

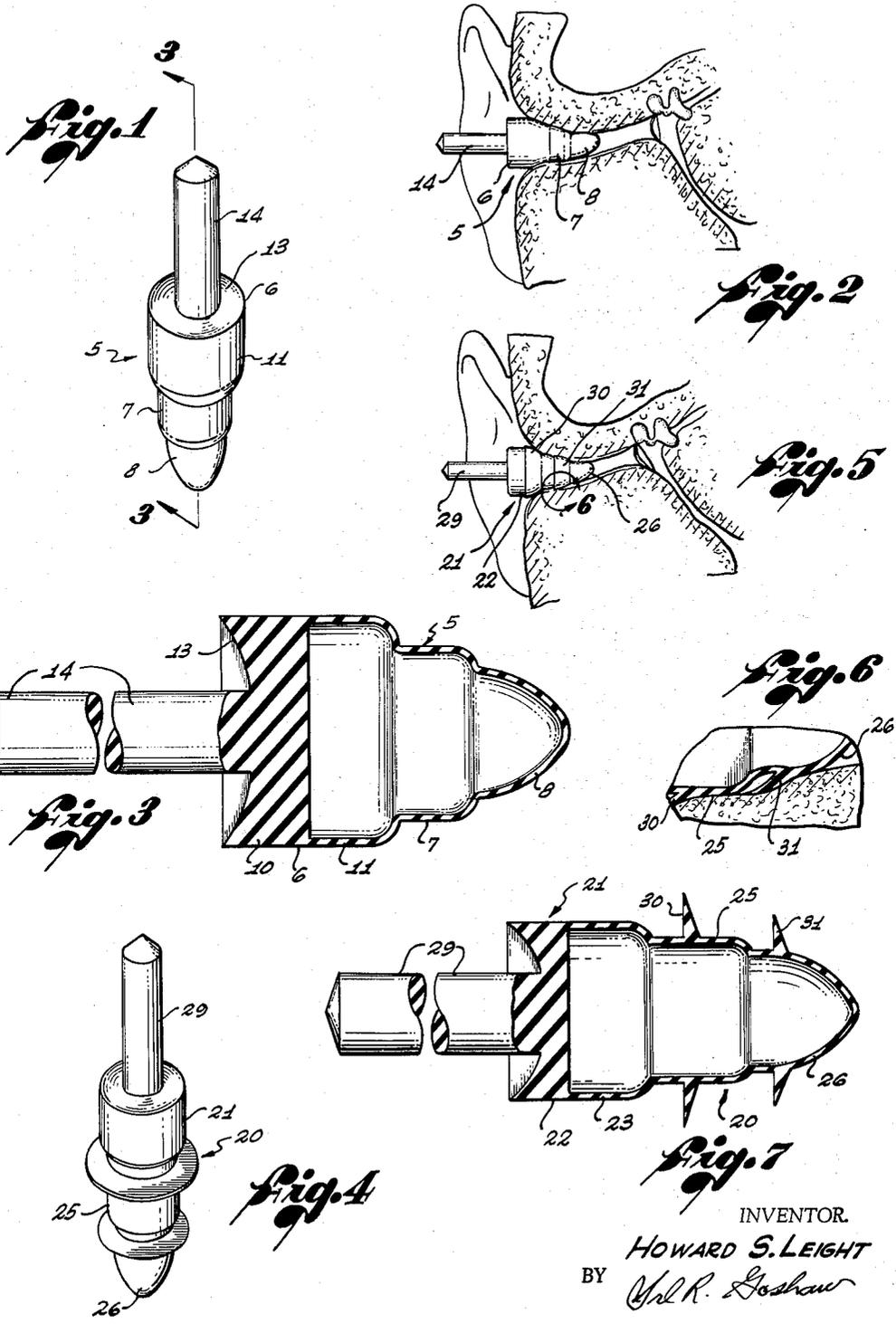
July 5, 1966

H. S. LEIGHT

3,259,128

EAR PROTECTOR FROM NOISE AND DIRT

Filed June 11, 1964



INVENTOR  
**HOWARD S. LEIGHT**  
BY *Carl R. Goshaw*  
ATTORNEY

1

3,259,128

**EAR PROTECTOR FROM NOISE AND DIRT**

Howard S. Leight, 1930 S. Robertson Blvd.,  
Los Angeles 34, Calif.

