

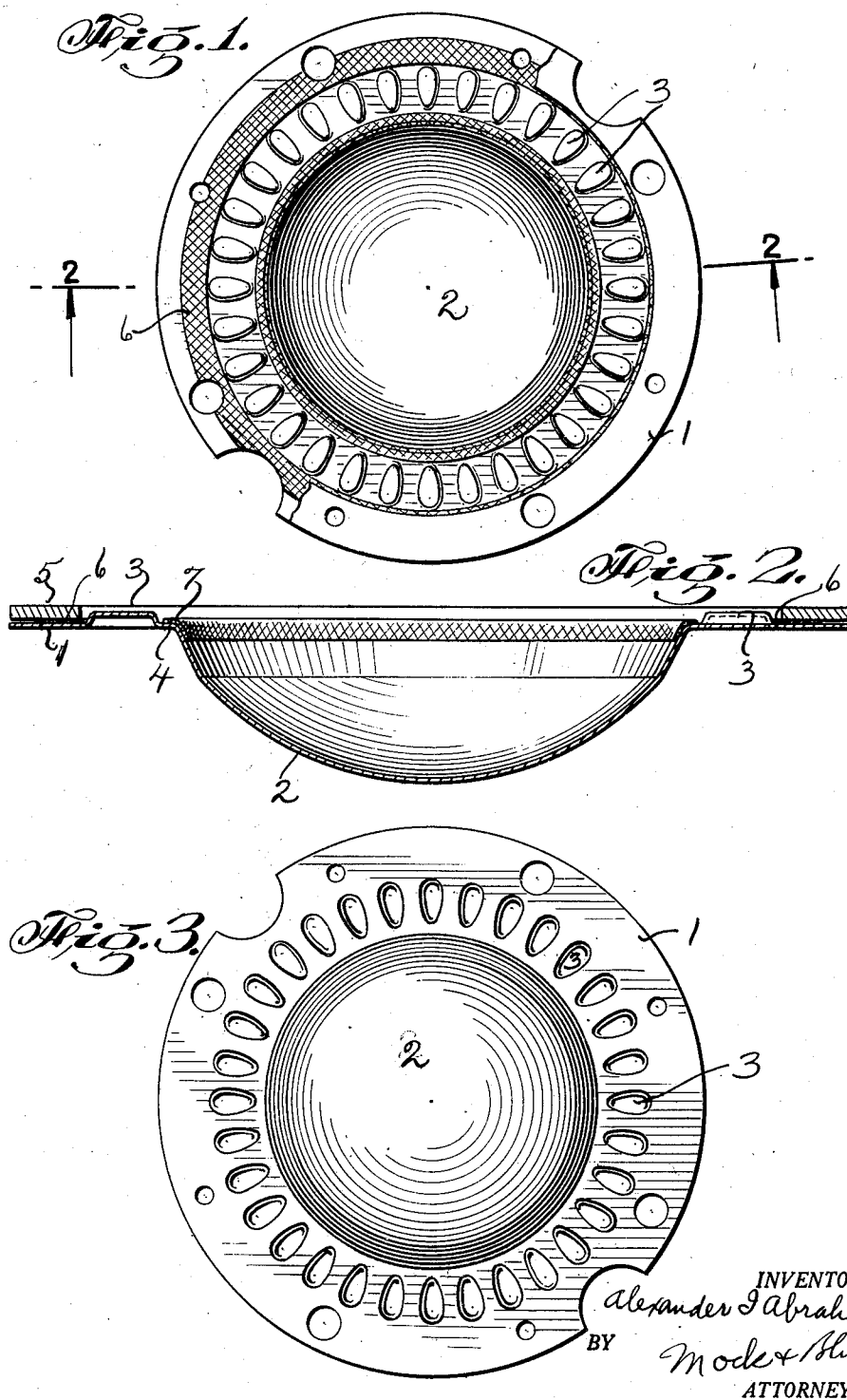
Nov. 17, 1931.

A. I. ABRAHAMS

1,832,608

DIAPHRAGM FOR ACOUSTIC DEVICES

Filed Nov. 12, 1930



UNITED STATES PATENT OFFICE

ALEXANDER I. ABRAHAMS, OF NEW YORK, N. Y.

DIAPHRAGM FOR ACOUSTIC DEVICES

Application filed November 12, 1930. Serial No. 495,147.

