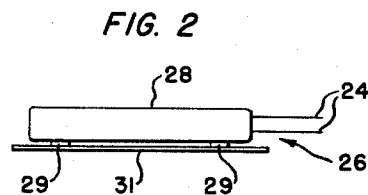
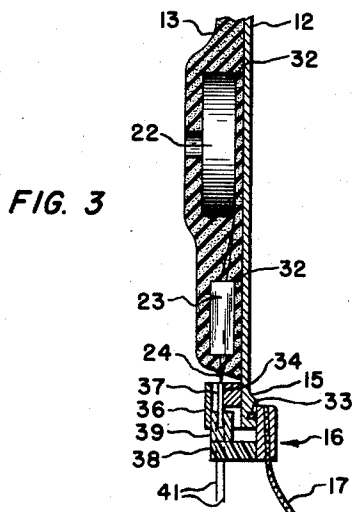
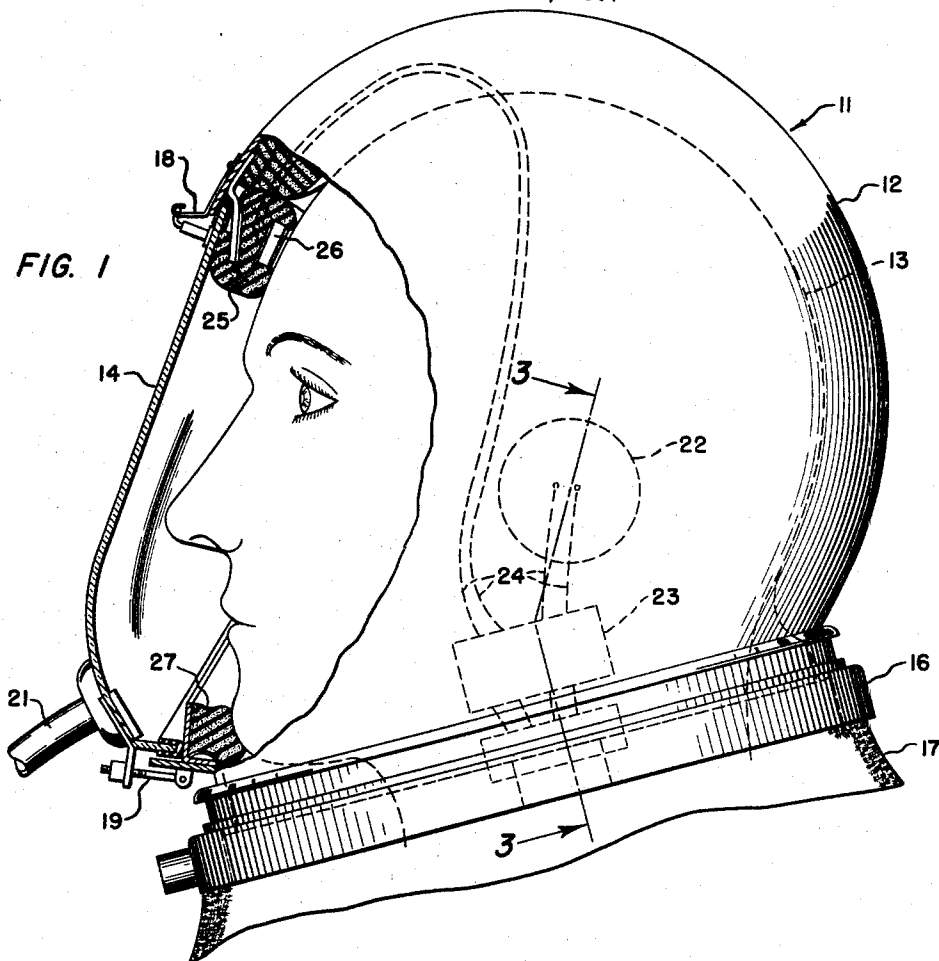


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HELMET COMMUNICATION SYSTEM

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HELMET COMMUNICATION SYSTEM

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This invention relates to helmet communications systems and more particularly to such systems in which components therein perform their intended functions without interference with the usefulness and utility of the helmet.

