

April 19, 1966

D. J. HINMAN

3,247,330

HEARING AID STRUCTURE

Filed June 30, 1961

2 Sheets-Sheet 1

FIG. 1.

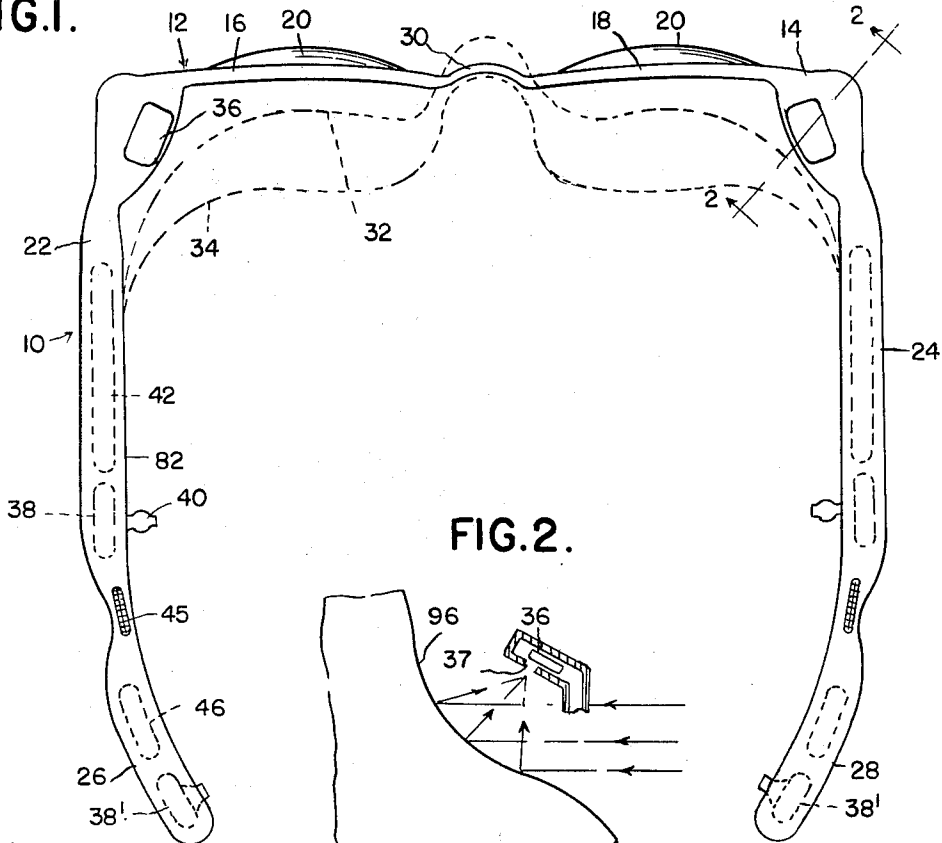


FIG. 2.

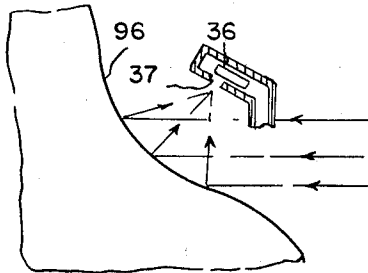


FIG. 3.

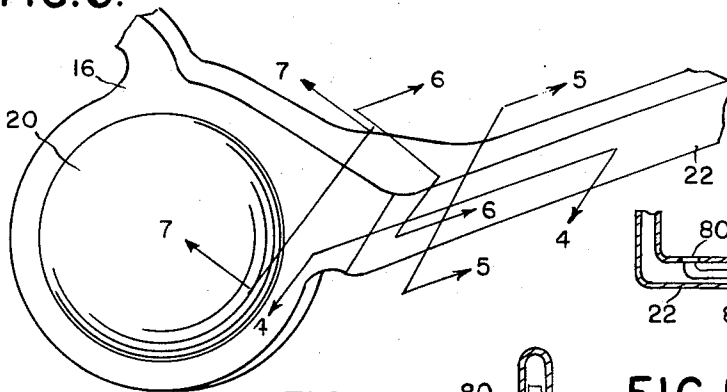


FIG. 4.

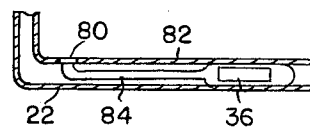


FIG. 6.

