April 29, 1930. W. F. SMITH, JR., ET AL 1,756,705

VOICE SCREEN

Filed Oct. 29, 1927

FIG. 1

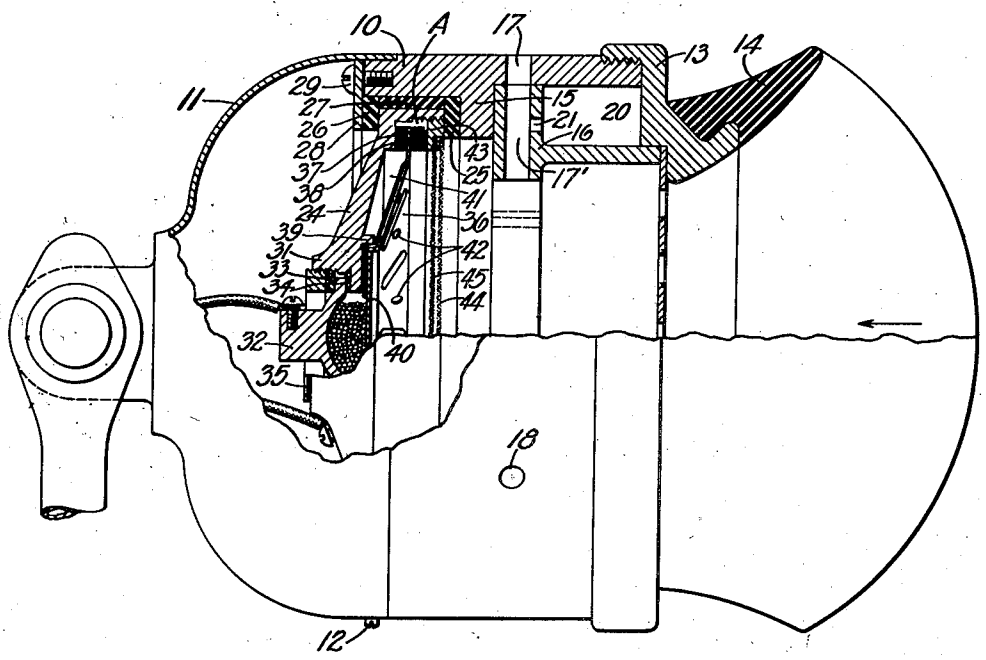
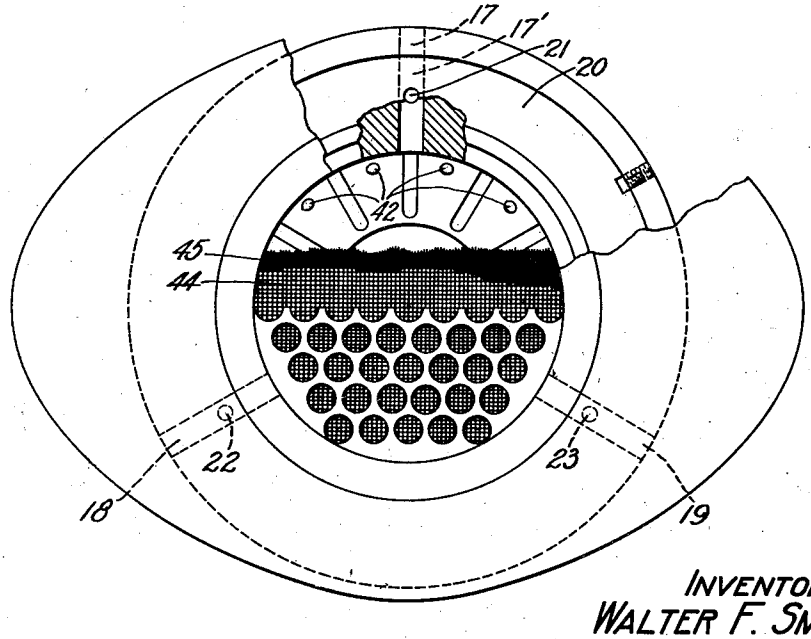


FIG. 2



INVENTORS
WALTER F. SMITH, JR.
THEODORE H. CRABTREE
BY Irving MacDonald
ATTORNEY

Patented Apr. 29, 1930 1,756,705

UNITED STATES PATENT OFFICE

WALTER F. SMITH, JR., OF NEW YORK, AND THEODORE H. CRABTREE, OF NEW BRIGHTON, NEW YORK, ASSIGNORS TO BELL TELEPHONE LABORATORIES, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

VOICE SCREEN

Application filed October 29, 1927. Serial No. 229,558.

This invention relates to voice screens and is an improvement over the type disclosed in Patent No. 1,688,995 of Oct. 23, 1928, to W. F. Smith, Jr.

In the voice screen or muffler of said application, a system of acoustic filters is provided whereby sound waves of high frequencies, which would be intelligible to persons in the vicinity of the user, are suppressed and those of low or unintelligible frequencies are exhausted in the atmosphere.

In these devices, due to the fact that the speaker talks directly into the mouthpiece, and that most of the energy is contained in sounds below 350 cycles per second, the volume efficiency or A. C. output has been found to be too high in that range of frequencies, which materially affects the quality of transmission, by rendering the sounds hollow at the receiver end of the telephone line.

While the provision of a high pass filter between the muffler and the transmitter diaphragm has been found to be satisfactory as far as speech transmission is concerned, such high pass filters increase the size of the muffler to an objectionable dimension and greatly increase its cost of manufacture.

