

March 10, 1959

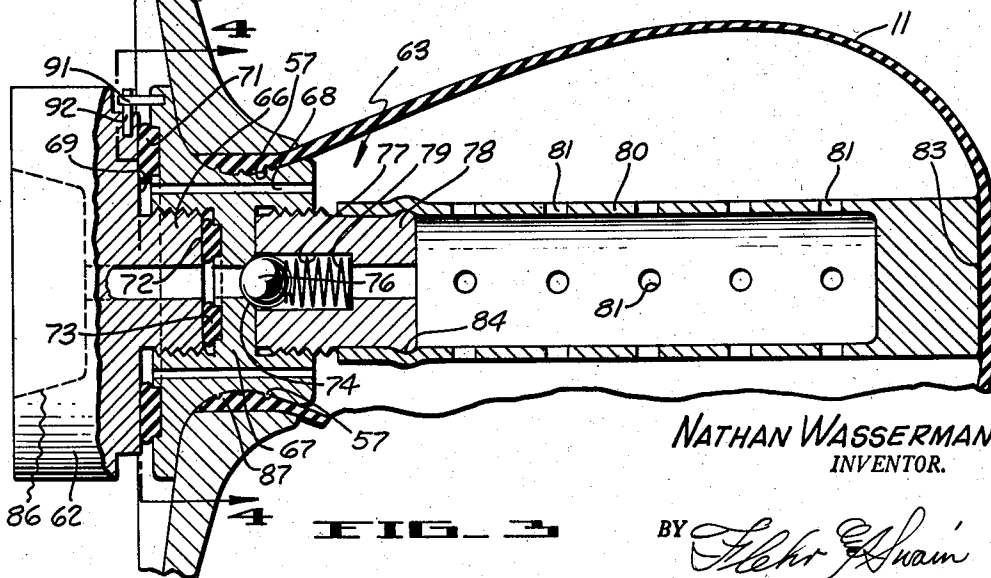
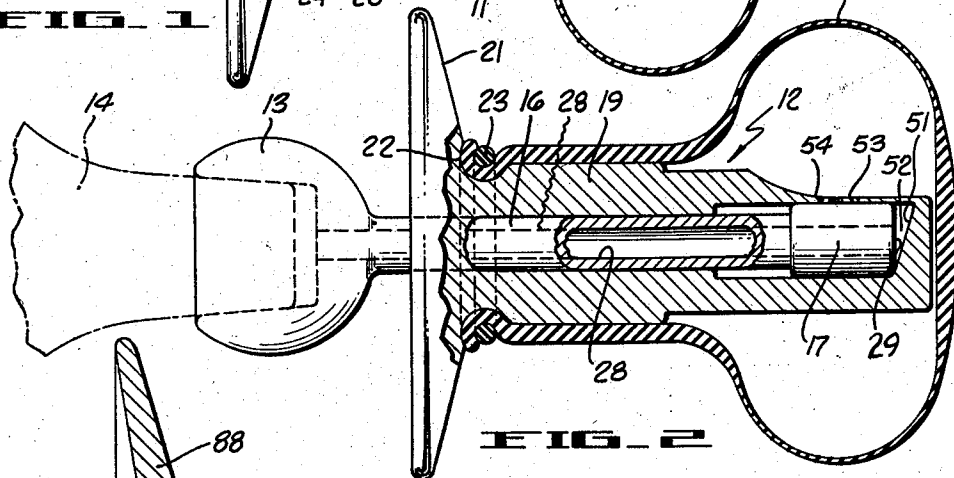
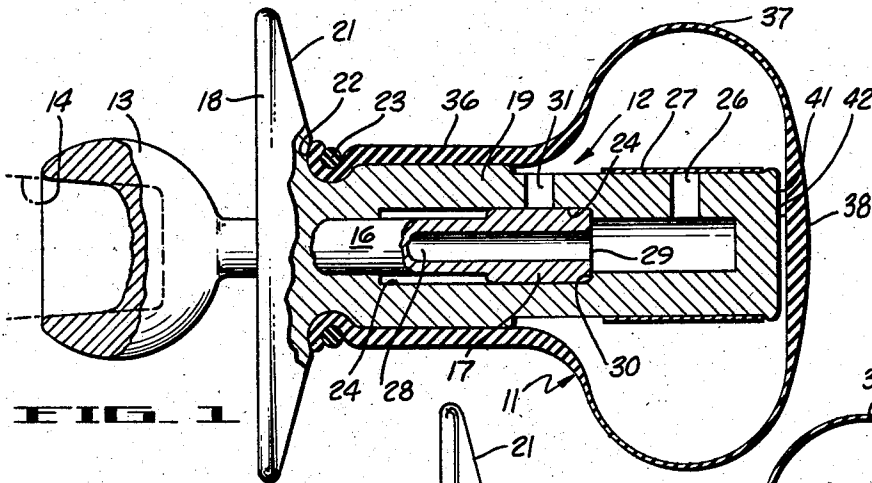
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2,876,767