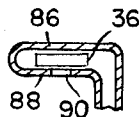


FIG. 5.

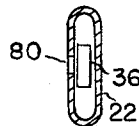
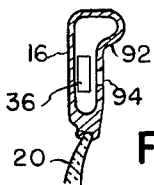


FIG. 7.

INVENTOR.
DORR J. HINMAN

BY *Whittemore, Kullback
& Belknap*
ATTORNEYS

April 19, 1966

D. J. HINMAN

3,247,330

HEARING AID STRUCTURE

Filed June 30, 1961

2 Sheets-Sheet 2

FIG. 9.

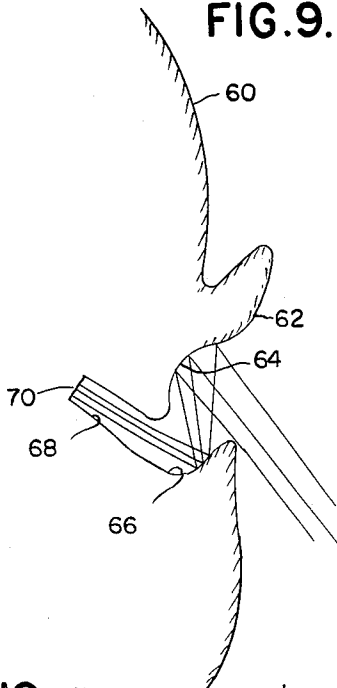


FIG. 8.

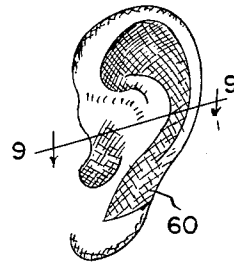


FIG. 10.

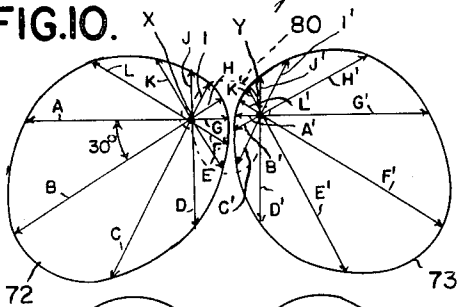


FIG. 12.

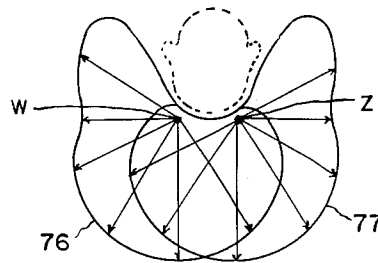


FIG. 11.

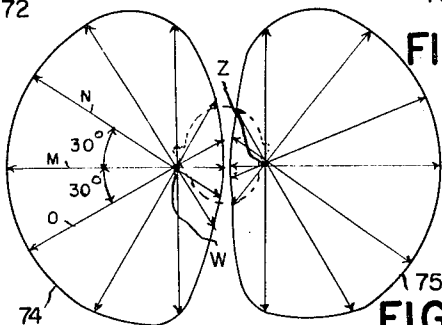


FIG. 13.

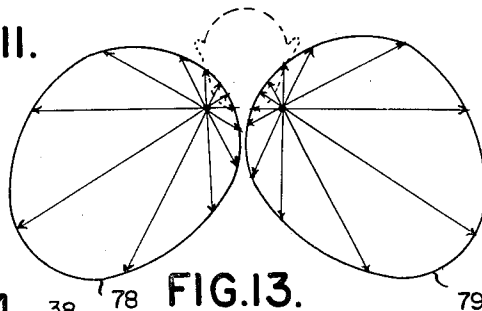
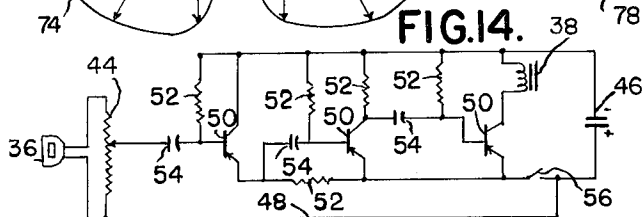


FIG. 14.



INVENTOR.

