Sept. 2, 1958 A. L. SMITH 2,850,584

BONE-CONDUCTION HEARING AID CLAMPS

Filed Nov. 25, 1953

Fig. 1

Fig. 2

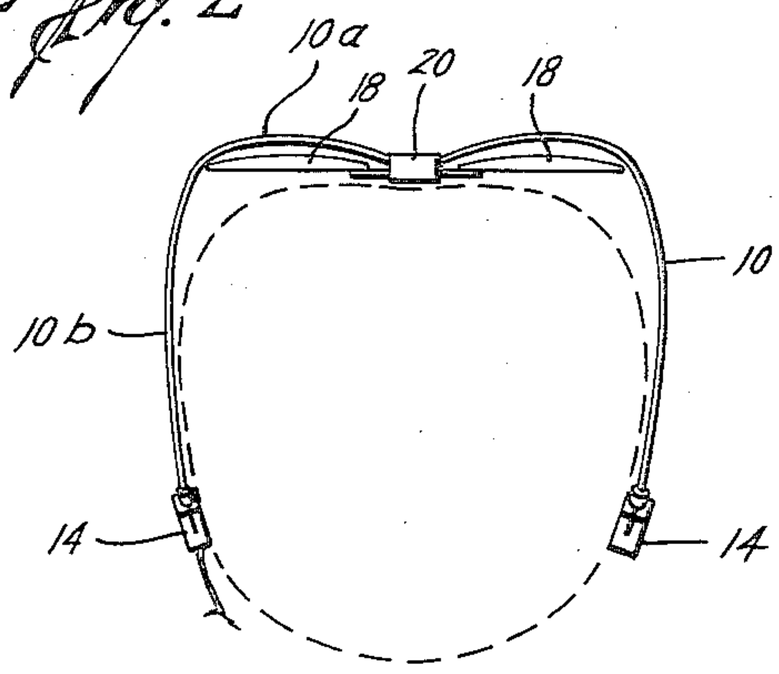


Fig. 3

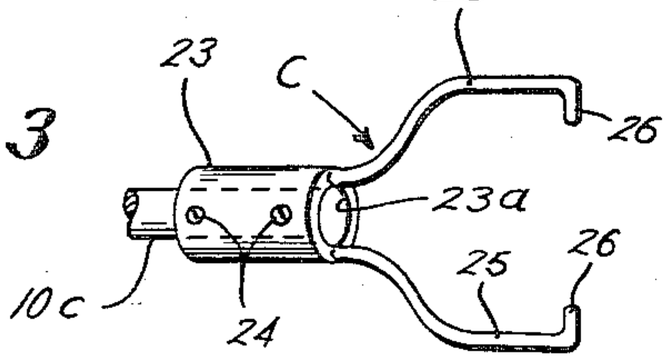
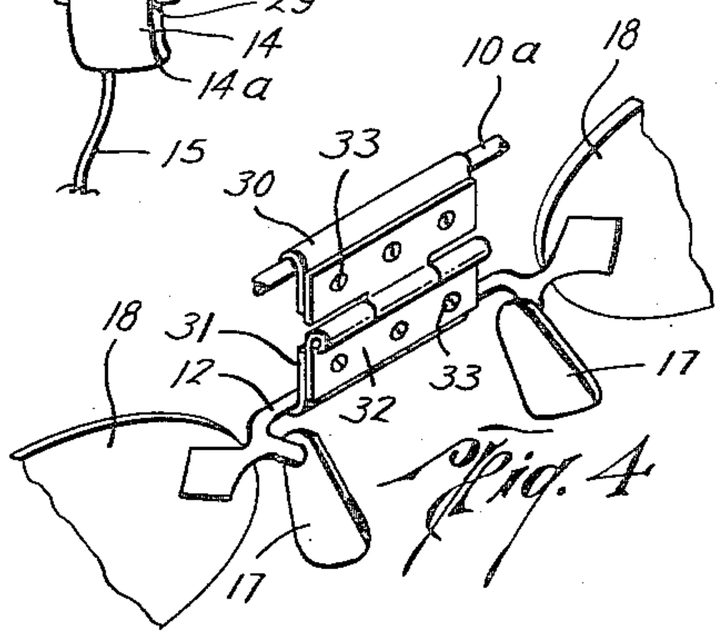


Fig. 4



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BONE-CONDUCTION HEARING AID CLAMPS

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12 Claims. (Cl. 179—156)

This invention relates to new and useful improvements in bone-conduction hearing aid clamps.

