United States Patent [19]

Devaney et al.

[11] **3,918,098**

[45] **Nov. 11, 1975**

[54] **THREADED EARCUP SUSPENSION SYSTEM**

[75] Inventors: **Robert P. Devaney**, San Dimas; **Erwin J. Fellner**, La Crescenta; **William A. Cohen**, Pasadena, all of Calif.

[73] Assignee: **Sierra Engineering Co.**, Sierra Madre, Calif.

[22] Filed: **Jan. 22, 1975**

[21] Appl. No.: **543,132**

[52] **U.S. Cl.** **2/209**; 2/6; 179/156

[51] **Int. Cl.**[2] **A42B 1/06**

[58] **Field of Search** 2/209, 6, 8; 179/156

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Primary Examiner—Werner H. Schroeder
Assistant Examiner—Peter Nerbun

[57] **ABSTRACT**

An earcup suspension for a full coverage protective helmet makes use of a ball and socket between a rigid head contacting earcup and an adjustable assembly attached to the helmet shell. The adjustable assembly is manipulated by a knob on the exterior of the helmet shell which has a threaded engagement with a stud to which the ball is connected. Because the stud is secured to prevent rotation, it is moved inwardly or outwardly by rotation of the knob so as to adjust the snugness of the fit of the rigid earcup with respect to the wearer's head.

7 Claims, 4 Drawing Figures

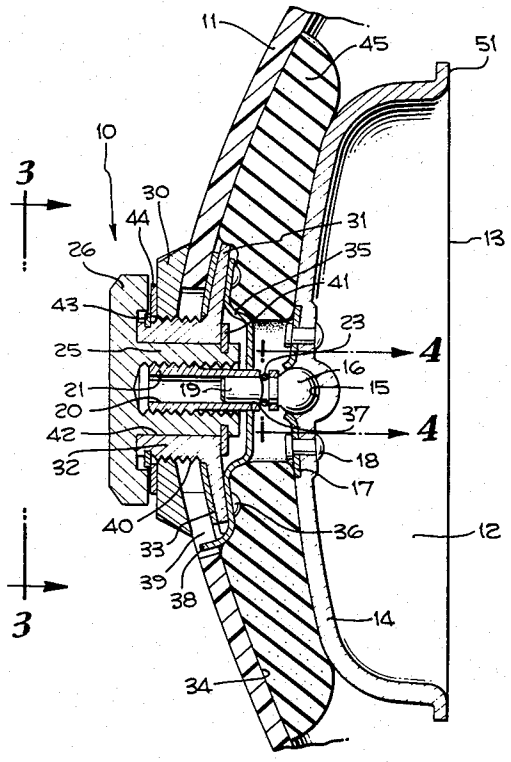


Fig. 1.