DORR J. HINMAN

BY

*White, Thomas, Hulbert
& Belknap*
ATTORNEYS

1

3,247,330

HEARING AID STRUCTURE

Dorr J. Hinman, 19192 Strasburg, Detroit, Mich.

Filed June 30, 1961, Ser. No. 121,233

13 Claims. (Cl. 179-107)

The present invention relates to a hearing aid for persons who are hard of hearing and relates more particularly to a hearing aid device which is incorporated inconspicuously in the frame of an eye spectacle. The invention is characterized by the manner in which either one or two sound detectors or microphones of the hearing aid device is located on the frame of the spectacle so as to generally receive or collect only the sound pressures resulting from sound waves or vibrations which are reflected from the face of the user.

Natural hearing requires the use of two ears so that each ear will normally produce a sound image. Both images are transmitted to the brain where they are fused or superimposed to produce a single impression of what is heard. In addition, a person with natural or stereophonic hearing is able, through the ability of the two ears to work together, to obtain space perception or sound source locating and separating ability. With stereophonic hearing, the brain merges the sound impressions transmitted from the ears into one and determines where the information is located. It is very important that a person has the ability to locate a sound source in a particular environment. Besides space perception or locating ability, the greater value of stereophonic listening lies in the ability of the hearing mechanism to concentrate upon sound pressure cycles coming from a selected location whereby an individual with normal hearing is permitted to maintain a conversation with one of several individuals in a group where a background of noise exists.

The prior art devices have stressed their ability to obtain binaural or bilateral hearing and have stressed the fact that the devices will determine the direction of sound and discriminate between sounds. The conventional hearing aid devices on the market utilize a separate sound detector or microphone for each ear wherein the entrances to the microphones are arranged to receive, pick up and collect direct sound vibrations which are in turn converted by the microphones into varying electrical pressures. However, the conventional devices have not succeeded in accurately determining the direction of sound and clearly discriminating between sounds.

In normal hearing, as contrasted to hearing aid instruments, prior to the sound pressures striking the eardrums, the sound waves are twice reflected by the ear lobe and funneled into a smaller volume, thereby compressing the sound waves and increasing the pressure which acts on the eardrum. In conventional hearing aid instruments, the sound detectors are not subjected generally to sound waves of any consequence which are reflected from the face.

It is therefore believed in order to obtain stereophonic hearing as close to natural hearing as possible, that the hearing aid instrument should be arranged on the head of the user so that the sound detector is shielded from direct sound waves and is adapted to receive generally only sound waves which are reflected from the face of the user generally between the eye socket and the cheek.

It is therefore an object of the present invention to provide a hearing aid instrument which is adapted to provide stereophonic hearing which is as close to natural hearing as is possible.

Another object of the present invention is to provide a hearing aid instrument which is arranged on the head of the user so as to receive generally only sound vibrations reflected from the face of the user.

2

Still another object of the present invention is to provide a self-contained hearing aid structure having a general configuration of a spectacle frame and in which the sound detector is mounted on the frame so that the entrance to the sound detector is shielded from direct sound vibrations and is directed with reference to the face to receive generally only sound vibrations reflected from the face of the user.

A further object of the present invention is to provide a simplified, low cost hearing aid structure of the aforementioned type having certain advantages contributing to efficiency, reliability and long life, as well as ease of maintenance.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, illustrating preferred embodiments of the invention, wherein:

FIGURE 1 is a top plan view of a self-contained hearing aid structure having a support having the general configuration of a spectacle frame.

FIGURE 2 is a view taken on line 2-2 of FIGURE 1 illustrating the principle in which the sound waves are reflected from the surface of the face between the eye socket and the cheek and the manner in which the reflected waves are converged and received by the sound detector.

FIGURE 3 is a perspective view of one part of the spectacle frame.

FIGURES 4-7 are sectional views taken on corresponding lines in FIGURE 3, illustrating various positions in which the sound detector may be housed so as to receive generally only sound waves reflected from the face of the user of the device.

FIGURE 8 is a pictorial view of an ear.

FIGURE 9 is an enlarged diagrammatic view of part of the ear taken substantially on line 9-9 of FIGURE 8.

FIGURE 10 is a diagrammatic illustration showing the relative field of sensitivity for a person with normal hearing.

FIGURE 11 is a diagrammatic illustration showing the field of sensitivity for a person utilizing conventional hearing aids where the entrances to the associated microphones are directed outwardly and are located at the center of hearing.