The conventional type of bone-conduction hearing aid oscillator receiver is held on the user's head by a head band which extends over the top of the user's head and presses the hearing aid receiver on the mastoid bone behind one of the ears. The head band is unsightly in appearance and, due to the distribution of pressure to the user's head, it is usually uncomfortable to wear. Also, the head band slips or shifts on the user's head, and consequently the receiver is moved off the mastoid bone, resulting in poor hearing. The hearing aid clamp of this invention overcomes the foregoing disadvantages of the conventional head bands and, preferably, the clamp of this invention is combined with eyeglasses.

It is, therefore, an object of this invention to provide a bone-conduction hearing aid clamp wherein the clamping pressure for the bone-conduction receiver is provided by a resilient clamping frame adapted to substantially equally distribute the clamping pressure to both mastoid bones and having means for suporting the frame on the nose of the user, whereby a comfortable, practical and attractive construction is obtained.

An important object of this invention is to provide a combined bone-conduction hearing aid clamp and eyeglass construction wherein a resilient one-piece clamping frame is adapted to press a hearing aid receiver against one mastoid bone of the user and is adapted to press another hearing aid receiver or a dummy member against the other mastoid bone, and wherein the front of the clamping frame is supported on the nose of the user; said clamping frame being supported at only the user's mastoid bones and nose whereby the pressure on the mastoid bones can be accurately adjusted and distributed for proper hearing and the comfort of the user.

Another object of this invention is to provide a clamping frame having pivotal connections at the ends thereof for attaching mastoid bone contact members wherein at least one of said members is a bone-conduction hearing aid receiver; said pivotal connections permitting said members to pivot in order to conform to the particular external shape of the mastoid bones of the user, whereby substantially the entire inner surface of said members contacts the external surface of said mastoid bones to uniformly distribute the pressure applied by the clamping frame.

A further object of this invention is to provide a clamping frame for supporting mastoid bone contact members at the ends thereof and for pressing said members against the mastoid bones of the user, at least one of said members being a bone-conduction hearing aid receiver, said frame having a portion thereof extending across the face of the user and to which is pivotally connected the bridge of an eyeglasses frame so that the eyeglasses frame can be pivoted above the line of vision of the eyes while the clamping frame remains on the head of the user.

A still further object of this invention is to provide a hearing aid clamp having side portions with oscillator

receiver holders thereon which is so constructed that one size of said clamp can be used for substantially all users by adjusting the length of the side portions.

The construction designed to carry out the invention will be hereinafter described together with other features thereof.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings forming a part thereof, wherein an example of the invention is shown, and wherein:

Fig. 1 is an isometric view illustrating the combined bone-conduction hearing aid clamp and eyeglass construction of this invention,

Fig. 2 is a plan view of the construction of this invention illustrating the three-point contact of the clamp with the head of the user,

Fig. 3 is a detailed elevation of the pivotal connection for the contact members, and

Fig. 4 is an isometric view showing a portion of the construction of this invention and illustrating a modified hinged connection of the clamping frame to the eyeglasses frame.

In the drawings, the numeral 10 designates a clamping frame which is formed of a resilient material such as spring steel, aluminum alloy or the like so that there will be inherent resiliency in the material of the frame. The central or front portion 10*a* of the frame 10 is adapted to extend across the front of the head of the user while the side portions 10*b* extend along the sides of the head of the user. The central portion 10*a* of the frame 10 is connected to a bridge member 12 of the front portion of an eyeglasses frame while the ends of the side portions 10*b* are each connected to mastoid bone contact members 14 which are adapted to be positioned over the mastoid bones of the user. At least one of the contact members 14 is a conventional bone-conduction hearing aid receiver and, as shown in the drawings (Fig. 1), such receiver would have wires 15 extending therefrom and leading to the amplifier positioned in the coat or shirt pocket of the user. The frame 10 is so constructed that the combined hearing aid clamp and eyeglass construction of this invention is slightly supported at the nose of the user and is primarily supported on the two mastoid bones of the user, whereby a three-point contact of the frame with the head of the user is obtained so that a uniform distribution of the clamping pressure applied by the clamping frame 10 is obtained.