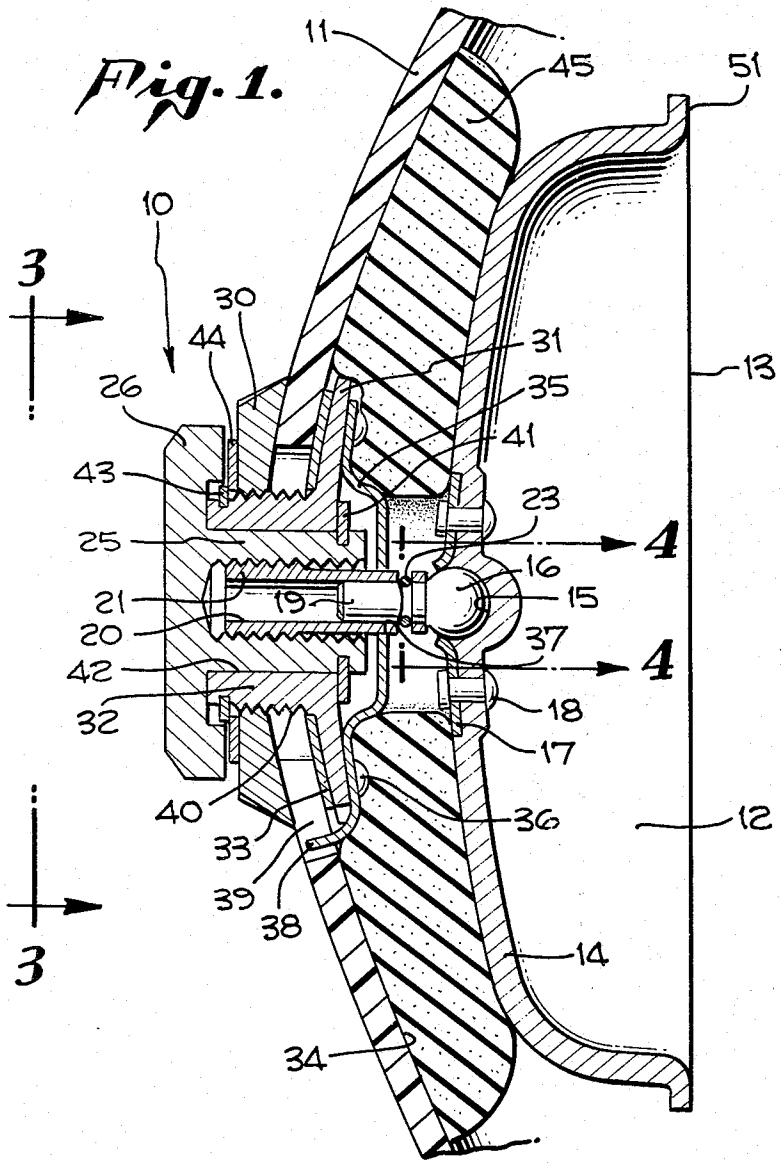
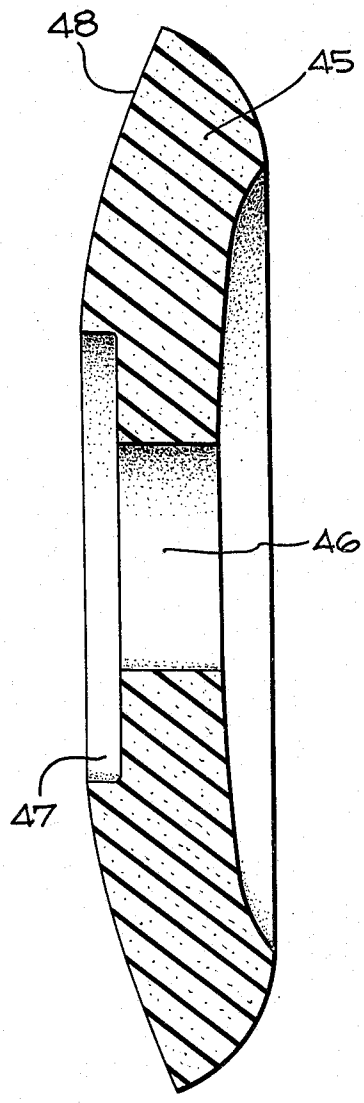


Fig. 2.



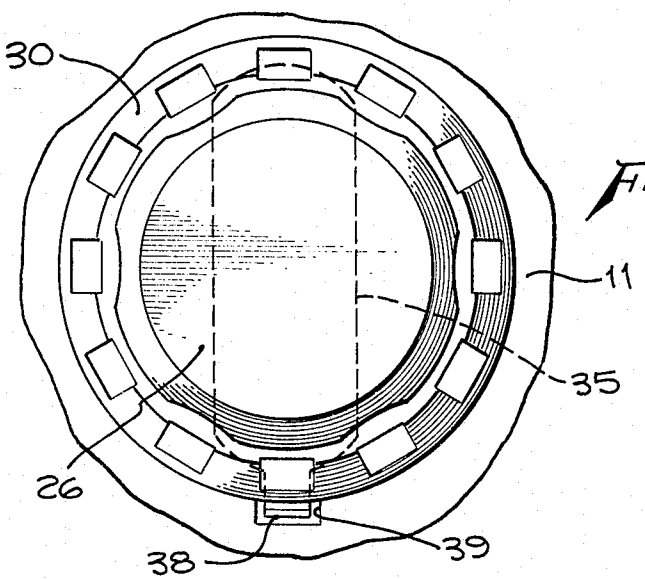
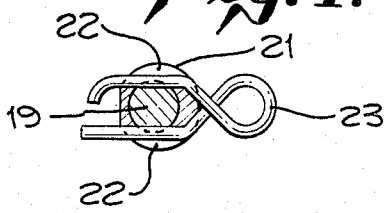


Fig. 3.