FIGURE 12 indicates another sensitivity pattern for a person utilizing conventional hearing aids where the entrances to the microphones face forward.

FIGURE 13 illustrates the relative field of sensitivity for a person utilizing the present invention.

FIGURE 14 is a diagrammatic illustration of an electrical hearing aid circuit.

Referring now to the figures, FIGURE 1 shows a pair of spectacles designated by the numeral 10. The spectacles include a frame 12 which may be made in various designs and from various types of plastic or other suitable materials. The component parts of the frame 12 are of substantial dimensions in accordance with the present-day designs, thus making the combining of the hearing aid equipment with the frame 12 readily possible. The spectacle frame 12 has the usual cross-bow member 14 which provides a pair of oval rims 16 and 18, as is best illustrated in FIGURES 1 and 3, which are integrally formed in one piece. The rims 16 and 18 enclose or surround the lens 20 in the usual manner. Secured to the cross-bow 14, either rigidly, slightly flexible, or pivotally connected thereto, are the temple members or temple bars 22 and 24 which extend rearwardly therefrom. The temple members 22 and 24 extend adjacent the side of the head of the user and are provided with the customary curved portions 26 and 28 respectively which are adapted to rest on the ears.

The cross-bow 14 is provided with the usual bridge 30 which connects the rims 16 and 18 and is adapted to rest on the nose of the user when the frame 12 is mounted properly on the head of the user in a substantially fixed position. The approximate contour of the face of the user at the cheeks is shown in FIGURE 1 in dotted lines represented by the numeral 32. The approximate contour of the face in the vicinity of the eyes is shown in dotted lines in FIGURE 1 and is represented by the numeral 34.

The side temple members 22 and 24 are of tubular construction made generally in either one or two pieces or parts so as to provide a hollow interior. The interiors of the temple members 22 and 24 are used to house the independent circuits and components of the electrical hearing aid structure. While one particular arrangement of the component parts of the electrical circuit for one ear is shown, it should be understood that the present invention may be practiced with any number of conventional hearing aid circuits presently on the market.

The essential part of any hearing aid structure is the means for converting sound vibrations into electrical impulses and the sound reproducer activated by the electrical impulses for activating the auditory nerve of the wearer. The essence of the invention is that the sound reproducer or microphone, as conventionally represented in FIGURE 1 and designated by the numeral 36, may be disposed in any one of a number of positions on or in the frame 12 of the spectacle to receive generally only reflected sound waves and so long as the direct sound vibrations are prevented from entering the sound detector. The entrance 37 to the microphone 36 faces downwardly as is illustrated in FIGURE 2. The microphone 36 may be of the crystal type, permanent magnet type, or of any other suitable type or design so long as its electrical characteristics match that of the amplifier. Since independent circuits are mounted in each temple member, it is sufficient to describe the parts of only one of the identical circuits.

The sound reproducer or receiver is diagrammatically illustrated at 38 in FIGURE 1. The present invention is adapted to either the air conduction principle of hearing or the bone conduction principle of hearing, either of which principle may utilize the circuit illustrated in FIGURE 14. In the present illustration, the air conduction principle is utilized wherein a tube 40 is shown in FIGURE 1 which is appropriately connected to the receiver 38 in the conventional manner. With such a construction, the tube 40 is injected into the ear whereby the sound waves delivered by the sound reproducer or receiver 38 may be passed inwardly to the eardrum. If the bone conduction method is used, the receiver 38 is generally located in the temple member 22 immediately behind the ear, as indicated at 38', so that the vibratory contact surface of the receiver will engage hearing inducing bone structure. The circuit includes an amplifier 42 of the transistor type and in addition is provided with a suitable volume control wheel 45 and conventional battery 46.

With the electrical parts just described, the aforesaid parts are appropriately connected in a general amplifying circuit as is illustrated in FIGURE 14.

The schematic diagram of FIGURE 14 appeared in Electronic Design for November 1953, page 18, and is suited for the explanation of the invention. The microphone 36 is connected to the battery 46 by an electrical conductor 48. The amplifying circuit includes transistors 50, resistors 52, capacitors 54, an on-off switch 56, and the potentiometer gain control 44 which comprise a complete sound amplifier or hearing aid channel. With such a circuit, a varying voltage proportional to the intensity and frequency of the sound waves striking the microphone 36 is induced across the potentiometer or variable resistor 44. The voltage is in turn amplified by the transistors 50 and reconverted to sound vibrations by the sound transducer or reproducer 38.

