

April 19, 1932.

H. G. PAPE

1,854,716

SOUND INSTRUMENT

Filed Jan. 24, 1929

Fig. 1

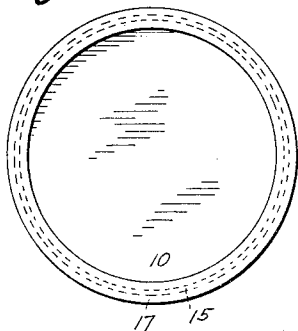


Fig. 3

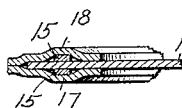


Fig. 2

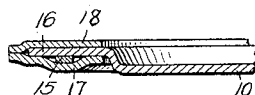


Fig. 4

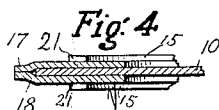


Fig. 5

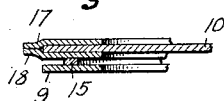


Fig. 6

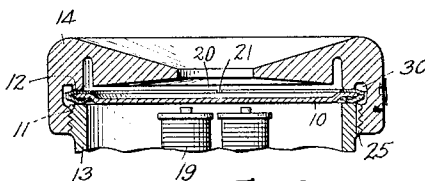


Fig. 7

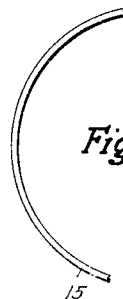


Fig. 8

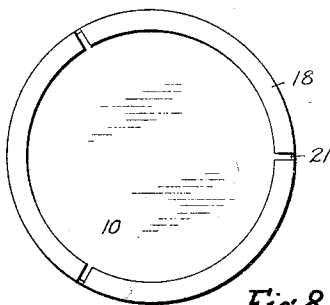


Fig. 9

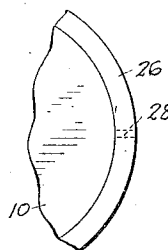


Fig. 10

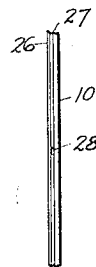


Fig. 11

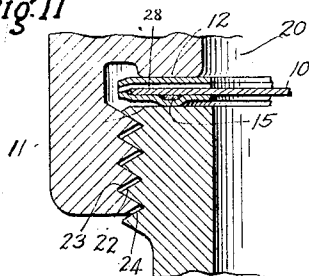


Fig. 12



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## UNITED STATES PATENT OFFICE

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## SOUND INSTRUMENT

Application filed January 24, 1929. Serial No. 334,659.

This invention relates to sound producing instruments and particularly, to the means for supporting the electrically, acoustically, mechanically or magnetically operated diaphragm thereof, and to the means for venting the interior of the instrument for preventing undesirable concussions upon the ear of the listener, and reducing the retarded activity.

The various objects of my invention will be clear from the description which follows and from the drawings, in which,

Fig. 1 is a bottom plan view of a diaphragm to the peripheral portion of which my improved cushioning and supporting means has been applied.

Fig. 2 is a vertical section of a part of the same, showing one form of my improved cushioning means.

Figs. 3, 4 and 5 are similar views of the same, showing other forms or arrangements thereof.

Fig. 6 is a vertical section of part of a receiver showing my invention applied thereto.

Fig. 7 is a top plan view of a portion of the ring or washer which I prefer to use with my improved diaphragm.

Fig. 8 is a similar top plan view of a diaphragm provided with venting or breather passages.

Fig. 9 is a similar view of part of the diaphragm showing another form of the vent or breather passage.

Fig. 10 is an edge view of the same.

Fig. 11 is a vertical section, enlarged, of part of a sound instrument showing the screw threads holding the parts of the instrument together, and showing in exaggerated fashion the breather passage communicating with the tone chamber, and

Fig. 12 is a similar view of another form of the threads.

The present invention is in part, in the nature of an improvement upon the diaphragm mounting means shown and described in my co-pending application for patent for diaphragm and mounting therefor, Serial No. 320,229, filed November 19th, 1928, wherein I have shown a diaphragm, in which the peripheral edge and peripheral surfaces are

encased in paper gaskets secured in place preferably by a gum rubber cement.

In that practical embodiment of my invention which I have illustrated herein by way of example, I prefer to interpose between the diaphragm 10 and the seats 11 and 12 therefor, made respectively, in the casing member 13 and the cap 14 of any sound producing instrument of the conventional types, one or more flat paper rings or gaskets as made as narrow as possible, and narrower than either of the seats 11 or 12. By the use of at least one such very narrow gasket, the pressure put upon the diaphragm through the seats 11 and 12, when the parts 13 and 14 are screwed together, is confined to a comparatively narrow area substantially a circular line on the periphery of the diaphragm, with the resulting advantage of elimination of harshness in the reproduced sound, elimination of tone distortion and of possible distortion of the diaphragm, and other advantages as will hereinafter appear.