The clamping frame 10 is preferably formed in a single piece and the ends 10*c* of the side portions 10*b* are adjusted so that the space therebetween is less than the width or thickness of the head of the user between the mastoid bones so that when the frame is positioned on the head of the user, the inherent resiliency of the frame 10 urges the ends 10*c* inwardly to press the contact members 14 firmly against the mastoid bones of the user. As best seen in Fig. 2, the contact members 14 are the only points at which the pressure of the frame 10 is exerted and the frame 10 does not contact the head of the user except through the contact members 14. In fact, due to the bowed construction of the frame 10 and the resiliency thereof, the contact members 14 tend to move rearwardly on the head of the user so as to maintain the nosepieces 17 of the eyeglasses frame firmly seated on the nose of the user. This prevents any tendency of the frame 10 to slip forwardly on the head of the user and it also eliminates the necessity for the usual downwardly curved ends on the side members of the usual eyeglasses frames. As shown in Fig. 1, the ends 10*c* are curved slightly downwardly, but the side portions 10*b* may be substantially straight without having the ends 10*c* thereof curved downwardly at all because the mastoid bone can be con-

tacted with such a construction and the clamping action of the frame **10** on the mastoid bones eliminates the necessity for support on the ears of the user. Although the eyeglasses frame shown in the drawings includes only the bridge member **12** and the nosepieces **17** which are attached to the eyeglasses **18**, it will be appreciated that the front portions of other types of known eyeglasses frames could be used. Preferably, the eyeglasses frames which are of the type that completely surround the eyeglasses themselves are used, but the side portions which normally extend from the eyeglasses frame are eliminated. The central portion **10***a* of the frame **10** is attached to the central portion **10***a* substantially midway between the side portions **10***b* by clamping, welding, brazing or similar securing means. Screws **21** or other securing means may be used for extending through the bracket **20** to the bridge member **12** to establish a firm connection therewith (Fig. 1).

The contact members **14** for contacting the mastoid bones of the user are preferably connected to the ends **10***c* of the clamping frame **10** by a pivotal connection assembly or receiver holder C (Fig. 3) which includes a sleeve **23** secured to an end **10***c* of the frame **10** by screws **24** which extend through the sleeve and contact the external surface of the end **10***c*. The bore **23***a* of the sleeve **23** is open for its entire length so that the sleeve **23** may be positioned at different points on the end **10***c* to adjust the length of each of the side portions **10***b* so that the contact members **14** can be accurately positioned on the head of a particular user for contact with the mastoid bones. In some instances, the length of the side portions **10***b* may be shortened by cutting off a part of each portion **10***b* so that the sleeves **23** are positioned at the ends **10***c* without any portion thereof extending rearwardly from the sleeves **23**. It will thus be evident that one size of the frame **10** can be used for substantially all users.

Pivot arms **25** are connected to the sleeve **23** by welding, brazing or similar securing means, or they may be formed integral with the sleeve **23**. Such arms **25** have pivot pins **26** thereon which extend inwardly toward each other and are adapted to fit in recesses **29** (Fig. 1) in the sides **14***a* of the contact members **14**. With this construction, the contact members **14** can pivot or swing relative to the frame **10** and the pivot arms **25** so that they can conform to the external shape of the mastoid bones of the particular user whereby substantially the entire inner surface of each of the contact members **14** rests upon a mastoid bone so that a relatively large area of contact with the mastoid bone is obtained to provide a comfortable contact and to assure proper hearing.

