Aug. 4, 1936. O. B. HANSON ET AL 2,049,586

SINGLE REFLECTOR TYPE MICROPHONE

Filed March 9, 1932 2 Sheets-Sheet 1

Fig. 1

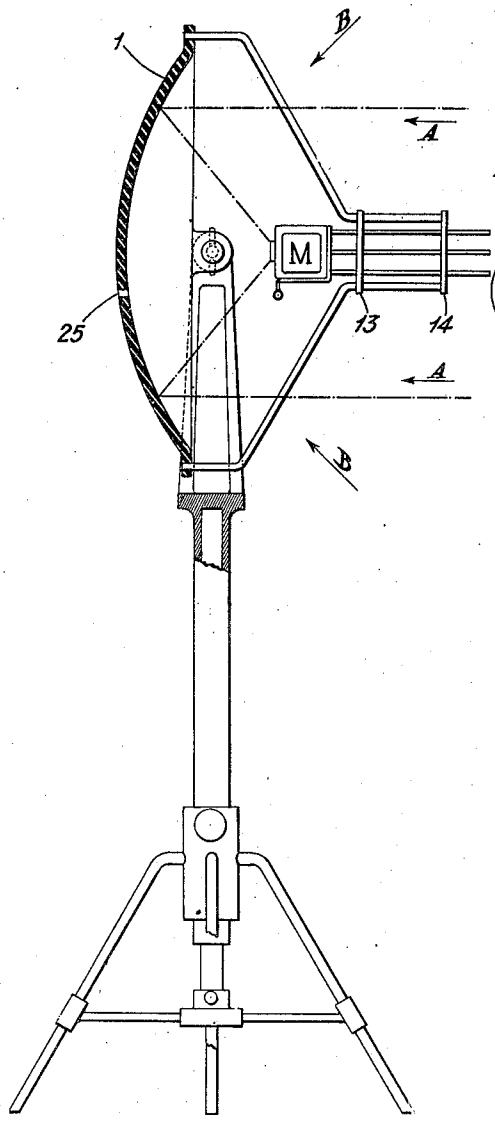
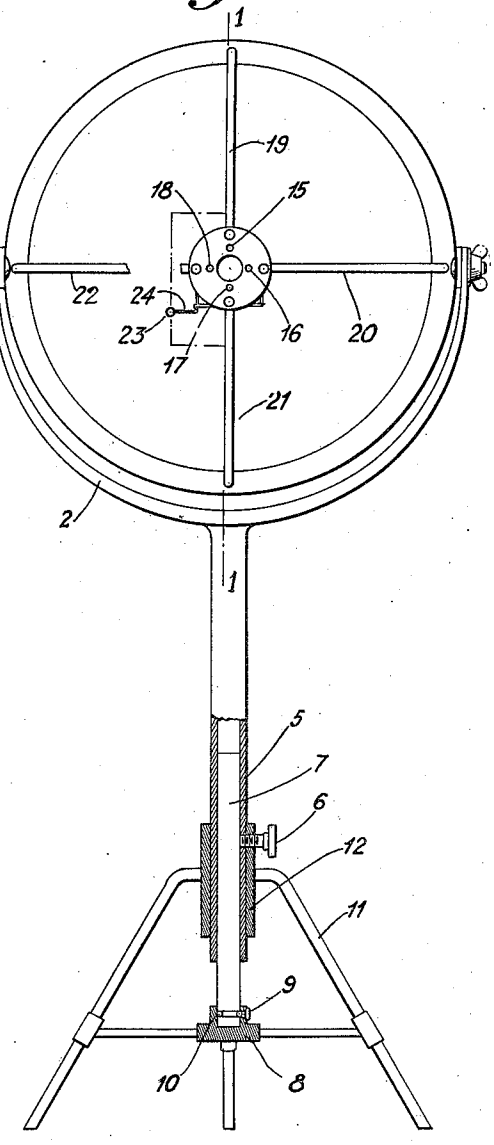