Heretofore helmet communications have been accomplished by means of a pair of earphones imbedded in the helmet liner for listening and some type of microphone positioned either on the throat or near the mouth area for picking up speech. The throat microphone, consisting of a pair of carbon filled elements placed on either side of the larynx, came into use as a result of oxygen mask developments interfering with communications and vice versa. The throat microphone had several disadvantages, the dynamic range was poor due to inherent self noise, there was no discrimination against outside noise, the intelligibility was considered medium, individual differences in human throats gave varied results and the microphone was hard to maintain in position.

Later a differential dynamic microphone was integrated into the oxygen mask and with the development of face-plated helmets, ducted microphones were placed inside the front of the helmet with the duct opening at the speaker's lips. These microphones also had certain disadvantages, breathing noises picked up interfered with intelligibility, its close proximity to the mouth made it a very personal item, its position had to be continually adjusted, it was bulky and it did not provide enough discrimination to loud noise.

The helmet communications system comprising the present invention consists of a pair of standard earphones embedded in the helmet liner for listening and a contact microphone placed in the helmet liner so as to make contact with the forehead area of the operator. The speaker's voice is picked up by the microphone through the medium of bone conduction. Either a single element may be used at one location on the forehead or several elements may be used placed at several positions over the forehead. An associated miniaturized preamplifier, with proper band-pass characteristics to insure intelligibility, may be placed in any suitable place in the same helmet liner. Microphone housings may be designed to include the preamplifier if desired. The advantages of this system include the following:

(1) There are very little individual differences in human forehead flesh thickness and microphone operation would thus be uniform for all users.

(2) No adjustments are necessary and good contact is always assured.

(3) The microphone would not be considered a personal item and use by others would not be objectionable.

(4) There is no noise pickup from breathing and the helmet liner provides good protection from outside noise.

(5) The helmet may now be more compactly designed without interference with its communication system.

(6) The microphone presents no hazard in escapement from high performance aircraft.

It is therefore an object of this invention to provide means for sensing vocal intelligence through a bone conduction medium.

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Another object is the provision of a helmet communications system wherein the speaker's voice is picked up through a bone conduction medium.

Another object is the provision of a helmet having a microphone mounted therein for contacting the wearer's forehead.

Another object is the provision of a helmet having a forehead contacting microphone embedded in the inner lining thereof.

Another object is the provision of a helmet wherein communication system components therein will not interfere with face mask placement or oxygen equipment.

Another object is the provision of a helmet wherein communication system components therein do not need physical adjustment for use or for removing or putting on the helmet.

Another object is the provision of a helmet wherein the microphone and earphone components of the communications system therein are placed so as to be exposed to a minimum of outside noise.

Other objects and features of the present invention will be readily apparent to those skilled in the art from the following specification and appended drawings wherein is illustrated a preferred form of the invention, and in which:

Figure 1 is a perspective view of the helmet with parts broken away to better show its construction,

Figure 2 is a plan view of the forehead microphone, and

Figure 3 is a cross sectional view taken along the line 3-3 of Figure 1.

Referring now to Figure 1 there is shown a pilot helmet 11 comprising an outer shell 12, an inner detachable lining 13, a face mask 14, and a neck rim 15 adapted to engage collar 16 for air tight connection with a pressurized suit 17. The face mask 14 pivots about a separable hinge 18 at the top and is fastened by a quick-release latch 19 at the bottom. Breathing apparatus may be connected to the mask by a suitable connection 21. The mask completely covers the face opening of the helmet and when attached makes the helmet airtight.

Inside the helmet is a removable lining 13. While any manner of securing the lining to the helmet may be made, in the preferred embodiment snap fasteners are used about the face opening and around the earphones. A zipper is used around the neck opening. This lining is preferably of a protective resilient material having sound absorbing qualities. Between the inner head-contacting surface of lining 13 and the outer shell 12 is mounted a set of earphones 22, a miniaturized preamplifier circuit and components 23 and suitable leads 24 thereto and to a forehead contacting bone conduction microphone 26. These elements may be secured to the shell 12 or the lining 13 as desired. The lining may lie over the elements or recesses formed in the lining to receive them and thus present a uniform smooth surface for contact with the wearer's head.

