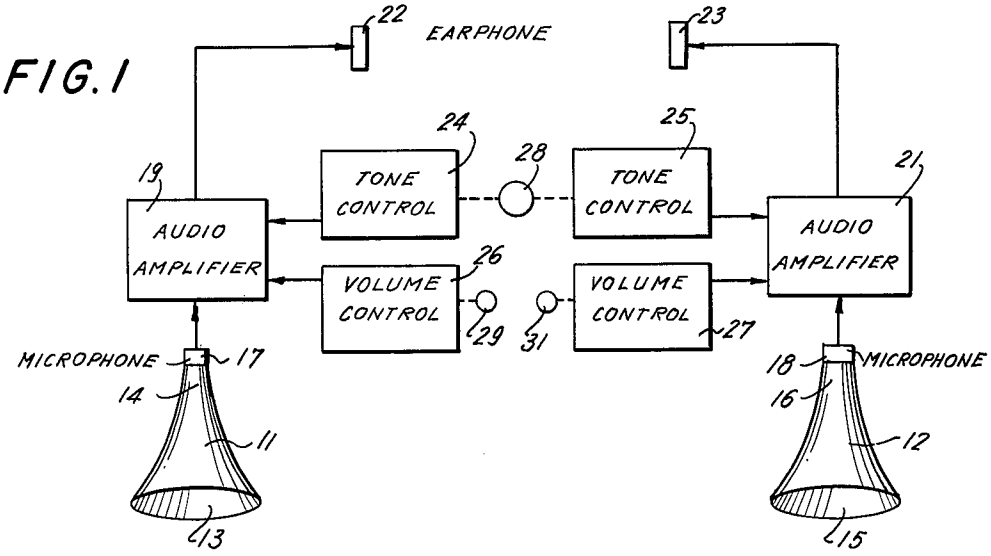
March 29, 1966 A. EATON 3,243,525

HEARING INTENSIFYING AND DIRECTING APPARATUS

Filed Nov. 13, 1962 2 Sheets-Sheet 1

FIG. 1



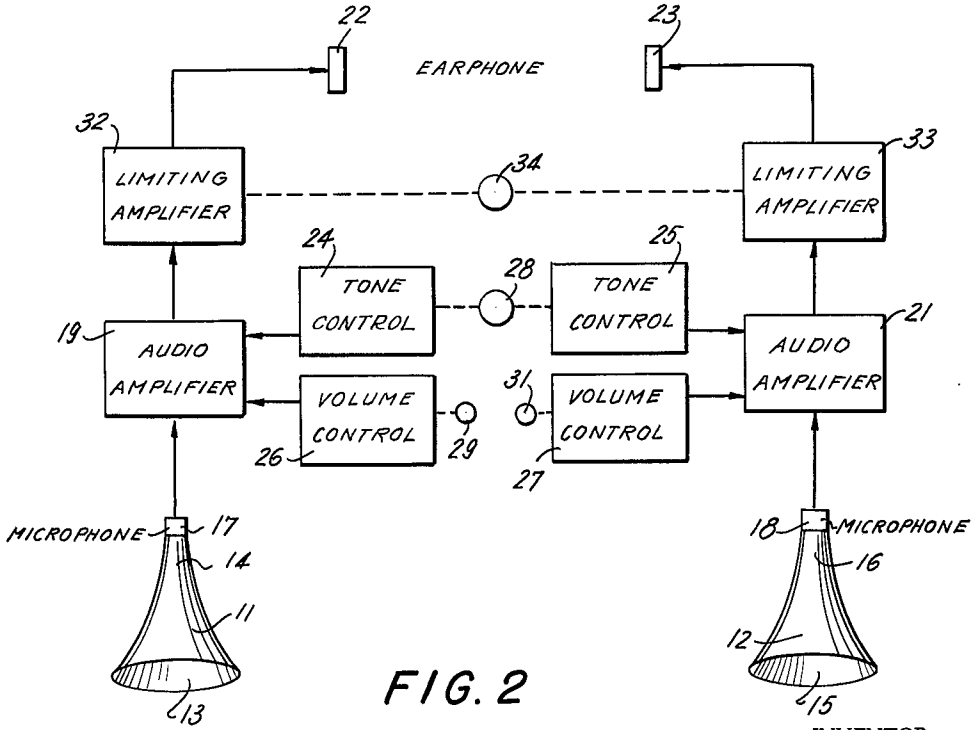


FIG. 2

INVENTOR.
Arthur Eaton

BY

Michael S. Striker
Attorney

March 29, 1966 A. EATON 3,243,525

HEARING INTENSIFYING AND DIRECTING APPARATUS

Filed Nov. 13, 1962 2 Sheets-Sheet 2