My invention relates to a new and improved diaphragm for acoustic devices.

One of the objects of my invention is to provide an improved diaphragm for reproducing devices of the electrodynamic type, in which the diaphragm is associated with a horn.

Another object of my invention is to provide an improved diaphragm of the type and for the purpose specified in U. S. Patent No. 1,711,514 issued May 7th, 1929, to Alexander I. Abrahams and Edward J. Jonssens, assignors to Dynamic Unit Corporation of America.

Another object of my invention is to provide an improved diaphragm of the type and for the purpose specified in U. S. Patent No. 1,711,514 which shall be of an improved all-metal construction.

Other objects of my invention will be set forth in the following description and drawings which illustrate a preferred embodiment thereof, it being understood that the above general statement of the objects of my invention is intended merely to generally explain the same and not to limit it in any manner.

Fig. 1 is a top view.

Fig. 2 is a sectional view on the line 2—2 of Fig. 1.

Fig. 3 is a view similar to Fig. 1 showing a modification.

It has heretofore been proposed to manufacture very light all-metal diaphragms for loud speaker horns, said diaphragms being made of very thin metal, such as duralumin, whose thickness is .002 of an inch. When such all-metal diaphragms were clamped at their peripheries, their lightness caused them to have a natural or free period of vibration which was above the ordinary audible limit. However, the manufacture of such all-metal diaphragms has been attended with great manufacturing difficulties so that the cost of these diaphragms was very high due to the large percentage of defective articles.

It has been proposed to provide these diaphragms with circumferential or annular corrugations in order to impart the necessary flexibility to the portion of the diaphragm

which is bent when the diaphragm is vibrated. However, such construction was delicate and expensive to manufacture.

As shown in Fig. 1, the diaphragm is provided with an annular peripheral portion 1, and with a dome-shaped central portion 2. The flat peripheral portion 1 is connected to the central dome-shaped portion 2, by means of an intermediate integral annulus which is provided with a series of radially directed bosses 3 which are formed by suitably stamping the metal. I do not wish to be limited to the use of radially directed bosses, or to the use of bosses of any particular shape, or to any particular grouping or arrangement or size of bosses. The essential idea involved is replacing the continuous circumferential corrugations which have hitherto been thought necessary by spaced portions which are stiffer than the remainder of the flange of the diaphragm so that a circumferential bending zone or zones is provided. The bosses 3 are separated from the edge of the dome-shaped portion 2, by means of an intermediate annular portion 4. The longitudinal contour of each boss 3 is substantially oval, the narrow end being adjacent the dome-shaped portion 2. The entire device is stamped out of a single sheet of thin metal, which may consist of a suitable aluminum alloy, the thickness of this sheet being .002 of an inch. This diaphragm is connected to a holder by means of a suitable clamping member 5, which abuts the peripheral portion 1.

As shown in Fig. 2, the inner edge of this clamping member 5 is spaced from the outer ends of the bosses 3.

The edge portion 1 of the device may be strengthened, in order to prevent it from cracking, by means of a reinforcing member 6. This reinforcing member 6 may be made of any suitable fabric, such as silk, cotton, linen, or the like, and this fabric is suitably impregnated with a lacquer, and this lacquer also serves as an adhesive to connect the reinforcing annular member 6 to the device. Part of the annular reinforcing member 6 is shown as being broken away in Fig. 1,

in order to more clearly illustrate the structure of the edge of the diaphragm.

The junction between the dome-shaped portion 2, and the inner annulus 4 may also be reinforced by a bent annular reinforcing member 7, whose construction may be similar to that of the reinforcing member 6.

I have not shown the coil for actuating the diaphragm, or the method of mounting this coil upon the diaphragm, as these details are shown in said U. S. Patent No. 1,711,514. Likewise, the invention is not necessarily limited for use in a loud speaker horn of the electrodynamic type.

In the embodiment shown in Fig. 3, the reinforcing members 6 and 7 are omitted.

The operation of this device is as follows:

The central part of the diaphragm is caused to vibrate by any suitable actuating device, so that the diaphragm vibrates in order to reproduce the desired sound. The dome-shaped portion 2 gives the central portion of the diaphragm the necessary rigidity so that this dome-shaped portion 2 vibrates as a unit in a piston-like manner, although the entire diaphragm is made of thin sheet metal of uniform thickness. The bosses 3 stiffen the diaphragm, so that it bends at the annulus 4 thereof, and it is also free to bend at that portion of the annulus 1, which is not directly clamped by the holding member 5.