Fig. 2



INVENTORS
O. B. HANSON
ROBERT M. MORRIS

BY

ATTORNEY

Aug. 4, 1936. O. B. HANSON ET AL 2,049,586

SINGLE REFLECTOR TYPE MICROPHONE

Filed March 9, 1932 2 Sheets-Sheet 2

Fig. 3

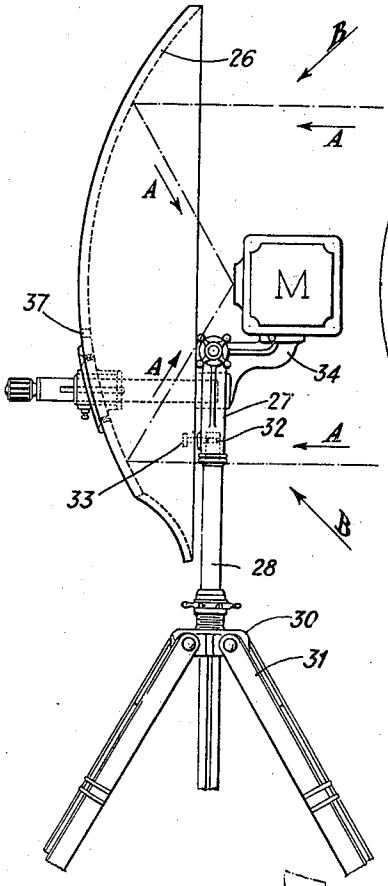


Fig. 4

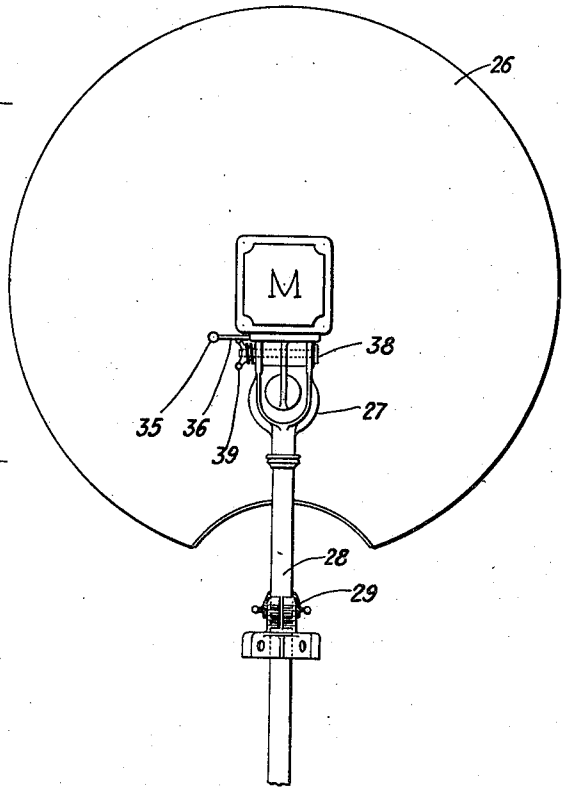
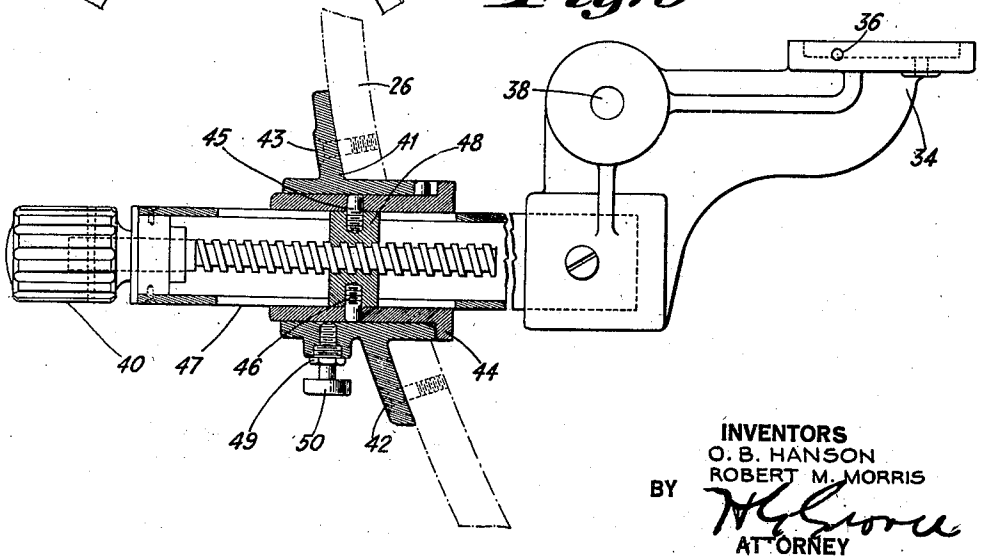


Fig. 5



INVENTORS
O. B. HANSON
ROBERT M. MORRIS

BY

ATTORNEY

Patented Aug. 4, 1936 2,049,586

UNITED STATES PATENT OFFICE

2,049,586

SINGLE REFLECTOR TYPE MICROPHONE

Oscar B. Hanson, Westport, Conn., and Robert M. Morris, Milburn, N. J., assignors to Radio Corporation of America, a corporation of Delaware

Application March 9, 1932, Serial No. 597,648

8 Claims. (Cl. 179—1)

This invention relates to a sound reflecting microphone and more particularly the type used in radio broadcasting.

An object of this invention is to simplify and improve microphones of the sound reflecting type.