Filed June 11, 1964, Ser. No. 374,376

7 Claims. (Cl. 128—152)

This invention relates to ear plugs and particularly to ear plugs for protection against noise, water, dust, and dirt.

Ear plugs are known as evidenced by U.S. Patents No. 1,355,276, of October 12, 1920, No. 2,427,664 of September 23, 1947, Design No. 195,322 of May 28, 1963, and No. 2,670,737, of March 2, 1954, an earphone plug being disclosed in No. 2,487,038, of November 8, 1949. Although these prior plugs have certain amounts of noise attenuation and ear protection qualities, the plug of this invention, by its specific construction, provides greater protection by its ability to conform to ear canals of different shapes and sizes and thus increase the seal between the ear canal wall and the plug.

Two forms of ear protective plugs are disclosed herein after, one form being primarily a noise attenuation plug, and the other form providing, in addition, protection from water, dust, and dirt. Both forms are air filled to aid the plugs to form the seal within the ear canal regardless of the variations in shape and size of the canal. The plugs have easily operated insertion and removal tabs which are aided by the concave outer end construction of the plugs.

The principal object of the invention, therefore, is to improve the efficiency of ear protection plugs.

Another object of the invention is to provide an improved ear protection plug.

A further object of the invention is to provide an ear protection plug having a continuous ear canal sealing capability by a plurality of flexibility flanges of different diameters.

A better understanding of this invention may be had from the following detailed description when read in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of one form of the invention;

FIG. 2 is a cross-sectional view of an ear canal with the invention of FIG. 1 positioned therein;

FIG. 3 is a cross-sectional view of the invention shown in FIGS. 1 and 2 and taken along the line 3—3 of FIG. 1;

FIG. 4 is a perspective view of another form of the invention;

FIG. 5 is a cross-sectional view of an ear canal with the invention of FIG. 4 positioned therein;

FIG. 6 is an enlarged detailed view of a section 6 of the invention shown in FIGS. 4 and 5; and

FIG. 7 is a cross-sectional view of the invention shown in FIGS. 4, 5, and 6.

Referring, now, to the drawings in which the same reference numerals identify the same elements, the ear protection plug of FIGS. 1, 2, and 3 has a body portion 5 having two cylindrical sections 6 and 7 and a convex conical tip section 8, the section 6 having a solid base portion 10 and a hollow portion 11. Extending from the center of the outer surface area of the solid portion 10, which is concave as shown at 13, is a cylindrical insertion and removal tab 14 which, in conjunction with the concave surface 13, makes finger-tip insertion and removal of the plug particularly easy.

The remaining portion of the plug has a reduced diameter section 7 and a bullet-shaped tip 8. The wall of portion 11 of section 6 and the walls of sections 7 and 8 are approximately  $\frac{1}{64}$  of an inch in thickness. This thickness of the walls, which are preferably of polyvinylchloride, together with the air filling of the sections, permits

2

ready contraction and expansion of the sections to provide a continuous contact of the wall of the ear canal as illustrated in FIG. 2. That is, the plug will mold itself to the shape of the ear canal to provide a continuous seal to enable the plug to be highly efficient as a noise insulator. The diameters of the sections 6, 7, and 8 may be larger by approximately  $\frac{1}{32}$  of an inch compared to the similar sections of the plug shown in FIGS. 4, 5, 6, and 7 which will be given hereinafter.

Referring, now, to the last-mentioned figures, the plug shown therein has a body 20 consisting of a cylindrical base section 21 with a solid portion 22 and a hollow portion 23, a smaller diameter hollow section 25 and a bullet-shaped nose section 26. An insertion and removal cylindrical tab 29 extends from the center area of the concave surface of solid portion 22. To the extent so far described, the two forms of plugs are similar. However, the features of this second form of plug now to be described provide an improved seal which is particularly suitable for protecting the ear from water, dirt, and dust in addition to its noise attenuation ability.

Where the first-described plug is suitable for many ear canals varying in size, this second form of plug is suitable for practically all sizes of ear canals. This is accomplished by adding tapered disc flanges 30 and 31 on the intermediate section 25 and the tip section 26, respectively, of certain sizes and at certain positions on the sections 25 and 26. In this manner, five separate and individual seals are obtained. As shown in FIGS. 5 and 6, when the flanges are inserted in the ear canal, they fold backward along the canal wall and each provide a seal without altering the seal provided by the next larger diameter section. The first of the five seals is the bullet-shaped increasing diameter tip 26, the second seal being flange 31. The third seal is cylindrical section 25, the fourth seal the flange 30, and the fifth seal the cylindrical portion 23 of section 21.

