March 19, 1946. L. R. BURROUGHS 2,396,825

DIAPHRAGM-ENGAGING RING

Filed Oct. 8, 1943

FIG. 1.

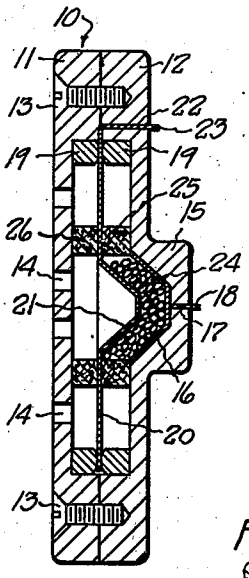


FIG. 2.

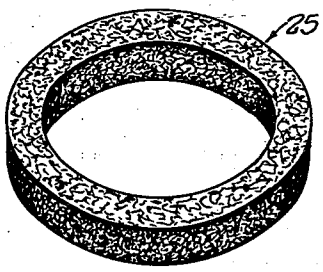
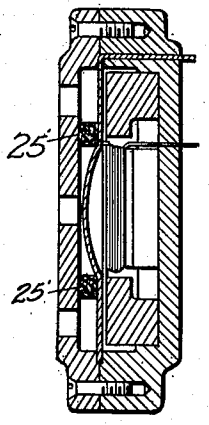


FIG. 3.



LOUIS R. BURROUGHS.
INVENTOR.
BY Attach & Woblock.
Attorneys.

Patented Mar. 19, 1946

2,396,825

UNITED STATES PATENT OFFICE

2,396,825

DIAPHRAGM-ENGAGING RING

Louis R. Burroughs, South Bend, Ind., assignor to Electro-Voice Manufacturing Co., Inc., South Bend, Ind., a corporation of Indiana

Application October 8, 1943, Serial No. 505,432

7 Claims. (Cl. 179—180)

This invention relates to a diaphragm-engaging ring. More particularly, the invention relates to the ring of a sound transmitting or translating device of the carbon granule type which serves to confine the granules in operative relation to the diaphragm and cooperating conductor of the device.

The position of this granule retaining ring spanning the space between the diaphragm and a wall of the housing of the device, and its engagement with the central portion of the diaphragm, makes it a critical part of a sound translating device. Certain properties and combinations of properties are essential for a successful ring. Thus, its damping effect upon the diaphragm must be limited, which necessitates properties of compressibility, liveliness and resilience. It must maintain these properties without change for long periods of time, preferably as long as the life of the sound translating device in which it is used. Also it should have a discontinuous engagement with the diaphragm and should not be subject to packing or breaking down in response to vibration. Rings of many different materials have been used in sound translating devices and have been found to possess some only of these properties in different degrees. It is the object of this invention to provide a ring which possesses all of these properties in acceptable degrees to provide constant high efficiency for long periods.

In the drawing:

Fig. 1 is a transverse sectional view of a microphone illustrating the use of the ring.

Fig. 2 is a perspective view of the ring.

Fig. 3 is a transverse sectional view of a dynamic microphone illustrating the use of the ring therein.

Referring to the drawing, which illustrates application of the invention to a microphone, the numeral 10 designates a microphone housing formed of front part 11 and rear part 12, each of dished or cup-shaped form and registering and engaging at the margins of the dished surfaces thereof. Screws 13 or like securing means hold the parts in operative interconnected and engaging relation. Front part 11 has openings 14 therein for passage of sound or other audible signal waves therethrough. Rear part 12 has a central deepened recess therein accommodated by a central projection or thickened part 15. A metal plate or button 16 lines said recess and has a conductor 17 connected therewith and projecting through the adjacent housing wall to project therefrom and provide a terminal 18.

A ring or other endless member 19 is seated solidly in each housing part at the outer portion of the housing cavity, said rings being similar and in registration. A diaphragm 20 is marginally engaged between said rings and lies substantially in the parting plane of the housing. Diaphragm 20 is preferably a thin flat metal disc capable of vibration responsive to sound waves impinging thereon, and has a central integral off-set portion 21 of a shape generally complementary to button 16 and projecting into said button but spaced therefrom. A lead 22 is connected to and projects from the outer portion of the diaphragm, and passes through the wall of a housing part to provide a terminal 23.