FIG. 3

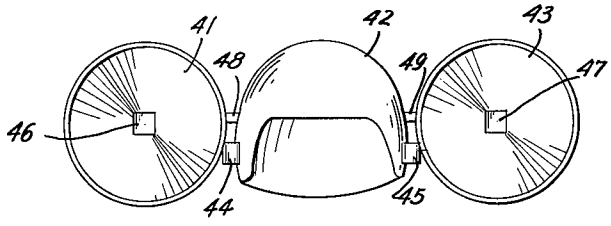
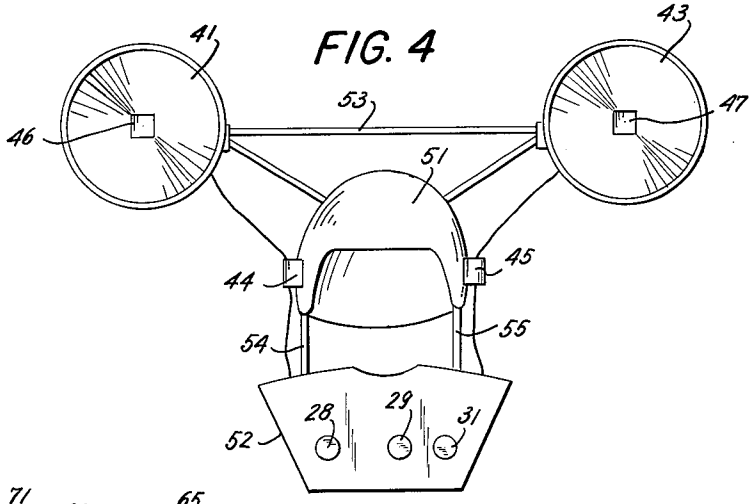


FIG. 4



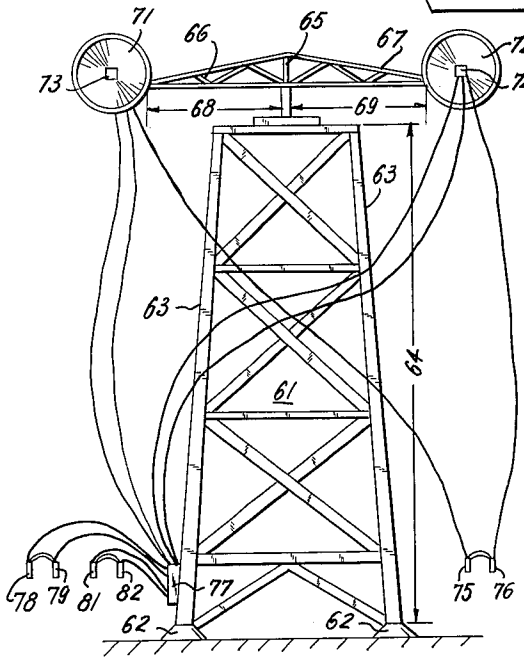


FIG. 5

INVENTOR.
Arthur Eaton

BY

Michael S. Striker

United States Patent Office 3,243,525 Patented Mar. 29, 1966

3,243,525

HEARING INTENSIFYING AND DIRECTING APPARATUS

Arthur Eaton, 117 Villard Ave., Hastings on Hudson, N.Y.