As shown in Fig. 2, the ring 15 may be interposed between the edge portion 16 of the diaphragm and a suitable lower gasket 17. As illustrated in Fig. 3, a narrow ring 15 may be arranged directly on both faces of the diaphragm and maintained in place by the outer gaskets 17 and 18, being preferably secured in place to one of the outer gaskets by a yieldable cement such as a gum rubber cement.

Where two opposed rings 15, one between the diaphragm 10 and each seat 11 and 12, are used, it will be obvious that even though the rings are not perfectly aligned or exactly above each other, distortion of the diaphragm under pressure put thereon by seats 11 and 12 which may not be perfectly parallel or not perfectly plane surfaces, is avoided.

This is so because the flat rings necessarily become so arranged that they press against each other, maintaining the peripheral portion of the diaphragm in its normal plane, even though the rings may be slightly out of line, in distinction from the operation of edged or curved devices for putting pressure on the diaphragm. It will be understood that if the seat 12 is quite narrow, as is usu-

ally the case, no ring 15 need be used thereunder.

As shown in Fig. 4, the rings 15 may be cemented or otherwise secured to the outside of the gaskets 17 or 18 so as to come into direct contact with the seats 11 and 12 respectively, and as shown in Fig. 5, additional spacing and cushioning gaskets as 9 may be used adjacent the seat.

By using such a narrow paper ring 15, not only is the diaphragm more or less hingedly and yieldingly supported upon the seats therefor, but the diaphragm is free to retain its proper normal shape when clamped and thereby stressed. This is an important feature of my invention since it is well known that in the manufacture of sound producing instruments, the seats for the diaphragm in the casing and cap cannot always be so accurately made as to lie in perfect planes. On the contrary, such seats are often slightly throughout or in part convexly or concavely conical so that when the seats are screwed upon the diaphragm, the diaphragm may become convexly or concavely distorted by being pressed toward and conformed to the imperfectly shaped seat, and thereby fail to properly reproduce the sound.

By reducing the area of support of the diaphragm and spacing the supported edge of the diaphragm slightly away from the seats therefor by a more or less compressible or yieldable ring or gasket, the diaphragm is left substantially free to retain its original shape and spacing from the magnets 19 without distortion under pressure and thereby cannot fail to perform its proper function in an efficient manner.

It will be understood that while I prefer to make the various rings and gaskets 15, 17 and 18 of comparatively thin paper, said gaskets may be made of other suitable materials having the same properties and functioning in the same manner such as for instance, fibre, celluloid and the like, provided only that the ring is sufficiently thin and narrow to function as described. It will also be understood that the ring 15 may be secured to the diaphragm or to a gasket which is secured to the diaphragm with the ring therebetween, or to one or more loose, unsecured gaskets, which may be arranged between the diaphragm and either or both of the instrument seats.

As is well illustrated in my prior Patent No. 1,560,303 for a double ear-piece, dated November 5th, 1925, it is desirable to provide some means communicating with the interior tone chamber 20 of the instrument and with the outside atmosphere whereby a breather or relief passage is provided for the air in the interior of said chamber. Under sudden pressure due to various causes such as a large volume of sound, the concussion may be sufficient to tend to injure the ear of

the listener if no such breather passage is provided, as well as to distort the sound.

In my prior patent, I have shown such breather means in the form of vents, passages or holes through the cap 14 and extending between the tone chamber 20 and the exterior of the instrument. In the present form of my invention, however, I prefer to utilize the threads, by means of which the parts 13 and 14 are secured together, for this purpose. In this case, the upper gasket 18 may be grooved at one or more places as by means of suitable narrow grooves 21 so that air may pass from the chamber 20 through the grooves and out to the exterior of the instrument, as through the passages 22 between the threads 23 and 24, it being well known that threads of this type are sufficiently loose when not clogged with accumulations of dust or dirt or other foreign matter to provide a helical or spiral passage therethrough suitable for the purpose described.

If desired, however, the threads may be of the type known as United States standard threads in which the points or sharp edges of the V threads have been somewhat flattened to provide a larger space 22, as illustrated in Fig. 11. If found convenient and desirable in addition, longitudinal grooves such as 25 coaxial with the casing, may be made across the threads to provide a passage through which the air may pass under the concussion from the chamber 20 through the grooves 21 and through the slot 25 to the outside.

As shown in Figs. 10 and 9, the groove leading from the chamber 20, instead of being cut into and through the gasket, may be formed by using two or more gaskets as 26 and 27 and slotting the under gasket 27 nearest the diaphragm 10, as by means of suitable slots 28 leading from the chamber 20 to the annular chamber 30 on the other side of the diaphragm.

It will be seen that I have provided simple, inexpensive and efficient means to compensate for possible variations from the ideal plane seat, and for obviating possibility of distortion of the diaphragm due to mounting said diaphragm under pressure on such variable or defective seats, while at the same time, providing for the effects of concussion in the tone chamber of the instrument.