Fig. 4.



THREADED EARCUP SUSPENSION SYSTEM

The comfort of fit of earcups within a flyer's protective helmet is very important to his efficiency. Communication by way of the earcups is clearly of vital importance. Normally the position and snugness of earcups is initially adjusted to an individual user's use before the helmet is donned, although some attempts have been made to build into the earcup mounting a degree of adjustability subsequent to donning. Those expedients heretofore available have had limited applicability and also have lacked the proper degree of universal adjustment. it is, moreover, especially advantageous to have earcups so constructed and fitted to the user's head that exterior noises can be effectively insulated from the user's ears.

It is therefore among the objects of the invention to provide a new and improved earcup suspension system which provides a positive means for positioning noise attenuating earcups in a full coverage protective helmet with full adjustability by the user while the helmet is worn.

Another object of the invention is to provide a new and improved earcup suspension system which can be simply and readily manipulated by adjusting knobs or buttons on the exterior of the helmet shell using one hand only, whereby both the pressure of the earcup against the user's head and the location of the earcup with respect to the helmet shell can be quickly and readily adjusted.

Still another object of the invention is to provide a new and improved earcup suspension system, the construction and adjustability of which is such as to make possible effective noise attenuation when adjusted to the user's head.

Still further among the objects of the invention is to provide a new and improved earcup suspension system which is simple and compact with parts concentrically located, making installation and adjustment positive and dependable under virtually all conditions.

With these and other objects in view, the invention consists in the construction, arrangement and combination of the various parts of the device, whereby the objects contemplated are attained as hereinafter set forth, pointed out in the appended claims, and illustrated in the accompanying drawings.

In the drawings:

FIG. 1 is a longitudinal sectional view of the earcup suspension system mounted in a helmet shell;

FIG. 2 is a longitudinal cross-sectional view of the cushion between the rigid earcup and the shell;

FIG. 3 is an outside elevational view on line 3—3 of FIG. 1;

FIG. 4 is a fragmentary cross-sectional view on line 4—4 of FIG. 1.

In an embodiment of the invention chosen for the purpose of illustration, there is shown an earcup suspension system indicated generally by the reference character **10** mounted upon a helmet shell **11.** A relatively rigid earcup **12** has an open side **13** adapted to engage the face of the user and a closed side **14.** Centerably disposed on the closed side is a socket **15** formed from the material of the earcup in which a ball **16** is mounted to provide universal movement for the earcup. A retainer **17** overlies the ball **16** to hold it in the socket **15,** and the retainer is attached to the earcup by suitable rivets **18.**

In the form of the device chosen for illustrative purposes, the ball **16** is mounted on the end of a stud **19,** and the stud in turn is retained within a bore **20** of a threaded shaft **21.** More particularly there are provided notches **22** in the threaded shaft for retention by a spring clip **23.** The threaded shaft **21** threadably engages a threaded sleeve **25** which is part of an adjusting knob **26.**

For mounting the parts just described in position on the helmet shell, use is made of an arrangement which may be appropriately referred to as a locking assembly consisting of a locking collar **30** on the outside of the shell, a flange **31** on the inside, and an exteriorly threaded skirt **32.** A washer **33** lies between the flange **31** and the inside surface **34** of the shell. For appropriately positioning the stud there is provided a shaft retainer plate **35** which is attached to the flange **31** by means of rivet **36.** The threaded shaft **21** extends through a hole **37** in the shaft retainer plate **35.** A lock finger **38** protrudes into a pocket **39** to prevent rotation of the flange and its threaded skirt when the locking collar is rotatably engaged with the threads **40.**

A retaining ring **41** sitting in an appropriate recess in the threaded sleeve **25** holds the threaded sleeve and, accordingly, the adjustable knob in place within a central aperture **42** in the threaded skirt **32.** A snap ring **43** which overrides a washer **44** serves to prevent the locking collar **30** from being rotated to engage with the adjusting knob **26.** The washer **44** is used for accommodation of the mechanism to various sizes of helmet shells.