Filed Nov. 13, 1962, Ser. No. 236,790
1 Claim. (Cl. 179—107)

The present invention relates to hearing intensifying and directing apparatus. More particularly, the present invention relates to hearing intensifying and directing apparatus adapted to be worn by or supported on an individual or user to enable such individual to direct his hearing in desired directions and to considerably magnify desired sounds.

The principal object of the present invention is to provide new and improved hearing intensifying and directing apparatus.

An object of the present invention is to provide hearing intensifying and directing apparatus for considerably magnifying sounds or acoustic signals.

Another object of the present invention is to provide hearing intensifying and directing apparatus for magnifying desired sounds.

Another object of the present invention is to provide hearing intensifying and directing apparatus for enabling an individual or user to direct his hearing as desired.

Another object of the present invention is to provide hearing intensifying and directing apparatus for enabling an individual to magnify desired sounds.

Another object of the present invention is to provide hearing intensifying and directing apparatus for enabling an individual to magnify desired sounds and at the same time to discriminate against undesired sounds.

Another object of the present invention is to provide hearing intensifying and directing apparatus for enabling a group of individuals or users to magnify desired sounds and to direct their hearing.

Another object of the present invention is to provide hearing intensifying and directing apparatus which is of simple structure, but sturdy and lightweight.

Another object of the present invention is to provide hearing intensifying and directing apparatus which may be worn by or supported on an individual without difficulty.

Another object of the present invention is to provide hearing intensifying and directing apparatus for enabling an individual to magnify sounds in a selected range of frequencies.

Another object of the present invention is to provide hearing intensifying and directing apparatus which limits the intensity of sound which it magnifies to a predetermined level.

Another object of the present invention is to provide hearing intensifying and directing apparatus having manually controlled tone and volume control.

Still another object of the present invention is to provide hearing intensifying and directing apparatus of great efficiency which is inexpensive in manufacture.

In accordance with the present invention, hearing intensifying and directing apparatus comprises a pair of spaced acoustic directors mounted on opposite sides of head gear adapted to be worn by a user. Each of the acoustic directors has an open base area mouth and an apex area spaced from and opposite the open base area mouth. A microphone is positioned in the apex area of each of the acoustic directors and functions to convert audio signals to electrical signals. An audio amplifier is connected to each of the microphones for amplifying the electrical signals. Earphones are connected to each of the audio amplifiers and convert the amplified electrical signals to amplified audio signals so that the user hears

sounds picked up by the acoustic directors at considerable magnification.

In a preferred embodiment of the invention, a volume control is included in each audio amplifier. Also, a tone control is included in each audio amplifier and functions to control the frequency range of the electrical signals. A limiting amplifier is connected between each audio amplifier and its corresponding earphone and functions to limit the maximum volume of the electrical signals.

In order that the present invention may be readily carried into effect, it will now be described with reference to the accompanying drawings, wherein:

FIG. 1 is a schematic block diagram of an embodiment of the circuit arrangement of the hearing intensifying and directing apparatus of the present apparatus;

FIG. 2 is a modification of the embodiment of FIG. 1;

FIG. 3 is a view of an embodiment of the hearing intensifying and directing apparatus of the present invention utilizing a helmet adapted to be worn by a user;

FIG. 4 is a view of a modification of the embodiment of FIG. 4 utilizing a head piece comprising a head poriton and a chest portion adapted to be worn by or supported on a user; and

FIG. 5 is a view of another embodiment of the hearing intensifying and directing apparatus of the present invention which utilizes a supporting structure and which enables a group of users to simultaneously utilize the hearing intensifying and directing apparatus of the present invention.

In the figures, the same components are identified by the same reference numerals.