EAR PLUG

Filed Nov. 2, 1955

2 Sheets-Sheet 1



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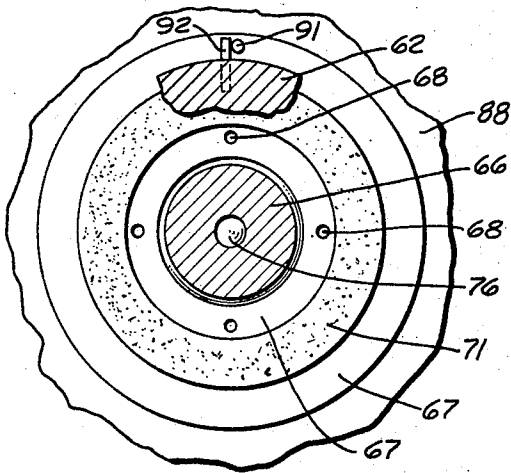


FIG. 4

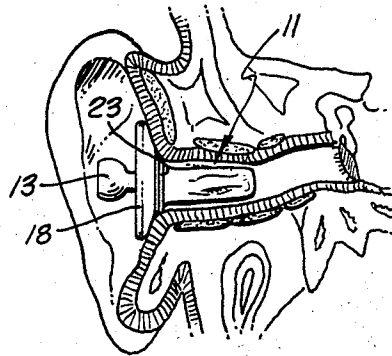


FIG. 5

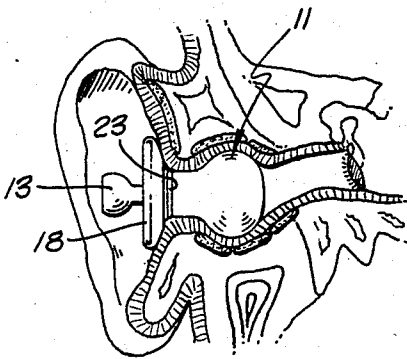


FIG. 6

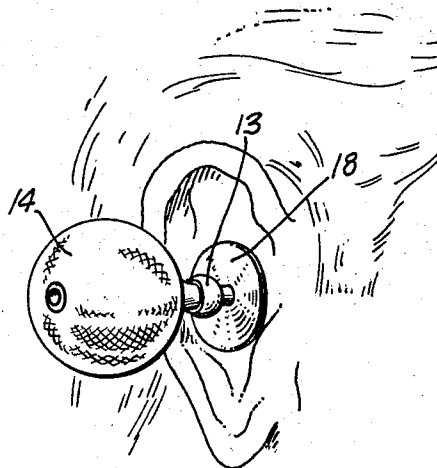


FIG. 7

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EAR PLUG

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8 Claims. (Cl. 128—151)

This invention relates generally to an air plug, and more particularly to an inflatable ear plug.

It is well known that many persons suffer from ear ailments, and if water enters the ear canal, potentially serious complications may result. For example, people suffering from the following ear ailments should not allow water to enter their ears: chronic middle ear disease with perforation of the ear drum; conditions following surgery such as fenestration or radical mastoid cavity; and diseases of the external auditory canal such as bacterial, fungal infections or associated eczemas.

Persons who are afflicted with any one of these ailments may not safely take a shower, swim, bathe or wash their hair without the danger that water may enter into their ear.

Prior art ear plugs are inadequate. They are generally made of solid or flexible material which is inserted into the ear. No provision is made for the material to conform to the internal contour of the ear. The plugs are made in standard sizes. As is well known, there is a wide normal variation in the size and contour of the external ear canal and meatus among individuals. There is a great variation between the size of the ear canal of adults and children. If surgery has been performed upon the ear, the cavity may be greatly enlarged. Prior ear plugs have not provided a positive seal in which the wearer is insured of safety under these varying anatomical conditions.

It is a general object of the present invention to provide an improved ear plug.

It is another object of this invention to provide an ear plug which will provide a positive seal under varying anatomical conditions.

It is still a further object of the present invention to provide an ear plug which is inflatable so as to provide an effective seal under varying anatomical conditions.

It is still a further object of the present invention to provide an ear plug which is easily inserted into the ear canal and which is inflatable by a bulb or syringe. The bulb or syringe may act as the introducer to facilitate the insertion of the ear plug.

It is still a further object of the present invention to provide an ear plug of the above character in which a collar prevents the plug from advancing too far into the ear and also acts as an external seal.

These and other objects of the present invention will be more clearly understood by reference to the following detailed description taken in conjunction with the accompanying drawings.