To complete the assembly there is provided a foam pad **45** of appreciable thickness which separates the earcup **12** from the inside surface of the shell **11.** A central hole **46** in the foam pad **45** accommodates appropriate portions of the locking assembly, and a counter sink **47** is adapted to receive the flange **31** and washer **33** so that they are flush with the outside surface **48** of the foam pad in the fully retracted position.

In operation with the locking collar loosened and the adjusting knob rotated to a withdrawn position for the earcup **12,** the helmet is donned and the earcup placed over the ear. Tilting is allowed for by reason of the employment of the ball and socket joint. When the earcup is not in proper position with respect to the ear itself, the locking assembly, and hence the earcup **12** and the foam pad as well, can be moved about because of there being provided an opening **50** in the helmet shell **11** which is substantially greater in diameter than the outside diameter of the threaded skirt **32** which extends through it when the earcup has thus been shifted to a desired position. The locking collar **30** is then rotated with respect to the threads **40,** and the locking assembly exemplified by the flange **31** is drawn against the inside surface of the shell as the locking collar is screwed down against the outside surface, thereby to fasten the locking assembly to the shell and, accordingly, fix the position of the earcup.

Since normally the earcup would be withdrawn away from the head of the wearer to its farthest position during this initial adjustment, the earcup then can be moved toward the head of the wearer until a rim **51** of the earcup bears against the wearer's face by rotation of the adjusting knob **26.** As the knob is rotated, the threads on the threaded sleeve **25** engage the threaded shaft **21,** and by rotation in the proper direction the threaded shaft **21,** the stud **19,** and therefore also the ball and socket joint are moved in a direction from left

to right, as viewed in FIG. 1, which serves to move the earcup in a corresponding direction towards the face of the wearer. For maximum convenience the head relationship may be such that by rotating the outer knob, either the left hand knob or the right hand knob, toward the front of the helmet the earcups will travel towards the center of the helmet. Obviously, rotation toward the rear of the helmet will retract the earcups toward the helmet shell.

Having described the invention, what is claimed as new in support of Letters Patent is:

1. An adjustable earcup suspension for mounting on a protective helmet shell comprising an earcup having one joint member of a universal joint disposed therein, a threaded stud including the other joint member of said joint, fastening means holding said joint members in operating association, said shell having a clearance recess in axial alignment with said earcup, a locking assembly having one element overlying the interior of the shell, a connecting section of cross-sectional size smaller than said recess extending through said recess and another element of said assembly overlying the exterior of the shell in adjustable engagement with said connecting section for adjustably fixing the position of the earcup relative to the center of the recess, an adjusting knob rotatably mounted on the exterior of the locking assembly and a threaded connection between the adjusting knob and said supporting stud whereby to adjustably shift the location of said earcup alternatively

away from or toward the shell.

2. An adjustable earcup suspension as in claim 1 wherein there is a resilient pad between the earcup and the interior of the shell.

3. An adjustable earcup suspension as in claim 1 wherein the universal joint is a ball and socket joint having a ball member of said joint mounted on said threaded stud.

4. An adjustable earcup suspension as in claim 1 wherein said other element of the locking assembly is a locking collar and there is a threaded engagement between said locking collar and the connecting section of said locking assembly.

5. An adjustable earcup suspension as in claim 1 wherein said earcup, said universal joint, said locking assembly and said adjusting knob are concentrically disposed on said shell.

6. An adjustable earcup suspension as in claim 1 wherein the adjusting knob is smaller in size than the lock collar whereby to enable relative independent adjustment of the earcup in directions laterally of and toward and away from said shell.

7. An adjustable earcup suspension as in claim 4 wherein there is a lock finger on said one element of the locking assembly in anchored engagement with the shell whereby to secure said one element against rotation by said locking collar.

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