In the embodiment of FIG. 1, the hearing intensifying and directing apparatus of the present invention utilizes a pair of acoustic directors 11 and 12 of any suitable configuration, although substantially conical acoustic directors are preferable due to their more desirable front to back ratio. The acoustic directors 11 and 12 are preferably acoustic horns of any suitable configuration, such as, for example, exponential or conical horns, and are identical. The horn 11 has an open base area mouth 13 and an apex area 14 spaced from and opposite the open base area mouth 13. The horn 12 has an open base area mouth 15 and an apex area 16 spaced from and opposite the open base area mouth 15.

A microphone 17 is positioned in the apex area 14 of the horn 11 and functions to convert audio signals to electrical signals. A microphone 18 is positioned in the apex area 16 of the horn 12 and functions to convert audio signals to electrical signals. The directivity of the horns 11 and 12 permits a user of the apparatus of the present invention to pick up desired sounds or sounds in a desired area. A conical, or exponential, horn has a desirable front to back ratio since it accepts sound almost exclusively through its open base area mouth and negligibly from its sides or back.

In a basic embodiment of the hearing intensifying and directing apparatus of the present invention, an audio amplifier 19 is connected directly to the microphone 17 and functions to amplify the electrical signals produced by the microphone and an audio amplifier 21 is directly connected to the microphone 18 and functions to amplify the electrical signals produced by the last-mentioned microphone. The audio amplifier 19 is directly connected to an earphone 22 which functions to convert the amplified electrical signals produced by said audio amplifier to audio signals which are considerably amplified or magnified over the audio signals picked up by the horn 11 through its open base area mouth 13. The audio amplifier 21 is directly connected to an earphone 23 which functions to convert the amplified electrical signals produced by said audio amplifier to audio signals which are considerably

amplified or magnified over the audio signals picked up by the horn **12** through its open base area mouth **15**.

Thus, in a basic embodiment of the apparatus of the present invention desired sounds may be magnified considerably so that a user may hear very faint sounds. Furthermore, the apparatus is directional and may be directed to any area desired to be heard by the user, merely by movement of the horns **11** and **12**. The sound magnification is so great that ordinarily inaudible close and far sounds may be heard by the user.

In the embodiment of FIG. 1, a tone control **24** is connected to the audio amplifier **19** as part of said audio amplifier and a tone control **25** is connected to the audio amplifier **21** as part of said last-mentioned audio amplifier. The tone control functions to control the frequency range of the electrical signals and thereby controls the range of audio frequencies produced by the earphones **22** and **23** in known manner. This permits the user to restrict the field of sound magnified or to broaden the field of sound magnified by varying the tone or frequency range of the sound picked up by the horns **11** and **12**.

A volume control **26** is connected to the audio amplifier **19** as part of said audio amplifier and a volume control **27** is connected to the audio amplifier **21** as part of said last-mentioned audio amplifier. The volume controls function to control the volume of the electrical signals and thereby control the volume of the audio signals produced by the earphones **22** and **23** in known manner.

The audio amplifiers **19** and **21**, the tone controls **24** and **25**, the volume controls **26** and **27**, the horns **11** and **12**, the microphones **17** and **18** and the earphones **22** and **23** are all known components and may comprise any suitable arrangements known in the art.

The tone controls **24** and **25** include known components which are variable and which function to control the frequency range of the electrical signals fed through them. The variable components of the tone controls **24** and **25** are ganged together and controlled together by a manually operable knob or dial **28**. Thus, by turning the knobs **28**, the user may restrict the range of sounds reproduced in considerable magnification by the earphones **22** and **23** to low frequency sounds or to high frequency sounds.

The volume controls **26** and **27** include known components which are variable and which function to control the volume of the electrical signals fed through them. The variable components of the volume control **26** are controlled by a manually operable knob or dial **29**. The variable components of the volume control **27** are controlled by a manually operable knob or dial **31**. Thus, by turning the knob **29**, the user may control the volume of the sounds reproduced by the earphone **22** and by turning the knob **31**, the user may control the volume of the sounds reproduced by the earphone **23**.

