, the disc may be constituted by spiralling one end of the pin 12, as at 22, the convolutions of the spiral being secured together, for example by soldering if found necessary or desirable. They may, however, be left unconnected with the convolutions closely coiled one on the other.

In a further alternative the disc may be replaced by a straight strip of metal which is bent into V-section so that the pin extends in a direction which is normal to the groove of the V and is secured to the concave apex thereof.

From the foregoing description it will be seen that the celluloid cover 15, considered in conjunction with the main diaphragm-element 10, constitutes a pocket within which is enclosed the metal disc or other part 13. The present invention, therefore, contemplates and includes the formation of a pocket in the diaphragm into which the metal disc or part may be inserted, whereafter the pocket is closed down on to the metal disc so as to hold it tightly therein.

We claim:—

1. A diaphragm of the type described comprising in combination a main diaphragm element, a metal part secured there-

on, a pin projecting from said metal part, and a cover which overlies said metal part, which extends marginally beyond it, and which is secured at its margin to the diaphragm element so as to enclose the metal part between the cover and the diaphragm element.

2. A diaphragm of the type described comprising in combination a main diaphragm element, a metal part secured thereon, a pin projecting from said metal part, and a cover which overlies said metal part, which extends marginally beyond it and which is secured at its margin to the diaphragm element in such a manner that its edges merge smoothly into the surface of the diaphragm element and the metal part is enclosed between the cover and the diaphragm element.

3. A diaphragm of the type described comprising in combination a main diaphragm element, a metal part and a stiffening element secured thereon, a pin projecting from said metal part, and a cover which overlies the metal part and the stiffening element, which extends marginally beyond them and which is secured at its margin to the diaphragm element so as to enclose the metal part and stiffening element between the cover and the diaphragm element.

4. A diaphragm of the type described comprising in combination a main diaphragm element, a metal part secured thereon, a stiffening element between the said metal part and the diaphragm element, a pin projecting from said metal part, and a cover which overlies said metal part and stiffening element, which extends marginally beyond them and which is secured at its margin to the diaphragm element so as to enclose the metal part and stiffening element between the cover and the diaphragm element.

5. A diaphragm of the type described comprising in combination a main diaphragm element, a metal part secured thereon, a stiffening element on each side of said metal part so that one of them is between the latter and the diaphragm element, a pin projecting from said metal part, and a cover which overlies said metal part and stiffening elements, which extends marginally beyond them and which is secured at its margin to the diaphragm element so as to enclose the metal part and the stiffening elements between the cover and the diaphragm element.

6. A diaphragm of the type described comprising in combination a main diaphragm element, a metal part secured thereon, a plurality of stiffening elements with the metal part arranged between two of them, a pin projecting from said metal part, and a cover which overlies said metal part and stiffening elements, which extends marginally beyond them and which is secured at its margin to the diaphragm element so as to enclose the metal part and the stiffening elements between the cover and the diaphragm element.

7. A diaphragm of the type described comprising in combination a main diaphragm element, a metal disc secured thereon so as to lie flat over the surface of the diaphragm element, a pin projecting from said disc, and a cover which overlies the disc, which extends marginally beyond it and which is secured at its margin to the diaphragm element so as to enclose the disc between the cover and the diaphragm element.

8. A diaphragm of the type described comprising in combination a main diaphragm element, a metal disc secured thereon so as to lie flat over the diaphragm element, a stiffening disc concentric with the metal disc, a pin projecting from said metal disc, and a cover which overlies said metal and stiffening discs, which extends marginally beyond them and which is secured at its margin to the diaphragm element so as to enclose the discs between the cover and the diaphragm element.

9. A diaphragm of the type described comprising in combination a diaphragm element, a metal part secured thereon, a pin projecting from said metal part, and a celluloid cover which overlies said metal part, which extends marginally beyond it and which is secured to the diaphragm element and to the metal part so as to connect said part firmly between the cover and the diaphragm element.

10. A diaphragm of the type described comprising in combination a celluloid diaphragm element, a metal part secured thereon, a pin projecting from said metal part, and a celluloid cover which overlies said metal part and which extends marginally beyond it, the diaphragm element, metal disc and celluloid cover being adhesively secured together so that the metal part is enclosed firmly between the cover and the diaphragm element.

11. A diaphragm of the type described comprising in combination a celluloid diaphragm element, a metal part secured thereon, a stiffening element between said metal part and said diaphragm element, a pin projecting from said metal part, a celluloid cover which overlies said metal part and which extends marginally beyond it, and celluloid adhesive means for securing all the parts together so that the metal part and stiffening element are firmly held between the cover and the diaphragm element.

12. A diaphragm of the type described comprising in combination a celluloid diaphragm disc, a metal disc secured thereon so as to lie flat over the diaphragm disc, a pin projecting from said metal disc, a celluloid cover disc which overlies said metal part and which extends marginally beyond it, and cel-

luloid adhesive means for securing all the parts together in such a manner that the edge of the cover disc merges smoothly into the surface of the diaphragm disc.

13. A diaphragm of the type described comprising in combination a main diaphragm element, a metal disc secured thereon so as to lie flat over the diaphragm element, a pin projecting from said metal disc, and a cover which overlies said metal disc, which extends marginally beyond it and which is secured at its margin to the diaphragm element so as to enclose the metal disc between the cover and the diaphragm element, said diaphragm element being formed with a circular corrugation concentric with said metal disc and closely surrounding it, for the purpose described.

14. A diaphragm of the type described comprising in combination a main diaphragm element, a metal disc secured thereon so as to lie flat over the diaphragm element, a pin projecting from said metal disc, and a cover which overlies said metal disc, which extends marginally beyond it and which is secured at its margin to the diaphragm element so as to enclose the metal disc between the cover and the diaphragm element, said diaphragm element being formed with a circular corrugation concentric with said metal disc and closely surrounding it, and with a second concentric corrugation spaced from the first-named corrugation, for the purpose described.

15. A diaphragm of the type described comprising in combination a main diaphragm element, a metal disc secured thereon so as to lie flat over the diaphragm element, a pin projecting from said metal disc, and a cover which overlies said metal disc, which extends marginally beyond it and which is secured at its margin to the diaphragm element so as to enclose the metal disc between the cover and the diaphragm element, said diaphragm element being formed with a circular corrugation concentric with said metal disc and closely surrounding it, with a second concentric corrugation spaced from the first-named corrugation, and with substantially radial corrugations extending between the two circular corrugations, for the purpose described.

In testimony whereof we have signed our names to this specification.

FRED KAY.
WILLIAM ERNEST CLIFTON.