The electrical components together with their associated wiring are generally embedded in the temple members 22 and 24 when it is formed or cast, or the component parts may be mounted on a small printed circuit board which is inserted as a unit in the temple members formed with a hollow section for this particular purpose.

Before discussing some of the various details of the present invention, it is believed advisable to further explain the relative field of sensitivity for a person with normal hearing, a person utilizing conventional prior art hearing aid devices, and a person utilizing the present invention. The phrase "field of sensitivity" is defined as the ability of a person to determine the direction of sound.

Referring to FIGURES 8 and 9, the normal ear is represented by the numeral 60. The pinna 62 is the external part of the ear 60 which acts as a funnel to collect and concentrate sound pressure waves. Sound waves entering the ear first strike the parabolic or curved surface 64 so as to converge the entering sound waves and in turn direct and reflect the waves against the opposite parabolic or curved surface 66 as is indicated by the lines in FIGURE 9. The reflected waves are converted and finally transmitted through the ear canal 68 so as to act upon the eardrum 70.

Referring now to FIGURE 10, the dotted line 80 represents the head of a person. The field of sensitivity for each ear is indicated so that the large dot X indicates the center of hearing for the right ear and the large dot Y indicates the center of hearing for the left ear. Radiating from the two dots X and Y at 30-degree intervals are vectors of varying lengths and directions. The length of each arrow indicates the relative sensitivity of hearing in that direction by one ear. Connecting the ends of the arrows or vectors are contour lines 72 and 73 which represent the relative field of sensitivity of the two ears. The vectors, twelve in number, for the left ear are indicated by the letters A through L, while the vectors for the right ear are indicated by the letters A' through L'. The area above the horizontal vectors A-G indicates a field of sensitivity behind a person, while the larger area below the vectors A-G indicates the area of sensitivity in front of the person. As an example, vector B is larger than vector C. This indicates that a person is more sensitive to a sound emanating from an angle 30 degrees forward of the vertical plane through the ears than from an angle 30 degrees behind the aforesaid plane. It is easier for a person to determine the direction of sound emanating from in front of the person rather than from behind, due to the relative position of the ear. This important sensitivity feature of normal hearing combined with the "phasing" feature, as described in the Hollingsworth patent, 2,930,858, provides a desirable direction detector for a person with normal hearing.

In a conventional hearing aid in which the microphones are exposed to the outside so as to be in a position to pick up direct sound waves, the microphones W and Z become the center of hearing as is illustrated in FIGURE 11. Vectors 30 degrees apart radiate from the microphones. Whether the sound originates 30 degrees behind the ears of the person or 30 degrees in front of the ears with reference to a plane extending through the centers of hearing is not generally distinguishable by the person. As an example, the vectors N and O are substantially equal. The sensitivity curves 74 and 75 which connect the ends of the arrows are symmetrical about the aforesaid plane. In other words, the area of the field of sensitivity behind the person is approximately equal to the area of sensitivity in front of the person. With such a construction, a person cannot generally determine the direction from which the sound originates with any degree of accuracy.

FIGURE 12 represents the field of sensitivity where a

5

hearing instrument is utilized, with the microphones W and Z exposed to direct sound waves from in front of the person. The vectors radiate from the microphones at 30-degree intervals and are enclosed by the overlapping sensitivity curves 76 and 77. As is clearly illustrated in the picture, a person would not be able to distinguish between sounds from the right or from the left of the person.

FIGURE 13 indicates a field of sensitivity for a person utilizing the present invention. The contour lines 78 and 79 connecting the arrows define a pattern which is similar to the pattern for a person with normal hearing as is shown in FIGURE 10. The results of this pattern are believed due to the reflected sound principle previously stated. As mentioned in connection with FIGURES 8 and 9, sound is reflected from the curved surfaces of the pinna 62 and finally directed into the canal 68. In the present invention, the sound is reflected from the face of the person generally in the vicinity of the eye socket and the cheek. In such a case, the nose of the person forms a shield between the two microphones.