Referring to the drawings:

Figure 1 is an enlarged sectional view of an inflated ear plug constructed in accordance with my invention;

Figure 2 is an enlarged sectional view of an inflated ear plug of the type shown in Figure 1, but including a different valve assembly;

Figure 3 is an enlarged partial sectional view of another embodiment of my invention;

Figure 4 is a sectional view taken along the line 4—4 of Figure 3;

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Figure 5 shows a deflated ear plug inserted into the external ear canal;

Figure 6 shows an inflated ear plug inserted into the external ear canal; and

5 Figure 7 is a perspective view of an ear with a plug mounted on a syringe and inserted in the ear.

In general my invention comprises an inflatable bladder which is insertable into the canal in its deflated condition. The bag is then inflated and expands against the wall of the external ear canal to seal the ear against 10 entrance of water or other foreign substances.

Referring to Figure 1, an inflatable bladder 11 is mounted on a valve assembly designated generally by the reference numeral 12. The bag 11 may be made of rubber or other suitable material having the proper elasticity. The material should be sufficiently pliable so that when it is inflated, it adapts itself to the contour of the external ear canal.

The knob 13 accommodates the end portion of a bulb or syringe 14. The knob 13 also provides means whereby the valve assembly may be operated to inflate or deflate the bag. The knob 13 is attached to a tubular portion 16. The tubular portion 16 may be machined from the same piece of material as the knob 13, or the two different pieces may be suitably joined. An exhaust valve 17 is disposed at the other end of the tubular portion 16. The stop or collar 18 and the post designated generally by the numeral 19 may be formed of a single piece. The collar 18 has a tapered portion 21 which terminates in a recess or groove 22. The groove 22 accommodates the end portion of the bag 11. A suitable O ring may be accommodated in the groove 22 to suitably mount the bladder 11 to the post 19. The O ring may be secured to the collar, as by cementing. The post 19 is provided with a recess 24 which accommodates the exhaust valve 17. The end portion of the post 19 is provided with a port 26 which permits air supplied by the syringe or bulb to flow into the bag 11. A thin rubber tubing or similar suitable membrane 27 acts as an intake valve. Thus the air travels from the bulb or syringe through the opening 26, between the membrane 27 and post 19 and into the bladder. The pressure of the gases within the bladder serves to urge the intake valve into a sealed position.

To deflate the bag the knob is pulled outwardly whereby the exhaust valve 17 is drawn back so that the end portion 29 clears the exhaust port 31. The gases then escape through the exhaust port opening 28. Thus, the bladder is deflated. The thickness of the bladder 11 varies so that the expansion is substantially lateral. For example, the bag may be formed relatively thick in the region 36 to provide a secure connection to the post, relatively thin in the region 37 which causes lateral expansion, and relatively thick in the end portion to prevent distal expansion of the bladder which might endanger the ear drum. It may be desirable in certain instances to also provide a suitable connection between the end portion 41 of the body 19 and the inner surface 42 of the bladder to limit the distal expansion.

Operation of the device is as follows: The knob 13 is pressed inwardly whereby the portion 29 abuts against the shoulder 30 formed on the post 19. The air which is supplied by the syringe flows along the opening 28, outward through the port 26 to expand the valve 27 and inflate the bag 11. The pressure of the air within the bag seats the valve.

To remove the ear plug from the ear, the member 13 is grasped by the thumb and forefinger and the exhaust valve 17 is drawn outwardly whereby the end 19 clears the port 31. The gases then escape through the exhaust port through an opening 28.

It is apparent that the end portion 36 of the bag 11

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may be attached to the post 19 by other means. Although the post 19 may be made of any suitable material, I prefer to employ rubber whereby it is flexible and will not damage the ear. The stop or collar 18 may be formed of soft material which adapts itself to the contour of the exterior of the ear. Thus it prevents inserting the plug too far into the ear and forms a seal as well.

In Figure 2, I have illustrated another type of valve assembly which simplifies the construction. The post 19 is shortened. The end portion 51 of the recess is slanted whereby when the end 29 of the exhaust valve 17 abuts the end, a space 52 exists. The wall portion of the post 19 is thinned down adjacent the intake and exhaust port 53. Thus this portion of the post forms the intake valve.

To inflate the bladder 11, valve 17 is advanced to abut against the shoulder 51 and the bulb or syringe supplies air through the opening 28 into the space 52 where it forces the portion of reduced diameter 54 outward to allow the gases to pass into the bladder.

To deflate the bladder, the valve 17 is drawn outward and the end portion 29 clears the port 53. The gases then escape through the opening 28.