The earphones **22** and **23** may, of course, comprise any suitable type of known electrical to audio signal transducer, such as, for example, ear plugs as used with hearing aids, or ear-covering earphones.

In the modification of FIG. 1, shown in FIG. 2, a limiting amplifier **32** is connected between the audio amplifier **19** and the earphone **22** and a limiting amplifier **33** is connected between the audio amplifier **21** and the earphone **23**. The limiting amplifiers **32** and **33** function to limit the volume of the audio signals produced by the earphones **22** and **23**. The limiting amplifiers **32** and **33** are well known components and may constitute any suitable arrangement known in the art.

The limiting amplifiers **32** and **33** include known components which are variable and which function to control the volume of the sound produced by the earphones **22** and **23**. The variable components of the limiting amplifiers **32** and **33** are ganged together and controlled together by a manually operable knob or dial **34**. The knob **34** thus provides volume limit control. Thus, by turning the knob **34**, the user may limit the maximum volume of the sound produced by the earphones to a predetermined amount. This prevents injury to the user by preventing the magnification of unusually loud sounds picked up by the horns and by limiting the reproduction of all sound by the horns to a predetermined maximum volume.

FIG. 3 is an embodiment of the hearing intensifying and directing apparatus of the present invention utilizing a helmet or hat adapted to be worn by a user. The helmet or hat serves to support the horns and components of the apparatus of the present invention in a manner which enables the user to freely direct the horns in any desired direction. In the embodiment of FIG. 3, an acoustic horn **41** is mounted on one side of the user's helmet **42** and an acoustic horn **43** is mounted on the other side of the user's helmet. Earphones **44** and **45** of the apparatus are supported by the helmet in proximity to the ears of the user. A microphone **46** is positioned in the apex area of the horn **41** and a microphone **47** is positioned in the apex area of the horn **43**. The audio amplifier, tone control, volume control and limiting amplifier components (not shown in FIG. 3) of the apparatus of the present invention are supported by either the helmet **42** or the horns **41** and **43**.

The acoustic horns **41** and **43** may be removably fastened to the helmet **42** by any suitable means, such as, for example, snaps **48** and **49**. The audio amplifier, tone control, volume control and limiting amplifier components of the apparatus may be supported by the horns in a combination compact unit, as known in the art.

The user need merely wear the helmet **42** on his head. The apparatus of the present invention then serves to give the user acute hearing and direction controlled hearing of an acuteness heretofore unknown. The horns **41** and **43** direct the sounds picked up from any direction in which the user turns his head to the microphones **46** and **47** and the audio amplifiers magnify the already horn-concentrated sound to a considerable degree before the earphones **48** and **49** reproduce the sounds picked up by the horns in their greatly magnified condition. The user may thus hear and distinguish very faint and distant sounds and becomes aware of the direction of origin of such sounds.

The two amplifier channels have identical phase charteristics so that the sound location in azimuth remains correct. If the phase of one amplifier channel differs from that of the other amplifier channel it would appear to the user that the sound has shifted in azimuth. If the horns were reversed, the sounds would seem to the user to come from directions shifted 180 degrees in azimuth. The earphones exclude sounds falling directly on the ear and accept only signals picked up by the horns.

Since the stereo effect or the sense of space or depth of sound depends upon the spacing between a user's ears, the stereo sense of the user is greatly enhanced by the apparatus of the present invention. This is due to the fact that the distance between the horns, thus the distance between the microphones, may be made considerably greater than the distance between the ears of the user. Thus, in FIG. 4, which is a modification of the embodiment of FIG. 3, the horns **41** and **43**, and thus their corresponding microphones **46** and **47**, are spaced from each other a greater distance than in the embodiment of FIG. 3.