As previously mentioned, the location of the microphone 36 is not usually critical, the important feature being that the microphone 36 is shielded on the support in such a manner that the direct sound waves are prevented from the acting thereon. FIGURE 3 illustrates one part of the frame spectacle 12. The templar member 22 is tubular and may be provided with a port 80 on the inner wall 82 of the templar member 22. The microphone 36, as indicated in FIGURE 4, is located in the interior of the templar member 22 remote from the port 80. A conduit 84 connects port 80 with the sound detector 36.

FIGURE 5 shows an embodiment wherein the entrance to the microphone 36 is located immediately in front of the port 80.

FIGURE 6 shows another embodiment wherein the microphone 36 is located at the juncture between the cross-bow member 14 and the templar member 22. The connecting bridge between the aforesaid members is generally horizontal as is indicated at 86. The bottom wall 88 of the bridge 86 has a port 90 therein. The microphone 36 has its entrance directly in front of the port 90.

FIGURE 7 illustrates another embodiment wherein the upper portion of the rim 16 has a hollow interior. The inner wall 92 of the rim 16 has a port 94 therein. The microphone has its entrance located immediately in front of the port 94.

In the embodiments illustrated in FIGURES 1-7, the microphone 36 is shielded from direct sound waves and is in a position to receive the reflected sound waves. This principle is illustrated in FIGURE 2 wherein the microphone 36 is housed in the frame 12 of the structure at the juncture between the cross-bow 14 and the templar member 24. The curved portion of the face is represented by the numeral 96 and is the area defined by the eye socket and the cheek. The sound waves strike the curved portion 96 of the face, as shown in FIGURE 2, and are reflected and converged so as to enter the relatively small port 37 provided in the frame 12.

In each of the embodiments, it should be observed that the cross-bow and templar members have wall portions which prevent the direct sound waves from striking the microphones.

The present invention provides many important advantages which have actually been observed through experimentation. Not only is a person able to have the normal fields of sensitivity, but is also able to discriminate between sounds. Another very important advantage is that there is an apparent improvement in the cushioning of high intensity sound waves without diminishing low intensity sound waves. It has been found that once the volume control on the hearing aid instrument has been set, there is generally no further need for changing the

6

volume through the entire range of the sound environment. This last mentioned feature coupled with the feature of sensitivity of direction helps to provide the means whereby a person can have normal conversation even in a noisy factory or restaurant without adjusting the volume control.

One possible explanation for this apparent improvement in cushioning of high intensity sound waves is believed due to the fact that some energy from the sound waves of high intensity are absorbed by the skin which forms the reflecting surface. Proportionately, an amount of energy for sound waves of low intensity is also absorbed by this reflecting surface, with the amount of absorption being proportional to the intensity of the sound waves. It is believed that the absorption coefficient of human skin follows the same general pattern as that of certain acoustical materials. Generally, high intensity sound waves are provided by noise and sounds from machines in a factory or restaurant and are generally in the frequency range of approximately 2,000 cycles per second or above. Most voice vibrations of speech are in the frequency range of approximately 1,500 cycles per second or below.

Another important advantage is that a lower level of amplifier gain is required for the same level of hearing. This is believed due to the fact that the entrance to the microphone is located at or near the focal center of the reflecting surface mentioned previously, thereby causing a concentration of the available sound waves.

Certain other advantages are present. In the past, acclimation to a conventional hearing aid required a considerable amount of time and was a tedious struggle since many persons did not adjust to the unnatural feeling of the conventional hearing aid. The present invention has decreased the amount of time required for a person to adjust to the instrument. Other specific advantages include the reduction in the tendency of feedback as well as a reduction in wind whistle.

It should be understood that this invention is applicable to a person with one normal ear and one defective ear. The application of the reflected wave principle to the defective ear will combine with the normal ear to provide the desired stereophonic hearing.

The drawings and the foregoing specification constitute a description of the improved hearing aid structure in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What I claim as my invention is:

1. A spectacle hearing aid structure comprising a spectacle frame adapted to be worn in a substantially fixed position on the head of the user, said frame including a cross-bow member defining rims for retaining a pair of lenses and a pair of side templar members attached to the cross-bow member, a pair of sound detectors, one for each ear of the user, carried by said members, each of said detectors having an entrance directly facing the face of the user, said detectors converting substantially only sound vibrations reflected directly from the face of the user into electrical impulses, the walls of said members being arranged around said sound detectors in such a manner that sound vibrations other than sound vibrations reflected from the face of the user are prevented from entering said sound detectors, and a pair of sound reproducers, one for each of said sound detectors, carried by said templar members whereby the electrical impulses produced by said sound detectors in turn produce audible sounds in the sound reproducers.