As pointed out above, one of the contact members **14** is a hearing aid receiver of the conventional construction used for bone-conduction hearing. Wires **15** would lead therefrom behind the ear of the user down the back of the neck of the user to the amplifier positioned in the shirt or coat pocket of the user. The other contact member **14** is generally a dummy or simply a block which is substantially the same shape as the usual bone-conduction hearing aid receiver and which is adapted to fit on the other mastoid bone of the user for distributing the clamping pressure of the frame **10**. In some cases, of course, both of the contact members **14** may be hearing-aid receivers, but such is usually not required. By providing both of the contact members **14** at the ends **10***c* of the frame **10**, the pressure caused by the clamping action of the frame **10** is substantially equally distributed to both of the mastoid bones so that the user is comfortable and so that a proper amount of pressure can be applied to the mastoid bone over which the hearing aid receiver is disposed. Additionally, the pressure on both mastoid bones is automatically equalized because the support of the midpoint of the front portion **10***a* of the frame **10** on the nose of the user by the nosepieces **17** serves as a fulcrum point about which the side portions tend to move inwardly toward the sides of the head of the user when positioned thereon.

In Fig. 4 of the drawings, a modification of the bracket **20** (shown in Fig. 1) is illustrated. In Fig. 4, the forward or central portion **10***a* of the frame **10** has an upper bracket member **30** connected thereto by welding or similar securing means and a lower bracket member **31** is connected to the bridge member **12**. A hinge **32** joins the bracket sections **30** and **31** and such hinge **32** is connected to the bracket sections **30** and **31** by screws **33** or similar securing means. With this construction (shown in Fig. 4), the eyeglasses frame may be pivoted outwardly from a position in front of the eyes of the user to a position above the line of vision of the user when the user desires to clean the glasses or to continue using the hearing aid without using the glasses. In this connection, it should be pointed out that although the frame **10** is ordinarily supported on the nose by the contact of the nosepieces **17** with the bridge of the nose, when the eyeglasses frame is pivoted to a position substantially horizontal to the ground or at an angle substantially perpendicular to the forehead of the user, the inherent resiliency of the frame **10** which tends to move the frame **10** rearwardly will bring the front or central portion **10***a* of the frame **10** into contact with the forehead of the user to maintain sufficient support for the frame when the glasses frame has been pivoted outwardly from its normal position in front of the eyes.

The foregoing disclosure and description of the invention is illustrative and explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What is claimed is:

1. A bone-conduction hearing aid clamp, comprising a clamping frame of resilient material having a central portion adapted to extend across the front of the head of a user and side portions adapted to extend along the sides of the head of the user, the ends of the side portions terminating substantially adjacent the mastoid bones of the user, a mastoid bone contact member connected to each of said ends of the side portions, each contact member being adapted to directly contact the head area of the mastoid bone of the user, one of said contact members being a bone-conduction hearing aid receiver, nosepieces adapted to have detachable connection with said central portion of said clamping frame whereby the clamping frame is supported on the nose of the user by said nosepieces, said ends of the clamping frame being urged inwardly toward the sides of the head of the user by the resilience of the material of the clamping frame, such inward urging of said ends being transmitted to said contact members whereby said contact members are pressed against the mastoid bones of the user to substantially equally distribute the clamping pressure of the clamping frame to both of said mastoid bones.

2. The structure set forth in claim 1, wherein said clamping frame is a single piece of resilient material, and wherein said side portions are spaced from the head of the user so that the clamping frame is supported on the head of the user solely by the contact of the mastoid bone contact members with the head areas of the mastoid bones of the user and the nosepieces with the nose of the user, thereby providing a substantially three-point balanced support for said hearing aid clamp.

3. The structure set forth in claim 1, including a pivotal connection assembly at each end of said clamping frame connecting each contact member to an end of said clamping frame whereby said members can pivot so that substantially the entire inner surface of each contact member contacts each mastoid bone.

4. The structure set forth in claim 1, wherein said nosepieces are part of a front portion of an eyeglasses frame, and wherein the nosepieces are connected to the

clamping frame by a bracket means secured to the middle of said central portion of the clamping frame and the bridge member of said front portion of an eyeglasses frame.

5. The structure set forth in claim 1, wherein said nosepieces are part of a front portion of an eyeglasses frame, and wherein the connection between said clamping frame and said nosepieces includes a hinge connecting the eyeglasses frame and the middle of said central portion of the clamping frame for swinging said front portion of an eyeglasses frame relative to the clamping frame from a position in front of the eyes of the user to a position thereabove, whereby the eyeglasses can be removed from the line of vision of the user without disturbing the hearing aid.