It is the object of this invention to reduce the size of the muffler and its manufacturing cost.

In accordance with this invention the function heretofore performed by the high pass filter is accomplished by providing the diaphragm with a number of apertures leading to a chamber formed by the rear electrode and the diaphragm, these apertures at low speech frequencies permitting the pressure variations to be partially transmitted to the air chamber, whereas at high speech frequencies the inertia of the air in and around the apertures offers such a high impedance to the transmission of the pressure that the pressure equalizing effect referred to is practically zero at these frequencies.

Other features of the invention and advantages will appear from the following description and by the claims appended thereto, reference being made to the accompanying drawing in which:

Fig. 1 is a side view of the device partially in section; and

Fig. 2 is a front view of the transmitter showing a number of parts partially cut away.

This transmitter consists of a body ring 10, which is securely attached to an ordinary transmitter shell 11 by a number of screws 12. On the ring 10 is screwed a ring 13 which is provided with an outwardly flared ridge adapted to receive a mouthpiece 14 which may be made of rubber or any other yieldable material arranged to snap in position on the flared ridge of ring 13 as shown in Fig. 1.

In the middle portion of ring 10 there is provided a number of radially disposed holes 17, 18 and 19 shown in Fig. 2, which register with similarly sized holes 17′, 18′ and 19′ in a ring 16. Holes 17′, 18′ and 19′ in ring 16 connect directly with an annular chamber 20 by a number of holes 21, 22 and 23. Holes 17′, 18′ and 19′, and 21, 22 and 23 and chamber 20 thus formed, cooperate to form a low pass filter system of the type used in the muffler disclosed in the application above mentioned.

In ring 10, adjacent the bell 11, there is mounted a microphone which is supported and insulated from the ring 10 by rings 25, 26 and 27 which may be made of any suitable insulating material. Rings 25, 26 and 27 together with electrode 24 are held securely in adjusted position in ring 10 by means of ring 28 fastened on the ring 10 by a number of screws 29.

Electrode 24 is provided with an interiorly threaded portion 31 in which the electrode 32 is mounted and insulated therefrom by rings 33 and 34 and at its periphery by a circular air space as shown. Electrode 32 and insulating rings 33 and 34 are held in adjusted position by ring 35 screwed in the threaded portion 31 of electrode 24. In electrode 24 there is mounted a truncated cone shaped diaphragm 36 which is yieldably held at its periphery by a number of paper rings arranged to form pile-ups 37 and 38 disposed on each side of the diaphragm, and held in adjusted position therein by a metal ring 43 on which screens 44 and 45 are mounted.

Electrode 24 is provided with a circular ridge 39 adapted for holding a number of paper rings 40 in position coaxially with respect to the effective surface of electrode 24. These paper rings cooperate with the truncated portion of the diaphragm for holding the resistance varying material in the chamber formed by electrodes 24 and 32 and an insulating ring 34.

As shown in Fig. 1, electrode 24 including ridge 39 and the paper ring pile-up 37 cooperate with the diaphragm 36 to form a chamber 41 which connects with the interior of the muffler by a number of apertures 42.

At low speech frequencies the holes in the diaphragm permit the pressure variations to be partially transmitted to the air chamber behind the diaphragm and so bring about a partial equalization of the resultant pressure acting on the diaphragm. At high speech frequencies the inertia of the air in and around the apertures offers a large impedance to the transmission of the pressure to the space behind the diaphragm, the result of which is that the pressure equalizing effect is substantially zero at these frequencies. The total effect of the apertures is thus to diminish the effective driving force at low frequencies without affecting the operation of the device at high frequencies.

The degree of frequency discrimination in the action is dependent on the size of the apertures, which determines the inertia of the wave path through the diaphragm, and also upon the size of the air chamber behind the diaphragm, since a given flow of air through the apertures will build up a larger pressure in a small chamber than in a large one.

The dimensions which have been found suitable are .035″ for the diameter of the apertures, eight in number, located midway between the edge of the button and the periphery of the diaphragm, and .1 cu. in. for the volume of the chamber.

The leakage path formed around the edge of the diaphragm by the paper damping rings is of such high impedance compared to that afforded by the holes in the diaphragm that it may be ignored since it does not materially affect the operation of the device.

What is claimed is:

1. In a transmitter, a diaphragm having a number of apertures, and a sound chamber behind said diaphragm, said diaphragm being so perforated and the dimensions of said chamber being such as to cause the pressure at low speech frequencies to be partially transmitted to the chamber, and to offer such a large impedance to the high speech frequencies that the equalizing effect is substantially zero at such frequencies.

2. In a telephone transmitter, a mouthpiece, a microphone, a diaphragm for operating the microphone in response to sound waves impinged on said diaphragm, said diaphragm having apertures therein and a sound chamber behind said diaphragm, the size of the apertures and the dimensions of the chamber being such as to permit the pressure variations at low speech frequencies to be partially transmitted to the said chamber and so bring about a partial equalization of the resultant pressure acting on the diaphragm and at high speech frequencies offering a large impedance to the transmission of the pressure to the chamber.

3. A telephone transmitter comprising a pair of electrodes, resistance varying material in contact with said electrodes, a perforated diaphragm for actuating the resistance varying material, the size of the perforations in said diaphragm being such that the effective driving force of the air waves is diminished at low speech frequencies and not affected at high speech frequencies.

In witness whereof, we hereunto subscribe our names this 27th day of October, A. D. 1927.

WALTER F. SMITH, JR.
THEODORE H. CRABTREE.