2. The hearing aid structure defined in claim 1 wherein said sound detectors are located at the junctures between said cross-bow member and said templar members, the entrances to said sound detectors being directed downwardly so as to receive the reflected sound vibrations.

3. A hearing aid structure comprising a support hav-

ing a general configuration of a spectacle frame adapted to be worn in a substantially fixed position on the head of the user, said frame including a cross-bow and a pair of side templar members, at least one of which is hollow, a sound detector enclosed in the interior of said one templar member so that generally substantially direct sound vibrations are prevented from entering said one templar member, a relatively small entrance port for sound in the wall of said one templar member adjacent and facing the head of the user for directing sound vibrations reflected directly from the face of the user into the interior of said one templar member where the aforesaid reflected sound vibrations are received by said sound detector, and a sound reproducer in the interior of said one templar member whereby the electrical impulses produced by said sound detector in turn produce audible sounds in the sound reproducer.

4. The hearing aid structure defined in claim 3 wherein the entrance to said sound detector is located in said one templar member immediately in front of said entrance port.

5. The hearing aid structure defined in claim 3 wherein the entrance to said sound detector is located in said one templar member remote from said port and a tubular conduit is provided in the interior of said one templar member so as to connect said port with said sound detector.

6. A hearing aid structure comprising a frame adapted to be worn in a substantially fixed position on the head of the user, said frame having a hollow portion, a sound detector in said hollow portion, a relatively small entrance opening for sound waves in the hollow portion of said frame, said entrance opening facing the face of the user in close proximity to the focal center of the concave area defined by one of the eye sockets and cheeks on the face of the user, the sound waves striking the concave area being reflected and compressed so that the compressed waves converge toward the focal center and are directed through said entrance opening to the entrance to said sound detector in the hollow portion of said frame, said detector converting substantially only the compressed and converging waves into electrical impulses, and a sound reproducer carried by said frame whereby the electrical impulses produced by said sound detector in turn produces audible sounds in said sound reproducer.

7. A hearing aid structure comprising a frame adapted to be worn in a substantially fixed position on the head of the user, a sound detector carried by said frame, said detector having an entrance directly facing the face of the user in close proximity to the focal center of the concave area defined by one of the eye sockets and cheeks on the face of the user, the sound waves striking the concave area being reflected and compressed so that the compressed waves converge toward the focal center and are received by the entrance to said sound detector, said detector converting substantially only the compressed and converging waves into electrical impulses, and a sound reproducer carried by said frame whereby the electrical impulses produced by said sound detector in turn produces audible sounds in said sound reproducer, said frame including means for substantially shielding said sound detector from sound waves other than the aforesaid compressed and converging sound waves.

8. A hearing aid structure comprising a frame adapted to be worn in a substantially fixed position on the head of the user, said frame having hollow portions, a pair of sound detectors in said hollow portions, one detector for each ear of the user, relatively small entrance openings for sound waves in the hollow portions of said frame, said entrance openings facing the face of the user in close proximity to the focal centers of the concave areas defined by the eye sockets and cheeks on the face of the user, the sound waves striking the concave areas being reflected and compressed so that the compressed waves converge toward the focal centers and are directed through said entrance openings to the entrances in said sound de-

tectors in the hollow portions of said frame, said detectors converting substantially only the compressed and converging waves into electrical impulses, and a pair of sound reproducers, one for each of said sound detectors, carried by said frame whereby the electrical impulses produced by said sound detectors in turn produce audible sounds in said sound reproducers.

9. A hearing aid structure comprising a frame adapted to be worn in a substantially fixed position on the head of the user, a pair of sound detectors carried by said frame, one detector for each ear of the user, said detectors having entrances directly facing the face of the user in close proximity to the focal centers of the concave areas defined by the eye sockets and cheeks on the face of the user, the sound waves striking the concave areas being reflected and compressed so that the compressed waves converge toward the focal centers and are received by the entrances to said sound detectors, said detectors converting substantially only the compressed and converging waves into electrical impulses, and a pair of sound reproducers, one for each of said sound detectors, carried by said frame whereby the electrical impulses produced by said sound detectors in turn produce audible sounds in said sound reproducers, said frame including means for substantially shielding said sound detectors from sound waves other than the aforesaid compressed and converging sound waves reflected from the face of the user.