In Figures 3 and 4, I have illustrated an ear plug which includes a ball type valve. The cap 62 of the valve assembly 63 accommodates the end portion of a bulb or syringe 14. The forward portion 66 of the cap is threaded and engages the member 67. The shoulder 69 engages the gasket or seal 71 and the end portion 72 engages the gasket or seal 73. A plurality of bleeder holes 68 are formed in the member 67. The purpose of these holes will be presently described. The member 67 is provided with a seat 74 which seats the ball 76. The ball 76 which is housed in the recess 77 of member 78 is urged into a seated position by the spring 79 and by the pressure of the air within the bladder. The member 78 also mounts a flexible hollow post 80. The post 80 has a plurality of holes 81 formed along its periphery. These holes communicate with the inside of the bladder 11. The post 80 has sufficient rigidity to facilitate insertion of the bladder or bag 11 into the ear and yet not endanger the internal organs. The bladder 11 may be affixed to the distal end 83 of the post 80. Thus, as the bag 11 is inflated, it cannot expand in a distal direction to damage the ear drum. Expansion of the bag 11 is lateral to press against the canal walls.

The post 80 is attached to the member 78. For example, the member 78 may have a shoulder 84 over which the hollow post fits. An axial hole is formed in the cap 62 and members 67 and 78. Thus, by inserting a bulb or syringe 14 in the recess 86 and squeezing the bulb or syringe, air flows through the axial hole forcing the ball 76 away from the seat. The air then flows through the hollow post into the interior of the bag 11 to inflate it.

The bag 11 is suitably attached to the member 67. For example, the member 67 may have ridges 57 formed thereon. These ridges serve to engage the bag 11 and securely seat the bag. It may be desirable to cement the bag 11 to the member 67.

A collar 88 is also mounted on the member 67 and serves to prevent insertion of the ear plug too far into the ear where it may damage the ear drum. The member 88 may be made of any suitable material, for example, rubber.

In certain instances it may be desirable to form the bag 11 and collar 88 as a single structure. It may also be desirable to make a portion of the collar 88 inflatable. Thus, as the bag is inflated, the collar 88 is also inflated and will bear against the ear to better seal the external portion of the ear.

To remove the plug from the ear, the bag is deflated by unscrewing the cap 62 whereby the seal formed by the seals 71 and 72 are broken. The air escapes through the holes 68. Suitable means may be provided to prevent

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loss of the cap 62 when it is unscrewed to deflate the bag 11. For example, the pin 91 is inserted into the member 67. Pin 92 is embedded into the cap 82 after the valve assembly 63 has been assembled. Thus the cap 62 may only be turned through one revolution.

It may be possible to employ other types of valves such as a reed type valve, together with an arrangement of the type described in conjunction with Figures 3 and 4.

The collar and cap may be colored to match the skin. A plug will then be less conspicuous. All portions of the valve assembly may be made of plastic. Thus the parts may easily be formed to reduce manufacturing costs.

Referring particularly to Figure 5, a plug with a deflated bag is shown inserted into the ear. By mounting the plug on the syringe 14, it may be easily guided into the ear. This is more clearly illustrated in Figure 7 where the syringe or bulb 14 is shown mounted on the plug which is inserted into the ear. After the plug is in the ear, air is forced into the bag 11 and it is inflated as shown in Figure 6. The bag expands in a lateral direction pressing against the external ear canal to thereby effectively seal the ear and the syringe or bulb is detached, leaving the inflated plug in situ.

It is seen that I have provided an improved ear plug which is not subject to the disadvantages of the prior art ear plugs. The plug is inflatable and will accommodate itself to an ear canal having any contour. Further, the plug will accommodate itself to adults and children as well as to the various sizes encountered in each class. The plug is easily and safely inserted into the ear and does not noticeably interfere with hearing.

I claim:

1. An ear plug comprising a flexible post, an inflatable bladder carried by said post, said post and bladder adapted to be inserted into the ear canal and valve means serving to control the inflation and deflation of said bladder.

2. An ear plug comprising a post, an inflatable bladder carried by said post, said post and bladder adapted to be inserted into the ear canal, intake valve means serving to maintain the bladder in an inflated condition, and exhaust valve means for deflating said bladder.

3. Apparatus as in claim 2 wherein said exhaust valve means comprises an exhaust valve slidably carried within said post.

4. Apparatus as in claim 2 wherein said intake valve means comprises a rubber membrane surrounding the end portion of said post.

5. Apparatus as in claim 2 wherein said intake valve means comprises a relatively thin portion of said post.

6. An ear plug comprising a flexible post, an inflatable bladder carried by said post, said post and bladder adapted to be inserted into the ear canal, intake and exhaust ports formed in said post, intake valve means associated with said intake port, and exhaust valve means associated with said exhaust port, said exhaust valve means comprising a plunger slidably carried within said post.

7. Apparatus as in claim 6 wherein said intake valve comprises a membrane surrounding said post and covering the intake port.

8. Apparatus as in claim 6 wherein said intake and exhaust ports comprise a single opening, and said intake valve comprises a relatively thin portion of said post in the vicinity of said opening.

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