April 3, 1928.

1,664,988

I. E. MOBLEY

SOUND REPRODUCER

Filed July 16, 1926

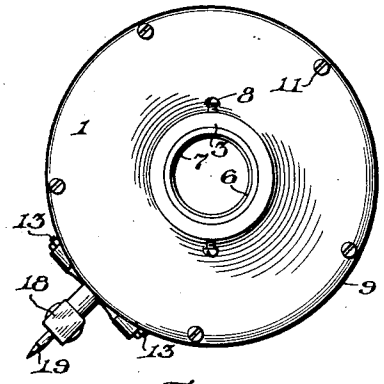


Fig. 1.

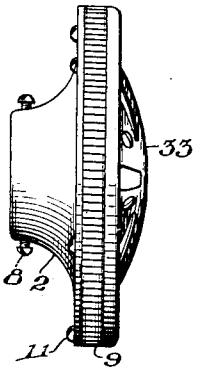


Fig. 2.

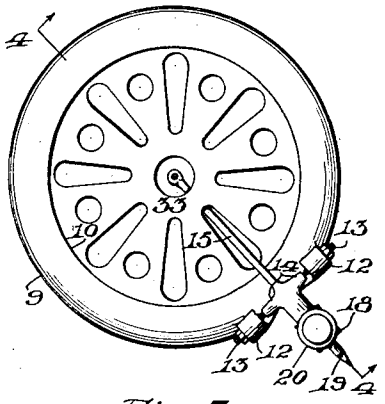


Fig. 3.

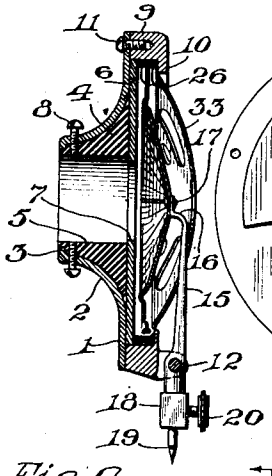


Fig. 4.

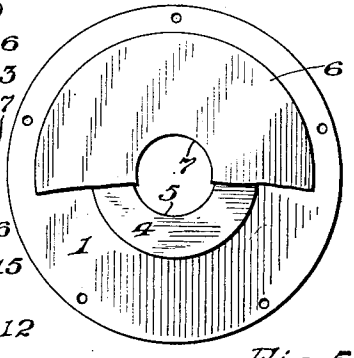


Fig. 5.

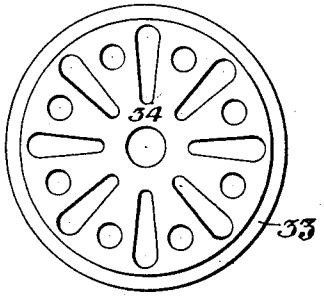


Fig. 6.

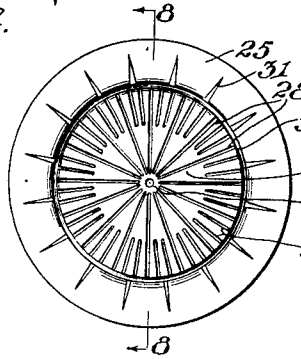


Fig. 7.

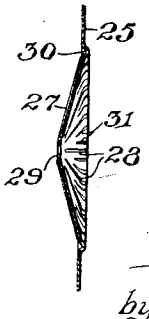


Fig. 8.

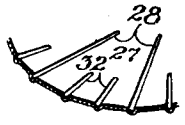


Fig. 9.

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Patented Apr. 3, 1928. 1,664,988

UNITED STATES PATENT OFFICE.

IDA E. MOBLEY, OF ROSLYN, PENNSYLVANIA.

SOUND REPRODUCER.

Application filed July 16, 1926. Serial No. 122,877.

The object of the invention is to provide improvements in sound reproducers, and particularly in that type which, with but minor alterations, can be adapted for use in both talking machines and radio receiving instruments.

Another object is more specifically to provide an efficient construction, whereby the reproducer when employed as a part of a talking machine can be mounted upon the free end of a tone arm, with a sound insulating gasket interposed between the metallic portions of the reproducer and said tone arm, said gasket being secured within the structure of the reproducer in such manner that it can neither accidentally slip nor even be removed intentionally without to a large degree disassembling the reproducer as a unit.

A further object is to provide an improved diaphragm, wherein by a novel arragement of corrugations, some of them relatively sharp in cross section, both radiating from and concentric with the axis thereof, the central conical portion is increased in rigidity so as to vibrate as a substantially rigid unit, though possessing a high degree of resonance due to its thinness, the material of which it is formed, and the treatment which it receives during the process of its formation.