In FIG. 4, a head piece comprises a helmet portion **51**, a chest portion **52** and a support bar **53** extending from the sides of the head piece. The horns **41** and **43** may be supported by either the helmet portion **51** or the chest portion **52** and the support bar **53** may extend from the sides of either said helmet portion or said chest portion. The support bar **53** may also be affixed to the top of the helmet portion **51**. The support bar **53** may be of any desirable length and may be supported at any desirable height above the helmet portion **51**. The helmet portion **51** and the chest portion **52** may comprise an integral unit with an aperture or visor therein or the chest portion may be affixed to the helmet portion by

suitable means such as side supports 54 and 55, or the helmet portion may be completely separate from the chest portion. The chest portion 52 supports the tone control knob 28 and the volume control knobs 29 and 31 in readily accessible position to the user, so that the user may control the range of sound and the volume of sound with facility. The audio amplifier, tone control and limiting amplifier components (not shown in FIG. 4) may be supported by either the helmet portion 51 or the chest portion 52.

In the embodiment of FIG. 5, the hearing intensifying and directing apparatus of the present invention is supported on a supporting structure or tower 61. The supporting structure comprises a base portion 62, a substantially vertical portion 63 extending a first predetermined distance 64 above the base portion 62, and a substantially horizontal portion 65. The horizontal portion 65 has opposite extremities 66 and 67 extending second predetermined transverse distances 68 and 69 respectively, from the vertical portion 63 and at least the distance 64 above the base portion 62.

In FIG. 5, an acoustic horn 71 is mounted on the extremity 66 of the horizontal portion 65 and an acoustic horn 72 is mounted at the extremity 67 of said horizontal portion. A microphone 73 is positioned in the apex area of the horn 71 and a microphone 74 is positioned in the apex area of the horn 72. The audio amplifier, tone control, volume control and limiting amplifier components of the apparatus (not shown in FIG. 5) are supported by either the horns or the structure, and the output is produced by earphones 75 and 76 which are worn by the user. The great height and the great separation of the horns and microphones enables the user to hear sounds over a considerably large area and to locate the direction of sounds with considerable accuracy.

A group of users could hear sounds by means of the apparatus simultaneously by utilizing a well known low impedance output 77 and connecting several sets of earphones, such as, for example, earphones 78 and 79 and earphones 81 and 82, to the output 77. For convenience, the low impedance output 77 is mounted at the base of the structure so that the various users may plug in or out as they wish. Any suitable means known in the art may be utilized to rotate or direct the apparatus in substantially horizontal and vertical planes.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention, and therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claim.

What is claimed as new and desired to be secured by Letters Patent is:

Hearing intensifying and directing apparatus comprising, in combination,

a supporting structure including a base portion, a substantially vertical portion extending a first predetermined distance above said base portion, and a substantially horizontal portion having opposite extremities extending second predetermined transverse distances from said vertical portion and at least said first predetermined distance above said base portion;

a pair of spaced acoustic horns mounted on the extremities of the horizontal portion of said supporting structure, each of said acoustic horns having an open base area mouth and an apex spaced from and opposite said open base area mouth;

a microphone positioned in the apex area of each of said acoustic horns for converting audio signals to electrical signals;

audio amplifying means connected to each of said microphones for amplifying said electrical signals, each of said audio amplifying means including tone control means for controlling the frequency range of said electrical signals and volume control means for controlling the volume of said electrical signals;

limiting amplifying means connected to each of said audio amplifying means for controlling the maximum volume of said electrical signals;

a low impedance output connected to each of said limiting amplifying means; and

a plurality of earphones connected to said low impedance output each for converting said amplified electrical signals to amplified audio signals.

References Cited by the Examiner

UNITED STATES PATENTS

1,907,723	5/1933	Bostwick	179—115.5
1,973,673	9/1934	Rice	181—0.5
2,166,991	7/1939	Guanella	181—26
2,930,858	3/1960	Hollingsworth	179—107
3,124,760	3/1964	Dykstra	179—107

FOREIGN PATENTS

862,452	12/1940	France.
971,273	7/1950	France.

KATHLEEN H. CLAFFY, *Primary Examiner.*

R. H. ROSE, *Examiner.*

F. N. CARTEN, *Assistant Examiner.*