The dimensions of a plug as shown in FIGS. 4, 5, 6, and 7 which are suitable to provide the increased sealing for different size ear canals are as follows: The diameter of section 21 is  $\frac{3}{8}$  of an inch, the diameter of section 25 is  $\frac{5}{16}$  of an inch, and the largest diameter of section 26 is  $\frac{1}{4}$  of an inch. The important dimensions which provide the five separate seals is the outer diameter of flange 31 which is  $\frac{3}{64}$  of an inch, the outer diameter of flange 31 which is  $\frac{13}{32}$  of an inch with respect to the shape of the juncture between sections 21 and 25 and between sections 25 and 26. The entire length of body 20 is  $\frac{25}{32}$  of an inch which includes  $\frac{1}{8}$  of an inch for solid portion 22,  $\frac{1}{8}$  of an inch for the hollow cylindrical portion 23,  $\frac{1}{16}$  of an inch for the curved juncture between portion 23 and section 25 and  $\frac{1}{16}$  of an inch for the distance from the curved juncture to flange 30. Continuing the dimensions of body 20, the base of flange 30 is  $\frac{1}{32}$  of an inch and the distance from the flange 30 to the curved juncture of section 25 with section 26 is  $\frac{1}{16}$  of an inch, the curved juncture distance being  $\frac{3}{64}$  of an inch, the distance therefrom to flange 31 being  $\frac{3}{64}$  of an inch. The base of flange 31 is  $\frac{1}{32}$  of an inch, while the distance from flange 31 to the tip of section 26 is  $\frac{5}{32}$  of an inch.

It will be noted that since the diameter of nose section 26 is  $\frac{1}{4}$  of an inch, the diameter of flange 31 is  $\frac{13}{32}$  of an inch and the length of the base portion of section 26 is  $\frac{3}{64}$  of an inch, the flange 31 will fold over the space between the base of flange 31 and the curved juncture between sections 25 and 26. The same dimension ratios apply for flange 30 so that five seals as mentioned above are produced which not only permit it to fit and adjust to all shapes and sizes of normal ear canals but provides an ear protector of high quality. It will be noted from FIG. 6 that the cylindrical sections between the flanges

3

and curved juncture sections are depressed by the bending back of the flanges.

I claim:

1. An ear protector comprising a triple air-filled cylindrical sectioned body having a base section including a solid cylindrical portion and an air-filled cylindrical portion, the surface of the end of said solid portion being concave, an intermediate cylindrical section of smaller diameter than said base section and joined thereto by a convex curved portion, a tip section of smaller diameter than said intermediate section and joined thereto by a convex curved portion, said tip section being convexly curved, and a tab attached to the central area of said concave surface of said solid base portion.

2. An ear protector in accordance with claim 1 in which a flange surrounds said intermediate section substantially at the center of said section and a second flange surrounds said tip section substantially at the center thereof.

3. An ear protector in accordance with claim 2 in which the outer diameters of said flanges are greater than the adjacent cylindrical sections.

4. An ear protector comprising a multiple sectioned cylindrical body having a base section including a solid cylindrical portion and an air-filled cylindrical portion, a convexly curved tip section of smaller diameter than the diameter of said base section, at least one cylindrical sec-

4

tion connecting said base and tip sections, said interconnecting section having a smaller diameter than the diameter of said base section and joined thereto by a convexly curved portion to provide a seal, said tip and interconnecting sections being air-filled, and a tab attached to the outer surface of said base section.

5. An ear protector in accordance with claim 4 in which a flange surrounds said tip section substantially at the center of said tip section.

6. An ear protector in accordance with claim 5 in which a second flange surrounds said interconnecting section substantially at the center thereof.

7. An ear protector in accordance with claim 6 in which the outer diameters of said flanges are greater than the diameters of the adjacent cylindrical sections to permit the flanges when folded toward said base section to provide multiple seals.

#### References Cited by the Examiner

##### UNITED STATES PATENTS

2,824,558 2/1958 Michael et al. 128—152

##### FOREIGN PATENTS

578,613 7/1946 Great Britain.

ADELE M. EAGER, *Primary Examiner.*