As shown in Fig. 2, the holding or clamping member 5 is slightly narrower than the flange 1. However, the main bending effect is secured at the annulus 4, and the width of the clamping member 5 may be made substantially equal to the width of the member 1 up to the outer ends of the bosses 3, without departing from the invention. However, I prefer to permit the diaphragm to bend along two circumferential lines or zones between which the radially directed bosses 3 are located.

The diaphragm is thus caused to have a natural rate of vibration which is above the ordinary audible range, and it is not necessary to form the diaphragm with circular corrugations, so that the cost of manufacturing is considerably lessened, and the danger of cracking is also minimized.

While I prefer to make the central portion of the diaphragm dome-shaped in order to stiffen this portion thereof, so that it can vibrate in a piston-like manner, I do not wish to be limited to any particular shape or construction for this purpose, as the essential idea of the invention is to provide a bending zone or bending zones without being required to form circular corrugations. It will be noted that the diaphragm has a portion thereof which is between the bosses 3 and the central portion 2 of said diaphragm. This intermediate portion of the diaphragm is

substantially planar, in that it is free from a circumferential rib. When I refer to this intermediate portion of the diaphragm as being substantially planar (in the claims), I do not wish to limit the shape to an absolutely flat or planar shape, as this expression is intended to distinguish the structure shown herein from prior art devices in which this intermediate portion was provided with a sharply defined rib.

The method of assembly of the improved diaphragm, with the remaining parts of an electro-magnetic driving unit, may be of the type shown in said U. S. Patent No. 1,711,514.

I have shown a preferred embodiment of my invention, but it is clear that numerous changes and omissions can be made without departing from its spirit.

I claim:

1. A diaphragm for an acoustic device comprising a central portion which is adapted to vibrate in a piston-like manner, and an edge portion, said edge portion having spaced and relatively stiffened portions, the inner ends of said relatively stiffened portions being spaced from said central portion, that portion of the diaphragm which is intermediate the central portion of the diaphragm and the inner ends of said relatively stiffened portions being substantially planar.

2. A diaphragm for an acoustic device comprising a central portion which is adapted to vibrate in a piston-like manner, and an edge portion, said edge portion having spaced and relatively stiffened portions, the inner ends of said portions being spaced from said central portion and the outer ends thereof being spaced from the outer edge of said edge portion, that portion of the diaphragm which is intermediate the central portion of the diaphragm and the inner ends of said relatively stiffened portions being substantially planar.

3. A diaphragm for an acoustic device comprising a central offset portion which is adapted to vibrate in a piston-like manner, and an edge portion, said edge portion having spaced bosses which are substantially radially directed, the inner ends of said bosses being spaced from said central portion, that portion of the diaphragm which is intermediate the central offset portion thereof and the inner ends of said bosses being substantially planar.

4. A diaphragm for an acoustic device comprising a central offset portion which is adapted to vibrate in a piston-like manner, and an edge portion, said edge portion having spaced and relatively stiffened portions which are non-circumferential and which are located between the inner and outer edges thereof, that portion of the diaphragm which is intermediate the central portion of the di-

aphragm and the inner ends of said relatively stiffened portions being substantially planar.

5 5. A diaphragm for an acoustic device comprising a central offset portion which is adapted to vibrate in a piston-like manner, and an edge portion, said edge portion having spaced and relatively stiffened portions which are non-circumferential and which are
10 located between the inner and outer edges thereof, said relatively stiffened portions comprising bosses which are substantially radially directed, that portion of the diaphragm which is intermediate the central
15 portion of the diaphragm and the inner ends of said relatively stiffened portions being substantially planar.

6. A diaphragm for an acoustic device comprising a central offset portion which is
20 adapted to vibrate in a piston-like manner, and an edge portion, said edge portion having spaced and relatively stiffened portions which are non-circumferential and which are located between the inner and outer edges
25 thereof, said relatively stiffened portions comprising tapered bosses which are substantially radially directed, the narrow ends of said tapered bosses being adjacent said central portion, that portion of the diaphragm
30 which is intermediate the central portion of the diaphragm and the inner ends of said relatively stiffened portions being substantially planar.

35 In testimony whereof I affix my signature.
ALEXANDER I. ABRAHAMS.

40

45

50

55

60

65