It will further be understood that the various gaskets shown herein may be secured to the diaphragm edges, or may be made in the form of separate gaskets as may be found desirable. For instance, compressible flat gaskets of the type shown in my prior application above referred to may be secured to the diaphragm and spacing gaskets may be used between the diaphragm gaskets and the seat, to which spacing gaskets may be secured the narrow ring 15.

Various other changes and modifications may be made in the structure shown and de-

scribed which is intended to be merely illustrative of my invention and not limitative. I therefore do not wish to be understood as confining myself to the specific details of construction shown and described but intend to claim my invention as broadly as may be permitted by the state of the prior art and the scope of the appended claims.

I claim:

1. In a sound producing instrument, the combination with a diaphragm and seating means therefor, of a narrow flat paper ring of substantially uniform thickness and of less width than that of the seating means interposed between the diaphragm and said seating means and arranged inwardly of the edge portion of the diaphragm and secured to the diaphragm.
2. The combination with a diaphragm for a sound producing instrument, of a paper gasket secured thereto and a narrower paper ring arranged concentrically with said gasket.
3. In a diaphragm, an edge paper gasket, and a flat paper ring narrower than said gasket interposed between the diaphragm and the gasket for minimizing the area of pressure on the diaphragm, said gasket securing the ring to the diaphragm.
4. The combination of a diaphragm, seats for removably clamping the edge portion of the diaphragm therebetween, edge gaskets secured to the edge portion of the diaphragm and means for minimizing the area of pressure of the seats on the diaphragm comprising a thin flat ring of less width than the seat interposed between the seat and the diaphragm, and arranged inwardly of the peripheral edge portion of the diaphragm and secured to one of the edge gaskets.
5. The combination of a diaphragm, seats for clamping the edge portion of the diaphragm therebetween, edge gaskets secured to said edge portion and means for minimizing the area of pressure of the seat on the diaphragm comprising a thin narrow ring independent of and of less width than the seat, removably inserted between the seat and the gaskets and inwardly of the peripheral edge portion of the diaphragm.
6. The combination with a diaphragm, of a paper gasket secured to the edge portion thereof, and a flat narrow ring secured between the first gasket and the diaphragm.
7. In a diaphragm, an edge gasket of paper and a thin narrow flat paper ring secured thereto.
8. In a sound instrument, a threaded casing, a cap engaging said casing, diaphragm seats on said casing and cap, a diaphragm arranged between said seats, and a flat ring narrower than either seat and of less thickness than that of the diaphragm interposed between the diaphragm and at least one of the seats for minimizing the area of pressure put by the adjacent seat on the diaphragm, said

ring being arranged inwardly of the peripheral edge of the diaphragm.

9. In a sound instrument, a threaded casing, a threaded cap screwed on to said casing and having a tone chamber therein, a diaphragm seat on said casing and cap, a diaphragm clamped by said casing and cap between said seats, and cushioning means between the diaphragm and at least one of the seats, said means having a breather passage therethrough connecting said tone chamber with the threads of the casing and cap.

10. In a sound instrument, a diaphragm, edge gaskets on said diaphragm, cooperating threaded means for removably clamping a diaphragm therebetween, and a narrow thin flat ring arranged to minimize the area of pressure put by the clamping means on the diaphragm, the edge gaskets having a breather passage therethrough connecting the interior with the threads of the clamping means.

11. In a sound instrument, a diaphragm, edge gaskets therefor, and cooperating threaded clamping elements for the diaphragm, at least one of said gaskets having a breather passage therethrough communicating with the interior of one of the clamping elements and with the threads thereof.

12. In a sound instrument, a diaphragm, and edge gaskets therefor, one of said gaskets having a narrow breather passage therein.

13. In an instrument of the class described comprising a casing, a cap member, a diaphragm member, a central sound chamber, seating surfaces provided by said members, for said casing, cap and diaphragm of which at least one is a breather vent provided for cooperatively uniting the central sound chamber with the outer air.

14. In a sound instrument, a casing, a cap and a diaphragm, cooperative seating means for all and a gasket seat having one or more breather vents.

15. A sound instrument comprising a casing, a cap and a diaphragm, a vent in one of said parts, a central sound chamber, an escapement chamber, said vent uniting said central sound chamber with said escapement chamber.

16. A sound instrument of the class described comprising clamping members having each a diaphragm seat, a diaphragm for the same, an edge gasket, a narrower gasket arranged concentrically with said first mentioned gasket and secured thereby to the diaphragm.

17. A sound instrument of the class described comprising clamping members having each a diaphragm seat, a diaphragm, a central sound chamber, a gasket, a second gasket of narrower construction arranged concentrically with said first mentioned gasket, and a breather vent uniting the central sound chamber with the outer air.

18. In a sound producing instrument, the combination with a cap, a case, a diaphragm and seating means therefor, a central sound chamber, a thread chamber, and one or more vents uniting the thread chamber with the central sound chamber.

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