

Oct. 6, 1942.

B. E. MILLS
SOUND REPRODUCING DEVICE

2,297,972

Filed Jan. 12, 1940

Fig-1

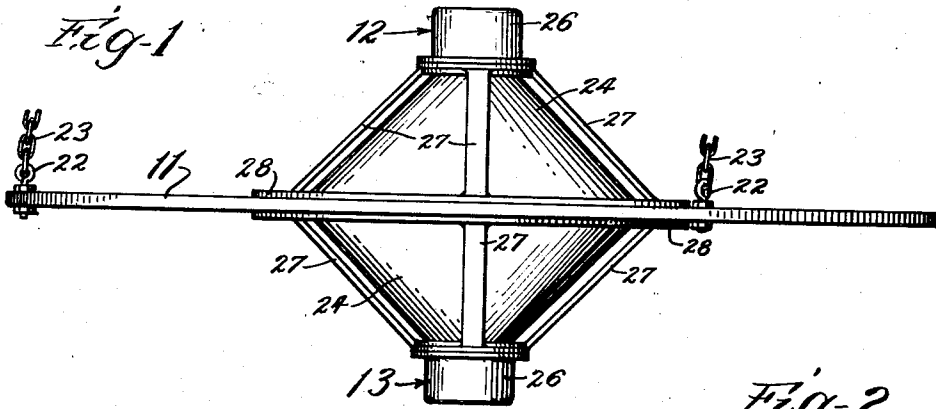


Fig-2

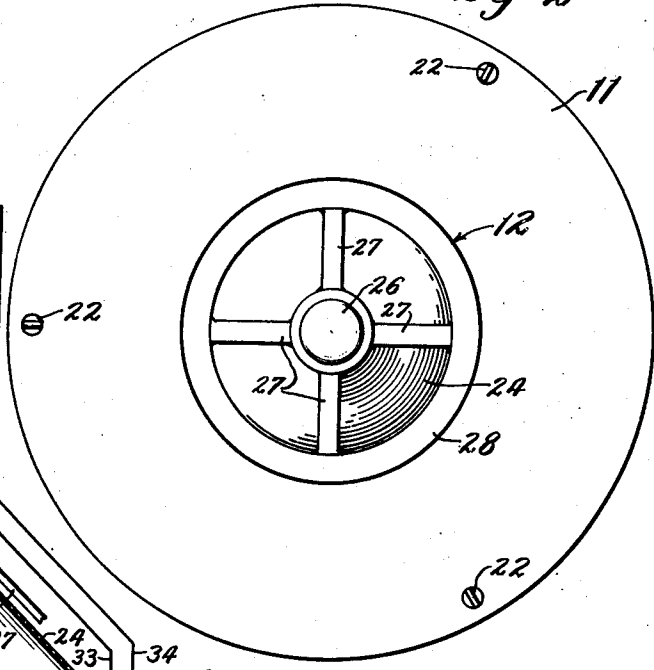
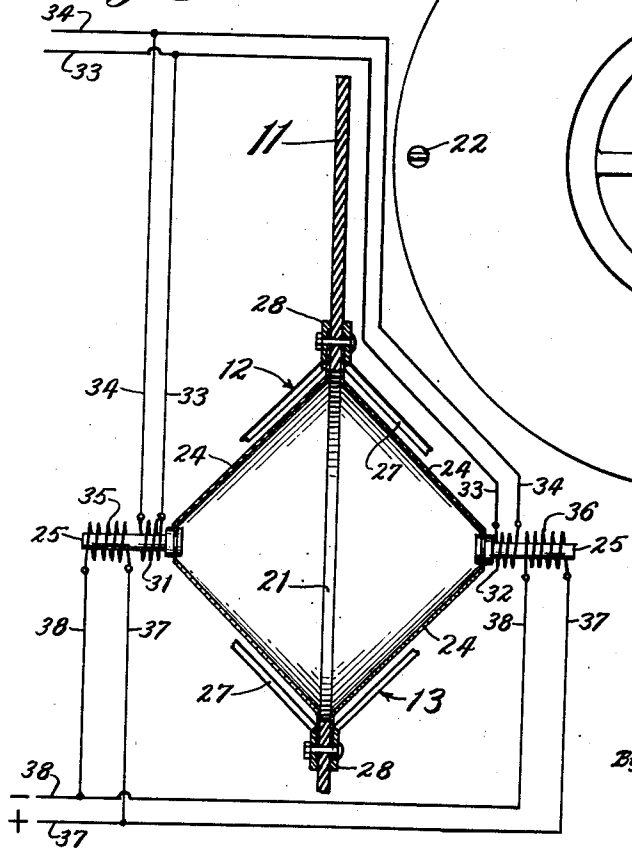