Another object of this invention is to provide a portable sound reflecting microphone for picking up certain sound waves from a distant point excluding other surrounding and undesirable sound waves.

A feature of this invention is the novel means for determining the precise location of desired sound energy.

The present invention, it has been found, is more highly efficient than those heretofore employed. This is due to the arrangement of the apparatus whereby the sound waves received are reflected in concentrated form upon the microphone diaphragm thus causing an apparent amplification of the sound wave energy and an increase in the effectiveness thereof. When a reflector is not used the sound waves entering the microphone are scattered and only a portion of the available energy is utilized to effect the diaphragm of the instrument.

The reflector microphone of this invention operates on the principle that sound arriving at its surface in a beam parallel to the axis is reflected to its focal point at which position a microphone is located. With the microphone in this position the reflector is highly directional, materially increasing the amplitude of sound arriving in the direction of the reflector axis and effectively attenuating sounds from other directions. Removal of the microphone from the focus and locating it at some other point along the axis decreases the directional characteristic and broadens its angular response.

Heretofore sound reflectors have been used to demonstrate in a theoretical manner the utility of a device of this nature. The construction of these reflectors have in some cases been made of concrete, thus making them massive and cumbersome. Hence, they have not been used for any practical purpose. The reflector about to be described herein, is of such design, size and weight as to be readily portable and adapts itself for use outside the broadcasting studio, such as in a baseball park, football stadium, or the like.

With this improved reflector microphone, and more particularly, due to its sound directional properties, it may be used at distances from the source of sound energy without introducing the complications which sometimes are obtained with the ordinary microphone, namely, increased reverberations, loss of the higher frequencies, extraneous sounds, and distortion of tonal qualities due to selective absorption of the walls, ceiling, floors, etc.

In the drawings like reference characters refer to similar parts throughout the several views, in which,

Fig. 1 is a vertical cross section, this section being taken on lines 1—1 of Fig. 2;

Fig. 2 is a front elevation of the improved reflector;

Fig. 3 is a vertical cross section of an improved modification of a portable reflector type microphone;

Fig. 4 is a front elevation of the improved portable reflector microphone;

Fig. 5 is a view of the adjustable microphone stand with the adjusting means shown in section.

The invention of the studio type reflector microphone is best illustrated in Figs. 1 and 2, wherein the concave reflector 1, which is approximately 3 feet in diameter, is composed of impregnated fabric or any other satisfactory sound reflecting material. It is shaped in accordance with the curve of a section of a parabola ($y^2=44x$) rotated about its axis forming a paraboloid and is also provided with a flattened rim portion. This reflector is mounted upon a suitable pivoted supporting yoke member 2 which is pivoted at the center of the large reflector 1 by means of bolts 3 and wing nuts 4. Directly below the yoke member 2 there is an upright supporting post 5 which is adjustable for height by means of a telescoping post 7 and a set screw 6, and is rotated in a lower bearing 8 held in position by means of a set screw 9 which allows the posts 5 and 7 to rotate in a slot 10. The upright posts 5 and 7 are firmly secured to a stand 11 by means of a socket 12. A microphone M is supported by two metallic rings 13 and 14 which have four round rods 15, 16, 17 and 18 mounted thereon. These rods are slidably supported by means of four larger supporting rods 19, 20, 21 and 22 which fasten the microphone and adjustable rods to the flattened rim portion of reflector 1. For determining the precise location of the desired sound energy there is provided a sighting ball 23 which is fastened to the microphone by means of a rod 24. Directly in line with the ball 23 there is a small aperture 25 in the reflector 1, and the desired sound waves are picked up by sighting through the aperture 25 and lining up the ball 23 with the object of the desired energy source.

Referring now to Figs. 3 and 4 which are

modifications of an improved microphone particularly adapted for outdoor use, there is shown the reflector 26 adjustably mounted upon an upright yoke supporting member 27 which is fastened to an upright supporting post 28, and is adjusted in height by means of a clamping member 29 which is supported to a threaded member 30 terminating in an adjustable tripod 31. The yoke 27 and the post 28 are arranged to provide rotation of the reflector 26 by means of a slot 32 which is locked in position by means of a set screw 33. The microphone M is mounted upon a bracket 34 and is provided with a ball 35 which is supported by means of a rod 36. An aperture 37 is provided in the reflector 26 by the operator sighting through the aperture 25 and lining up the ball 23 with the object of which the desired directive sound pick-up is to be obtained. The microphone M and reflector 26 may be further adjusted by a pivot 38, and is clamped in position by means of a clamping member 39. To adjust the focusing distance between the microphone M and the reflector source 26 an adjustable screw thread 40 is provided, the reflector 26 being fastened to a suitable bracket 41 which is clamped by means of screws 42 and 43. This bracket is guided by means of a support 44 and pins 45 and 46 which are guided in a slot 47 in which a movable nut 48 is located. When the proper focal distance is obtained, the members 41 and 44 are locked in final position by means of nut 49 and screw 50.

