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Lonnstedt

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[54] **AUDITORY PROTECTION ON SAFETY HELMETS**

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[52] **U.S. Cl.** ..... **2/3 R,** 2/209

[51] **Int. Cl.** **A42b 3/00**

[58] **Field of Search** ..... 2/3 R, 209, 6; 179/156 R

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[57] **ABSTRACT**

The present invention relates to an arrangement for preventing auditory damage and keeping out irritating noises. It consists of ear muffs displaceable on clamps pivotably arranged with attachment units on a safety helmet. The invention is characterized mainly in that each attachment unit on the helmet is provided with, in addition to attaching means for pivotable attachment on the safety helmet, adjusting means acting on the clamp which is attached to the attachment unit on the helmet and determines the contact pressure. As a result, the ear muffs can be easily lifted off, even with a gloved hand, and swung up to a resting position on the safety helmet.

10 Claims, 4 Drawing Figures

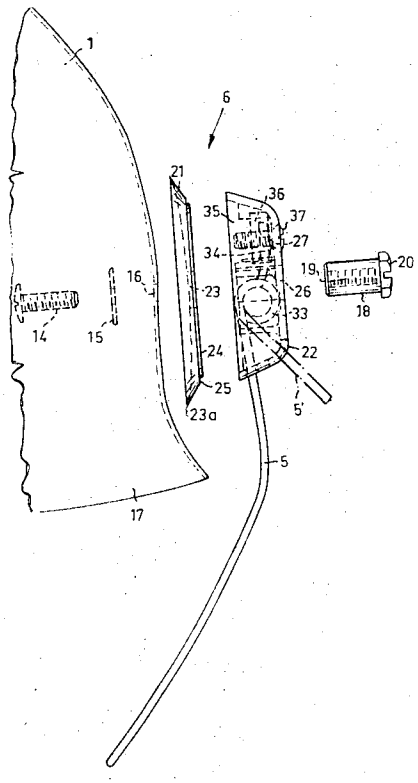
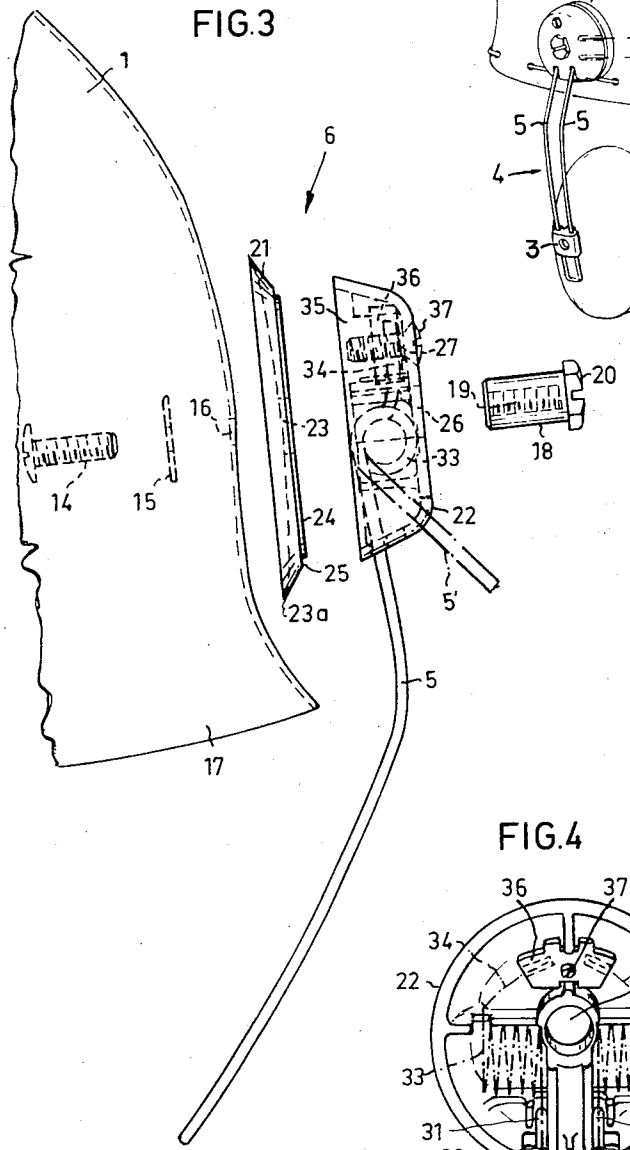


FIG.3



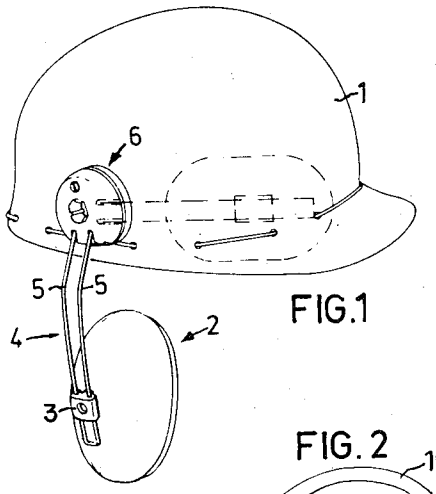


FIG.1

FIG. 2

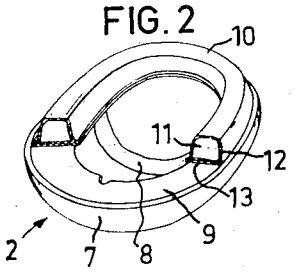
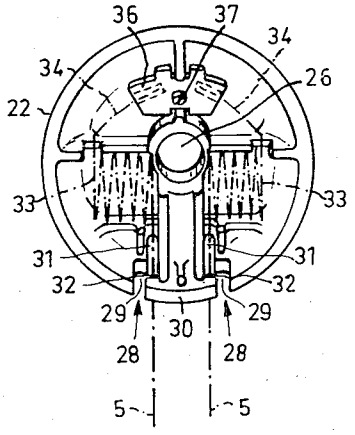


FIG.4



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AUDITORY PROTECTION ON SAFETY HELMETS

The present invention relates to an arrangement for preventing auditory damage and keeping out irritating noises. It consists of ear muffs displaceable on arms pivotably arranged with attachment units on a safety helmet.