6. In a combined bone-conduction hearing aid and eyeglass construction, a clamping frame formed of resilient metal bent in substantially a U-shape with the ends thereof adapted to be positioned behind the ears of a user and with the central portion thereof adapted to extend across the forehead of the user, a mastoid bone contact member connected to each end of said frame for positioning in direct contact with the head areas of the mastoid bones of the user, one of the contact members being a bone-conduction hearing aid receiver, the ends of the frame being spaced from each other a lesser distance than the thickness of the head of the user from one mastoid bone to the other so that upon positioning the frame on the head of the user, the resilience of the frame urges the contact members toward each other and against the head areas of the mastoid bones so that substantially equal pressure is applied to each mastoid bone.

7. The structure set forth in claim 6, wherein said clamping frame is a single piece of resilient metal, and wherein said frame is so constructed that only said contact members apply a pressure to the head of the user.

8. In a combined bone-conduction hearing aid and eyeglass construction, a clamping frame formed of resilient material bent in substantially a U-shape with the ends thereof adapted to be positioned behind the ears of a user and with the central portion thereof adapted to extend across the forehead of the user, a mastoid bone contact member connected to each end of said frame for positioning in contact with the head areas of the mastoid bones of the user, one of the contact members being a bone-conduction hearing-aid receiver, the ends of the frame being spaced from each other a lesser distance than the thickness of the head of the user from one mastoid bone to the other so that upon positioning the frame on the head of the user, the resilience of the frame urging the contact members toward each other and against the head areas of the mastoid bones so that substantially equal pressure is applied to each mastoid bone, the connection of each contact member to each end of the frame including a pair of pivot pins fitted in recesses in each contact member to permit each contact member to pivot relative to said frame so that substantially the entire inner surface of each contact member is in contact with one of the mastoid bones.

9. In a combined bone-conduction hearing aid and eyeglass construction, a clamping frame formed of resilient material bent in substantially a U-shape with the ends

thereof adapted to be positioned behind the ears of a user and with the central portion thereof adapted to extend across the forehead of the user, a mastoid bone contact member connected to each end of said frame for positioning in contact with the head areas of the mastoid bones of the user, one of the contact members being spaced from each other a lesser distance than the thickness of the head of the user from one mastoid bone to the other so that upon positioning the frame on the head of the user, the resilience of the frame urges the contact members toward each other and against the head areas of the mastoid bones so that substantially equal pressure is applied to each mastoid bone, the connection of each contact member to each end of the frame including a sleeve surrounding each end, means securing the sleeve to the end, a pair of pivot arms connected to said sleeve, and a pair of recesses in the sides of each contact member for receiving said arms, whereby each contact member is mounted on the frame for pivotal movement relative to the frame.

10. The structure set forth in claim 6, including a bracket on said central portion of said clamping frame for attaching said clamping frame to a bridge member of an eyeglasses frame.

11. A spring type head clamp for use with hearing aids, comprising a clamping frame, means on the frame for mounting a front portion of an eyeglasses frame thereon so that the nose pieces of said eyeglasses frame may assist in supporting the clamping frame on the nose of a user, means on the frame for attaching thereto a bone-conduction hearing aid receiver for contacting the receiver with the head area of the mastoid bone on one side of the head of the user, means on the frame for attaching thereto a contact member for contacting said member with the head area of the mastoid bone on the other side of the head of the user, said clamping frame being resilient and being formed so that said receiver and said member are adapted to be spaced from each other a distance less than the width of the head of the user when said clamping frame is off the user's head, whereby said clamping frame is adapted to apply substantially equal pressure to said receiver and said member when said clamping frame is positioned on the head of the user.

12. A device for clamping a hearing aid on the head of a user, comprising a head clamp of spring material, having means for detachably mounting an eyeglasses frame, means for utilizing the pressure of the spring clamp to exert pressure to a mounting for a hearing aid receiver member on one side of the clamp, and means to apply substantially the same pressure to a mounting for a contact member on the other side of the clamp.

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