Bordering the face cut-out portion of the helmet is a pliable strip 27 of resilient material, such as sponge rubber for example. This strip forms a face contacting surface which divides the helmet into two compartments, the face masked area where oxygen is supplied and the rear portion where the communications equipment is placed. This strip, when contacting the face, tends to retard escape of oxygen from the forward area and also serves to seal out external noise and contain within the helmet intelligence received via the earphones.

Embedded within a recessed portion in the strip adjacent the wearer's forehead is a bone conduction microphone 26. This microphone is preferably attached to the shell by a light leaf spring 25 so that the microphone is gently urged into contact with the wearer's forehead even when the wearer turns his head or pivots his

head backwardly. Since there are no known microphones commercially available which were designed for this purpose, a small crystal mike 28 with a pair of actuating forehead contacting members 29 was used. This is shown in Figure 2. The forehead contacting area was then enlarged by attaching a flat thin plate 31 to the members. This plate relieved discomforting localized pressure on the wearer's forehead which was present before the plate was used. This plate also provides better contact and is more responsive to the vibrations of the forehead when the wearer speaks.

As shown in Figure 3 earphone 22 is positioned by a pocket in lining 13. The earphone may be inserted into the pocket through a slit 32 at the top. The printed circuit board with components thereon comprising the preamplifier 23 may be similarly mounted. While the earphones are obviously placed in close proximity to the wearer's ears, the preamplifier may be conveniently positioned as desired.

The neck portion of the helmet terminates in a rim 15 adapted to engage collar 16 of suit 17. An O-ring 33 maintains the airtight relationship and a suitable latch (not shown) is provided for releasably fastening the helmet to the suit. Inside the rim 15 is mounted a terminal connection block 34 for connecting leads 24 from the helmet communications components to external circuitry. A protective guard 36 prevents damage to the connectors 37 on the block in mounting and removing the helmet. In the preferred embodiment connectors 37 are electrically conductive coatings on a printed circuit board although other types may be used. A mounting block 38 is mounted on the inside wall of collar 16 to support a mating terminal connection 39 wherein mating terminals to external circuit leads are housed. In this manner electrical connection to the helmet communications equipment is automatically made when the helmet is placed over the wearer's head and onto the suit. Electrical connection is automatically broken when the helmet is removed.

While certain preferred embodiments of the invention have been specifically disclosed, it is understood that the invention is not limited thereto as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the terms of the following claims.

What I claim is:

1. A helmet communications system comprising in combination a helmet, earphones in said helmet mounted

for placement in close proximity to the ears of the helmet wearer, and a voice sensing device mounted in said helmet for contact with the forehead of said wearer thereof.

2. A helmet having an inner lining, a recessed area in said lining adjacent the forehead of the wearer thereof, and a bone conduction sensing device positioned in said recess for contacting said wearer's forehead.

3. A helmet, an inner lining in said helmet, said inner lining having a microphone therein mounted for contact with the forehead of a wearer of said helmet, a miniaturized preamplifier circuit in said helmet electrically connected to said microphone, earphones in said helmet fitted therein in close proximity to said wearer's ears, and readily detachable leads for interconnecting said earphones and preamplifier to external circuitry.

4. A helmet communications system comprising a helmet having an inner lining adapted to fit about the face of its wearer, a microphone in said lining having a plate thereon for contacting said wearer's forehead, said plate receiving bone conduction vibrations from said forehead when said wearer speaks and actuates said microphone in response thereto, and means in said helmet for communicating audio intelligence to said wearer.

5. A helmet comprising a protective outer shell and a soft pliable inner lining, an airtight removable mask fitted over the face portion thereof, said inner lining fitting in contact with the wearer's forehead, temples, jaws and chin, earphones mounted in said helmet in close proximity with said wearer's ears, vibration sensing means mounted in said helmet for contacting said wearer's forehead, means permitting oxygen flow to said wearer's face, and means for releasably securing said helmet to a garment worn by said wearer.

6. A bone conduction microphone for sensing vocal utterances, said microphone comprising vibration actuating means, a relatively thin flat plate for contacting a person's forehead, said plate being connected to said actuating means, a helmet for placement over said person's head, and means for yieldingly supporting said microphone within said helmet for gently urging said plate into contacting engagement with said person's forehead.

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