10. A spectacle hearing aid structure comprising a spectacle frame adapted to be worn in a substantially fixed position on the head of the user, said frame including a cross bow member defining rims for retaining a pair of lenses and a pair of side templar members attached to the cross bow member, said templar members having hollow portions, a pair of sound detectors in said hollow portions, one detector for each ear of the user, relatively small entrance openings for sound waves in the hollow portions of said templar members, said entrance openings facing the face of the user in close proximity to the focal centers of the concave areas defined by the eye sockets and cheeks on the face of the user, the sound waves striking the concave areas being reflected and compressed so that the compressed waves converge toward the focal centers and are directed through said entrance openings to the entrances to said sound detectors in the hollow portions of said templar members, said detectors converting substantially only the compressed and converging waves into electrical impulses, and a pair of sound reproducers, one for each of said sound detectors, carried by said templar members whereby the electrical impulses produced by said sound detectors in turn produce audible sounds in said sound reproducers.

11. A spectacle hearing aid structure comprising a spectacle frame adapted to be worn in a substantially fixed position on the head of the user, said frame including a cross bow member defining rims for retaining a pair of lenses and a pair of side templar members attached to the cross bow member, a pair of sound detectors carried by said frame, one detector for each ear of the user, said detectors having entrances directly facing the face of the user in close proximity to the focal centers of the concave areas defined by the eye sockets and cheeks on the face of the user, the sound waves striking the concave areas being reflected and compressed so that the compressed waves converge toward the focal centers and are received by the entrances to said sound detectors, said detectors converting substantially only the compressed and converging waves into electrical impulses, and a pair of sound reproducers, one for each of said sound detectors, carried by said templar members whereby the electrical impulses produced by said sound detectors in turn produce audible sounds in said sound reproducers, said frame including means for shielding said sound detectors from sound waves other than the aforesaid compressed and converging sound waves reflected from the face of the user.

12. A spectacle hearing aid structure comprising a spec-

9

tacle frame adapted to be worn in a substantially fixed position on the head of the user, said frame including a cross bow member defining rims for retaining a pair of lenses and a pair of side templar members attached to the cross bow member, a pair of sound detectors, one for each ear of the user, carried by said frame, each of said detectors having an entrance directly facing the face of the user to receive substantially only reflected sound vibrations, said detectors converting substantially only sound vibrations reflected directly from the face of the user into electrical impulses, a pair of sound reproducers, one for each of said sound detectors, carried by said templar members whereby the electrical impulses produced by said sound detectors in turn produce audible sounds in said sound reproducers, said frame including means for substantially shielding said sound detectors from sound vibrations other than the sound vibrations reflected from the face of the user.

13. A spectacle hearing aid structure comprising a spectacle frame adapted to be worn in a substantially fixed position on the head of the user, said frame including a cross bow member defining rims for retaining a pair of lenses and a pair of side templar members attached to the cross bow member, a pair of sound detectors, one for each ear of the user, carried by said frame, each of said detectors having an entrance directly facing the face of the

10

user to receive substantially only reflected sound vibrations, said detectors converting substantially only sound vibrations reflected directly from the face of the user into electrical impulses, a pair of sound reproducers, one for each of said sound detectors, carried by said templar members whereby the electrical impulses produced by said sound detectors in turn produce audible sounds in said sound reproducers, said frame including means for substantially shielding said sound detectors from sound vibrations other than the sound vibrations reflected from the face of the user, said sound detectors being located substantially at the junctures between said cross bow member and said templar members.

References Cited by the Examiner

UNITED STATES PATENTS

1,897,833	2/1933	Benway	179—107
2,207,705	7/1940	Cox	179—107
2,613,282	10/1952	Scaife	179—107
2,765,373	10/1956	Smith	179—107
2,874,231	2/1959	Wallace	179—107
3,035,127	5/1962	Strzalkowski	179—107

ROBERT H. ROSE, *Primary Examiner*.

STEPHEN W. CAPELLI, *Examiner*.