Granular conductive material 24, such as carbon granules, occupies the space between the diaphragm 20 and the button 16 and engages said spaced parts. These granules are retained or confined in operative relation to their cooperating opposed parts 16 and 20 by a retainer ring 25 coaxially arranged relative to said parts and spanning the space between said diaphragm and the inner face of the rear housing part. A similar ring 26 in register with ring 25 may span the space between the diaphragm and the inner face of the front housing part to balance the action of ring 25 on the diaphragm. Each of the rings 25 and 26 is formed from glass fibers interlaced and bonded in a body having myriad communicating voids or interstices throughout and commonly known as "fiber glass." The rings may be secured in place by adhesive means or by providing retaining means therefor in the housing.

The rings 25 and 26 are particularly well suited for their purpose. The myriad fine or minute flexible glass fibers, suitably bonded, which form the body give it a discontinuous structure having myriad communicating voids throughout. Also, the body has inherent springiness, a good response to vibration, and the property of returning to normal shape after compression. The glass filaments are not subject to decomposition with age, nor are they subject to fatigue and loss of resilience from long continued usage. The stresses imposed thereon, being limited to those exerted by the diaphragm in vibrating responsive to sounds, impulses or like signals, are small, and the housing protects the rings from greater stresses, so the rings are not subject to crushing stresses which would fracture the filaments. The filament structure of the body provides for myriad minute points of engagement or pressure between the diaphragm and the body. Hence damping of diaphragm vibrations incident to the engagement of the rings therewith is limited and the diaphragm operates with a high degree of efficiency. Also, while the

body is not solid, its voids and interstices are so small that the carbon granules are effectively retained therein.

In some applications it may be found that the fiber glass ring body does not afford ample vibration-damping action on the diaphragm. For such applications a sized fiber glass body whose compressibility is reduced may be employed. Thus, the fiber glass may be dipped in a suitable solution which will adhere to the individual fibers under conditions which prevent filling of the voids or interstices between the fibers. One such solution is a vinyl resin, such as "Vinylite," which is used under conditions entailing maintenance of fluid condition thereof after dipping of fiber glass therein until all thereof, except that adhering to and forming a thin coating on individual fibers, drains or is removed from the body, as by air blast means. The sizing of the fiber glass produces a snubbing action upon the fibers and the fibrous body which affords the requisite vibration-damping properties.

Where the fiber glass body is adhered to a support, care must be taken to avoid filling of the interstices of the body by the adhesive. Thus a thick bodied cement not subject to capillary flow in the interstices or voids of the body should be used. Certain types of thick bodied plastic cements which possess these qualities are readily available commercially.

While the invention has been illustrated and described as applied to translating devices of the carbon granule type, its use is not limited thereto. Thus, by selecting fiber glass whose filaments are exceedingly fine, as in the range of one to ten microns fiber thickness, and cutting the same in ring or other suitable form, a member **25'** can be provided which is suitable for use as a damping agent in connection with transmitting devices, such as microphones, of the dynamic type, as illustrated in Fig. 3. Damping means for such devices must be responsive to minute pressures or vibrations, of a character much smaller than those experienced in carbon granule instruments, for which purpose the fine fiber glass mentioned above is peculiarly suited.

I claim:

1. A ring-like member for engaging a diaphragm and retaining granular conductive material between a diaphragm and a conductor in a sound translating device, comprising a preformed body formed of fine resilient filaments of non-conducting material bonded to form a springy structure having myriad communicating voids throughout.

2. A diaphragm-damping member for use in a sound translating device, comprising a preformed body of bonded fiber glass having filaments of a thickness in the order of from one to ten microns, said body being characterized by a high degree of resilience and by myriad communicating voids throughout.

3. A diaphragm-engaging member for use in a sound translating device, comprising a preformed body of fiber glass whose filaments are sized with plastic material to increase resistance of the fiber glass to compression.

4. A diaphragm-engaging ring for use in a sound translating device, comprising a preformed body formed of fine bonded individually resilient filaments of non-conductive material and characterized by myriad minute spaced surface-defining portions and by the properties of compressibility and immediate return to normal shape after compression.

5. A granule retaining ring for engaging a diaphragm in a sound translating device of the carbon granule type, comprising a preformed body formed of thin flexible glass fibers bonded together and characterized by resiliency and substantially non-damping response to vibrations in the audible frequency range of a member engaged thereby.

6. A diaphragm-damping ring for use in a sound translating device, comprising a preformed body of thin flexible glass fibers bonded together and individually coated with a thin layer of plastic material, said body having myriad voids and interstices throughout.

7. The combination with a microphone of the dynamic type having a housing provided with a chamber receiving a diaphragm, of a preformed shape retaining body of bonded fiber glass in said chamber and engaging said diaphragm.

LOUIS R. BURROUGHS.