Still another object is to provide a diaphragm, having a central portion, such as that thus briefly, yet hereinafter more fully described, surrounded by a substantially plane marginal portion, separated from the said central portion by a narrow annular hinge groove or corrugation, said marginal portion being preferably traversed to a degree by additional corrugations, which in one form radiate from said annular corrugation, and place said marginal portion under a certain amount of circumferential stress.

And a still further object is to provide in such a reproducer the combination of the improved diaphragm, spaced away from a transversely extending, centrally apertured lining plate or disc, which in turn has its central portion spaced away from the corresponding, centrally apertured portion of the back plate, the space between said disc and plate being substantially filled with the attaching gasket above referred to, which gasket also serves to modify the tone of the sounds reproduced by the diaphragm.

With these and other objects in mind, the present invention comprises further details of construction and operation, fully brought out in the following description, when read in conjunction with the accompanying drawings, in which Fig. 1 is a rear elevation of one embodiment of the invention; Fig. 2 is an end elevation of the same; Fig. 3 is a front elevation of the same; Fig. 4 is a transverse section on the line 4—4 of Fig. 3; Fig. 5 is a fragmentary elevation of the back-plate, gasket and disc liner; Fig. 6 is an elevation of the perforated shield shown in Figs. 2, 3 and 4; Fig. 7 is a front elevation of the improved diaphragm per se; Fig. 8 is a transverse section on the line 8—8 of Fig. 7; and Fig. 9 is a fragmentary portion of the diaphragm arranged to show the general shape and relative positions of the radial corrugations with respect to each other.

Referring to the drawings, a back-plate comprises a plane marginal portion 1, merging radially inwardly into a laterally extending cup-shaped portion 2, which in turn terminates in an inwardly directed radial flange 3. Positioned within this cup-shaped portion of said plate is a substantially conical gasket 4, having an axial bore 5, and terminating inwardly in the plane of the marginal portion 1 of the plate, the outer end of said gasket being retained and protected by the flange 3. After this gasket is inserted within said back-plate, an annular lining disc 6 is permanently secured in any suitable manner to the marginal portion of the said plate, so that its central aperture 7 is concentric with the bore 5 of the gasket, and its central portion surrounding its said aperture bears firmly against and maintains said gasket in fixed operative position, as shown in Fig. 4. It will be also noted that radially extending screws or the like 8, extend through the cup-shaped portion 2 of said plate, adjacent to the flange 3 for the purpose of removably attaching the reproducer to the tone arm of a talking machine, or the like.

The forward portion of the reproducer comprises a cylindrical rim 9, provided outwardly with a plane, radially directed flange 10, and is designed to be operatively secured to said back-plate by means of screws 11, or in any other suitable manner. Thus, said rim abuts directly against the plate 1, surrounding and with its interior lined by, the disc 6. One lower portion of said rim

is also provided with any suitable pivotal mounting for a stylus-bar, in this case the mounting comprising spaced lugs 12, through which extend aligned pivot screws 13, between which are oscillatably supported the transversely extending arms 14 of a stylus-bar 15, secured at its inner curved end 16 to the central portion of the diaphragm by means of a screw 17 or the like, and provided upon its outer free end with an enlarged head 18, bored to receive a stylus 19, which is removably retained by means of a set-screw 20. The stylus-bar and its support may be of any desired construction, and it is well known that, when the stylus is in co-operation with the sound-recording groove of a record, changes in depth or direction of the groove cause the stylus to vibrate, and thereby cause the inner or diaphragm-engaging end of the stylus-bar to vibrate in accordance therewith.

Assuming that the record grooves represent in their characteristic way the exact sounds produced by one or more voices, musical instruments, or other sound-producing media, the object has always been to insure the inevitable diaphragm connected to the stylus-bar vibrating in exact accordance with the waves of the groove. However, the material, design and construction of the diaphragm have always operated either individually or conjointly to defeat this desired attainment, to a greater or less degree, though the result obtained has in some instances been very gratifying. Nevertheless, absolute perfection has probably not yet been reached, and the object of this invention therefore is to improve upon the results heretofore obtained by devices of similarly low cost, and to equal or even exceed the results reached by much more expensive instruments.