Our improved microphone device functions briefly as follows:

With a microphone located at the focus, it will respond only to sounds arriving in a beam parallel to the axis as shown by the dotted lines indicated by the arrows A and impinging on the surface of the reflector. Other sounds arriving at an angle with respect to the axis as shown by the dotted lines and arrows B, will be reflected past the microphone and therefore will be ineffective. It is also apparent that this device will be a highly directional collector of sound energy. Laboratory measurements have shown it to be highly directional at the high frequencies, and becoming less directional at the lower frequencies. Since the area of the microphone diaphragm is effectively increased, it is apparent that some appreciable magnification of sound energy over that picked up by the microphone alone, will be obtained. Locating the microphone along the axis at positions other than the focal point, results in broadening the angular response which increases its utility, as its scope is not limited to a narrow beam which under normal conditions would be unsuitable for sound energy such as orchestral pick-ups. It is apparent that the reflectors may be constructed of any suitable material which can be formed to follow the shape of the desired curve and which has suitable density, thickness and diameter to reflect the desired band of audio frequencies. Likewise, the size and shape of the reflector may also be changed if it is felt desirable to increase the efficiency or to suit any particular circumstances, as for example, to obtain a responsive beam greater in width than in height such as, for example, the shape may be changed to follow the equation of a curve other than that of a parabola to secure any other response other than that obtainable with the reflector so described.

Although this invention has been described and illustrated, it is apparent that other modifications in its construction may be varied in order to obtain the desired results, and yet retaining the fundamental principles of this device within the spirit and scope of the appended claims.

We claim:

1. A directive sound responsive device comprising a concaved sound reflector having a curved section of a parabola ($y^2=44x$) rotated about its axis forming a paraboloid, a sound responsive microphone adjustably mounted at the focus thereof by a plurality of rods which are slidably supported by a ring-like member, said member secured by a plurality of rods fastened to the rim of said paraboloid.

2. A directive sound responsive device comprising a concaved sound reflector having a diameter in the order of three feet, and a curved section of a parabola ($y^2=44x$) rotated about its axis forming a paraboloid, a sound responsive microphone adjustably mounted at the focus thereof by a plurality of rods which are slidably supported by two ring-like members, said members secured by a plurality of rods fastened to the rim of said paraboloid.

3. A directive sound-responsive device, comprising a sound reflector, a sound-responsive microphone adjustably mounted at the focus thereof by means of a ring-like member which is secured by a plurality of rods, said ring-like member secured by a plurality of support rods centrally located on the outer rim of said sound reflector, and a portable stand for supporting said reflector and said responsive element.

4. A directive sound-responsive device, comprising a sound reflector having a sighting aperture, a sound-responsive element adjustably located at the substantial focus thereof by means of two ring-like members which are secured by a plurality of central support rods located on the outer rim of said sound reflector, said sound-responsive element having a plurality of rods sliding through said ring-like members with respect to said sound reflector to receive the desired sound energy.

5. A directive sound-responsive device, comprising a parabolic sound reflector having a flattened rim portion, a sound-responsive microphone adjustably mounted at the focus thereof by means of four central support rods located on the outer rim of said reflector, and a plurality of ring-like members having a plurality of apertures in which a plurality of rods are arranged to slidably support said sound-responsive microphone.

6. A directive sound-responsive device, comprising a parabolic sound reflector having a flattened rim portion, a sound-responsive microphone adjustably mounted at the focus thereof by means of four central support rods located on the outer rim of said reflector, and a plurality of ring-like members having a plurality of apertures, a plurality of rods fastened to said microphone to slidably support said sound-responsive microphone by sliding said rods through the aperture in said ring-like member.

7. A directive sound-responsive device, comprising a parabolic sound reflector having a flattened rim portion, a sound-responsive microphone adjustably mounted at the focus thereof by means of four central support rods located on the outer rim of said reflector, and two ring-like members centrally located with respect to said reflector and having four apertures and four rods fastened to said microphone to slidably support said sound-responsive microphone.

8. A directive sound-responsive device, comprising a parabolic sound reflector having a flat-

tened rim portion, a sound-responsive microphone adjustably mounted at the focus thereof by means of four central support rods located on the outer rim of said reflector, and two ring-like members centrally located with respect to said reflector and having four apertures and four rods fastened to said microphone to slidably support said sound-responsive microphone, and a portable stand for supporting said reflector and said microphone.

OSCAR B. HANSON.
ROBERT M. MORRIS.