Fig-3



Inventor.
Bert C. Mills.
By Raymond V. Schmoor

Atty.

UNITED STATES PATENT OFFICE

2,297,972

SOUND REPRODUCING DEVICE

Bert E. Mills, Oak Park, Ill., assignor to Mills Novelty Company, Chicago, Ill., a corporation of Illinois

Application January 12, 1940, Serial No. 313,519

4 Claims. (Cl. 179-116)

This invention relates in general to a sound reproducing device and more particularly to such a device which is adapted for the reproduction and distribution of electrically transmitted sound.

An important object of the invention is to provide a nondirectional sound reproducing device or such a device which will effect a substantially spherical distribution of sound and does not distribute or direct sound waves in one general direction only.

A further object of the invention is to provide such a device which practically eliminates the high frequency beam effects found troublesome in ordinary devices provided for the purpose and which will effect a greater distribution of sound without material distortion such as is common in directional reproducing devices in common use.

Other objects will be apparent as the invention is better understood from the following description, which, taken in connection with the accompanying drawing discloses an embodiment thereof.

Referring to the drawing:

Figure 1 is an elevational view of a sound reproducing device embodying the invention.

Fig. 2 is a plan view of the device shown in Figure 1; and

Fig. 3 is a diagrammatic view illustrating details of construction and arrangement and the electrical connections for operating the device.

To illustrate the invention I have shown a support plate 11 and companion sound wave distributors 12 and 13 secured thereto in accordance with this invention.

The support plate 11 may be any suitable device to which the distributors 12 and 13 may be secured in accordance with this invention and to provide such a device I have shown an annular plate having a substantially central opening 21 therein and being of a somewhat larger diameter than the extreme dimensions of the distributors 12 and 13. The plate 11 may be formed of wood and suitable hardware may be connected thereto for directly supporting or suspending the device. In the present embodiment I have shown eye bolts 22 secured in radially spaced relationship near the periphery of the plate 11 to which suitable chains 23 or the like may be attached for suspending the device from above.

The distributors 12 and 13 may each include a sound amplifying and distributing cone 24 of a relatively flexible material, such as fibrous sheet material, to which a magnet core 25 is rigidly

secured, and a frame including a housing 26 and radially disposed supporting legs 27 which may be secured directly to a support such as the plate 11 or through an annular sealing band 28 as shown. However it is believed that fair results may be obtained by substituting a plain distributing cone of suitable form, size and material for one of the distributors.

Commercial cone speakers of either the magnetic or the dynamic type may provide the distributors 12 and 13 and accordingly I have shown speakers of the dynamic type in which electrically energized coils 31 and 32 are substituted for the permanent magnetic means for applying tension to the cores 25 used in magnetic speakers.

The coils 31 and 32 are electrically coupled in parallel by conducting wires 33 and 34 which may be extended to a remotely located source of supply.

Voice coils 35 and 36 indicated in Fig. 3 are mounted within the housings 26 and serve to effect movement of the cores 25 in response to electrically transmitted sound impulses received from a remote source through a positive wire 37 and returning through a negative wire 38. All movements of the cores 25 are transmitted to and amplified and distributed by the cones 24 because of their direct mechanical connections with the cores.