Great attention has consequently been given to the construction of the diaphragm. In the present instance, a substantially plane marginal portion 25 is secured between a pair of suitable annular gaskets 26, positioned between the lining disc 6 and the rim flange 10, the central portion 27 of the diaphragm being conical, and traversed by angularly spaced radially directed corrugations 28, extending from a central plane portion 29 to a concentric corrugation 30, beyond which lies the marginal supporting portion 25. The otherwise uniform evenness of this latter marginal portion is broken by relatively short corrugations 31, which extend radially from the circular corrugation 30. The conical portion of the diaphragm is furthermore broken by a series of radial corrugations 32, which extend from the circular corrugation 30 inwardly towards, but stop short of, the central portion 29, and lie in spaced relation with the longer corrugations 28. This diaphragm, when formed as described and positioned between the gaskets 26, is secured to the stylus-bar as before stated, and is protected against injury by the convex or other suitable type of shield shown in Fig. 6, said shield comprising a plane marginal portion 33, surrounding a central, apertured portion 34 conforming preferably to a shallow spherical segment.

In the formation of the diaphragm, many metals have been tried, but thus far the best results have been obtained with the use of brass of approximately .002 inch thickness, commonly known as shim-brass because of the principal purpose for which it is made. As it is desired to have the diaphragm as yielding as possible, particularly through its marginal portion, a blank is annealed both before pressing and again after leaving the dies by which it is formed into a diaphragm of the desired shape. The arrangement of the radial corrugations seems to render the central portion substantially rigid transversely, so as to insure its vibrating somewhat as a unit, at least when compared to the relatively high flexibility of the marginal portion 25. The corrugation 30, due to its shape and location, as well as the fact that the metal is slightly stretched and thinner along this line, serves as a curved hinge or the like, connecting the central and marginal portions, and making it exceedingly easy for the former to oscillate with respect to the latter, while the relatively short corrugations 32, by creating a circumferential stress appear to aid in the purification of the tone, probably by breaking up a tendency for secondary vibrations to be set up within said marginal portion with their consequent deleterious effect. However, while the central portion moves to and fro, without flexing to any great extent, the presence of an excess quantity of wax or the like has been found sufficient to materially deaden the resulting sound reproduction, wherefore it is very probable that some definite tone characteristic is possessed and must be retained by said central portion.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States, is:—

1. In a sound reproducer for talking machines, in combination, a substantially cylindrical rim provided at one edge thereof with an inturned flange, a back plate arranged to be detachably secured to the opposite edge of said rim to form conjointly with said flange an annular groove, a diaphragm having a plane marginal portion and a central conically shaped portion arranged with said marginal portion within said groove and said conically shaped portion projecting away from said plate, and a protecting shield for said diaphragm having a marginal portion received within said

groove and a central portion conforming to the shape of and spaced from the central portion of said diaphragm.

2. In a sound reproducer for talking machines, in combination, an annular rim having a radially extending flange lying substantially in the plane of the forward face of said rim, a back plate detachably secured to and lying substantially in the plane of the rear face of said rim, said plate acting conjointly with said flange to form an annular groove upon the inner peripheral surface of said rim, a diaphragm having a central raised portion bounded by a plane marginal portion, said diaphragm being positioned within said rim with the marginal portion thereof seated within said groove and the central portion thereof projecting away from said back plate, a protecting shield for said diaphragm having a central portion conforming to the shape of and spaced forwardly from the central portion of said diaphragm, and means for securely clamping said diaphragm and shield in said spaced relation.

3. In a sound reproducer for talking machines, in combination, an annular rim having a radially extending flange lying substantially in the plane of the forward face of said rim, a backing detachably secured to and lying substantially in the plane of the rear face of said rim, said backing acting conjointly with said flange to form an annular groove upon the inner peripheral surface of said rim, a diaphragm positioned between said flange and backing with the peripheral edge thereof seated within said groove, said diaphragm being provided with a central raised portion, and a protecting shield for said diaphragm having a central portion projecting forwardly from the plane of said flange and arranged in spaced relation with respect to the central raised portion of said diaphragm.

4. In a sound reproducer for talking machines, in combination, an annular rim provided at one edge thereof with an inturned flange, a backing arranged to be detachably secured to the opposite edge of said rim to form conjointly with said flange an internal annular groove, a substantially conically shaped diaphragm having a plane marginal portion arranged to be received within said groove, a protecting shield for said diaphragm conforming substantially to the shape of and maintained in spaced relation with respect to the latter, the central portion of said shield bulging outwardly and away from the conically shaped portion of said diaphragm, and a stylus bar pivotally supported upon said rim with the inner end thereof projecting through said shield for securement to the apex of said conically shaped diaphragm.

In testimony whereof I hereby affix my signature.

IDA E. MOBLEY.