It has been found that the best results are obtained when the cones 24 and consequently the cores 25 are operated out of phase or when the oppositely disposed cones and cores operate in the same direction at all times and therefore, while the voice coils 35 and 36 are connected in parallel, the connections thereto are crossed so that electrical impulses flowing through the coils from the positive wire 37 to the negative wire 38 will tend to move the cores 25 in the same direction.

The perimeters of the distributing cones 24 are tightly sealed against the support plate 11 by the annular sealing bands 28 of the speakers and suitable bolts 41 or the like extending through the plate 11 and the sealing bands. The speakers are located so that the cones 24 thereof completely cover the opening 21 in the plate 11.

In operation, sound is electrically conducted through the wires 37 and 38 to the voice coils 35 and 36 where it is converted to mechanical movement and transmitted to the cones 24 in the usual manner except that the phase of the voice coils is reversed so that the cones will travel together to prevent material variations in the pressure of the air confined between the cones and

2

for coordinated amplifying and distributing action.

Sound waves of the highest frequencies are normally amplified at or near the center of a speaker of the cone type and are consequently only projected straight outwardly from the front and the back of the cone. As the frequency of the sound wave lowers more of the cone is affected to produce a greater distribution of sound until the maximum or long wave length sounds are transmitted through the cone to the support which in the present embodiment is arranged to act as a sounding board.

From the above it will be obvious that objectionable high frequency beam vibrations having a frequency of 3500 or more normally projected in a beam straight out in front of the speaker are projected directly into another speaker and gradually cancelled out by repeated reflection. On the outside of the cone these high frequency vibrations are cancelled out by obstruction since the housing 26 covers the central portion of the cone and therefore only sound waves having lower frequencies are emitted or distributed from the external surfaces of the cones 24.

Upon vibratory movement of a conical distributor sound waves are caused to move perpendicularly with respect to all points on the exterior surface of the cone and since the two cones 24, each one of which distributes sound throughout a semi-spherical area, are arranged to respond coordinately or to act together and some of the more base sounds are similarly distributed from the surfaces of the support plate 11 it will be apparent that operation of the device as above described effects a spherical or universal distribution of sound waves or a distribution thereof in all directions simultaneously or substantially nondirectionally.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction, and arrangement of the parts without departing from the spirit and scope of the invention, or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

What I claim and desire to secure by Letters Patent is:

1. A sound reproducing device comprising, means forming a sound board supporting plate having an opening therein, sound amplifying cones having their perimeters secured against said plate on the opposite sides thereof and covering the opening therein, and electrically operable sound reproducing means individualized to said amplifying cones and coupled in parallel whereby electrically transmitted sound may be reproduced and distributed.

2. A sound reproducing device comprising, means forming a supporting plate having an opening therein, sound amplifying cones secured against said plate on the opposite sides thereof and covering the opening therein, and electrically operable sound reproducing means individualized to said amplifying cones and coupled in parallel whereby electrically transmitted sound may be reproduced and distributed, said sound reproducing means each including a voice coil, one of which is electrically reversed to operate in opposite phase.

3. A sound reproducing device comprising, means forming a supporting plate having an opening therein, sound amplifying cones secured against said plate on the opposite sides thereof and covering the opening therein, and sound reproducing means coupled thereto whereby said amplifying cones are vibrated to generate sound, said sound reproducing means being arranged to vibrate the cones together and in the same direction and being arranged to cover a substantial portion of the apex of the cone for eliminating high frequency beam radiations by obstruction.

4. A sound reproducing device, comprising a coordinated arrangement of a plurality of cone type speakers and supports therefor, including a sounding board embraced between companion speakers, whereby high frequency beam radiations generated near the apex of the cones of the speakers and moving in opposite directions from the cones are eliminated in part by mutual cancellation and in part by obstruction after generation, said device including means arranged to cover a substantial portion of the apex of the cone for eliminating high frequency beam radiations by obstruction.

BERT E. MILLS.