The problem is to produce such an arrangement so that is can be easily borne by persons who are required to wear safety helmets when they work. The arrangement must be effective and comfortable, but also easily removable to allow for e.g. conversations and thereafter easily put in place again.

Previous use of auditory protection arrangements with the wearing of safety helmets has been mainly limited to different types of ear plugs. The drawback with these models has chiefly been that they were difficult to remove and put on with gloved hands, a problem prevalent on building sites, in mines, in shipyards, etc. As a result, auditory protection was not always utilized to the required extent. In addition, they did not always provide sufficient sound dampening effect.

Arrangements of the type having ear muffs with clamps provide much more effective auditory protection but have been difficult to suitably combine with safety helmets. One method used has been to bend the clamp, which normally unites the ear muffs, behind the neck. However, this has not provided good results. Attempts have even been made to secure the ear muffs onto the helmet, but it has been difficult to attain the right contact pressure. It has also proved difficult to temporarily remove the ear muffs with the safety helmet still on the wearer's head.

The aim of the present invention is thus to produce an auditory protection arrangement attached to a safety helmet wherein the arrangement is effective, comfortable to wear and easy to temporarily remove and put on again.

Another objective is to provide an arrangement which is shock-proof — i.e. prevents contact between the inside and the outside of the safety helmet — and is insulated against high voltages.

A third purpose is to provide an arrangement which is hygienically acceptable, even after prolonged usage, and maintains its effectiveness.

This is achieved by providing each helmet attachment unit with, in addition to attaching means for pivotable attachment on the safety helmet, adjusting means for adjusting the contact pressure of the ear muffs, the adjusting means acting on the arm which is attached to the helmet's attachment unit and determines the contact pressure.

As a result, the ear muffs can be easily lifted off, even with a gloved hand, and swung up to a resting position on the safety helmet, forwards or backwards. At the same time, each wearer can easily adjust the contact pressure individually, either increasing or decreasing it with the desired accuracy, in comparison with the known method of simply reshaping the arm.

The attachment unit can be advantageously designed to consist of an inner fastener which, by means of a washer, contacts the inside of the helmet and has one end running through a hole in the side of the helmet, and also engages an outer fastener bearing against the helmet. This outer fastener pivotably supports,

between its outer end and the helmet, a housing support and an attachment housing containing the arm and the adjusting means, the housing support lying closest to the helmet. Consequently, the attachment unit is easy to attach to different types of helmets and can thus be used to equip existing helmets with good auditory protection.

In order to lessen the wear and tear on the helmet caused by pivoting the ear muffs, and to obtain good sealing between the helmet and the attachment housing, it is preferable to make the housing support of a flexible, wear resistant material having low friction and to shape it so that it has, in cross section, increasing thickness from a center hole towards the periphery, and that it terminates at the periphery with a knife-like edge against the safety helmet. On the side which runs along the periphery and faces the attachment housing, this housing support is provided with a circumferential groove for securing and tightening against said attachment housing.

In a preferred embodiment, the adjusting means act on ends of legs of the arm or clamp, these legs being spring shaped. The adjusting means consist of an adjusting screw which is easily turnable from the outside of the attachment housing and is provided on the inside of said attachment housing with a clamp holder for the leg ends of the clamp, said leg ends being situated in said attachment housing. Thus, by turning the adjusting screw, the clamp holder is moved thereby altering the contact pressure. In addition, the legs supporting the ear muff preferably extend through guide slots on the underside of the attachment hood, these guide slots allowing the clamp to move a certain distance either out from or in towards the safety helmet. Each guide slot consists of two mutually parallel, laterally displaced slot portions, an outer slot portion opening into the edge of the attachment housing and an inner slot portion, the slot portions being connected by a transverse slot which is placed perpendicular to the longitudinal direction of said slot portions. As a result, the putting on and taking off of the ear muffs is facilitated, and also the assembly of the parts of the attachment housing is facilitated, the assembly resulting in an integrated attachment unit.

The attachment housing is preferably insulating — even for high voltages — so that electrical contact is prevented between the inside and the outside of the safety helmet.

In another preferred embodiment, the sealing ring on the casing of the ear muff and lying against the wearer's head is releasably adherred to said casing. This means that the sealing ring, which has become soiled and stiff after prolonged usage, can be quickly and easily replaced, thus maintaining the effectiveness of the auditory protection arrangement.

The invention is further explained below with the help of an embodiment shown on the enclosed drawing where

FIG. 1 shows a safety helmet with a pivotably attached ear muff;

FIG. 2 is a sectional view of the ear muff with a replaceable sealing ring;

FIG. 3 is an enlarged side view of the helmet attachment unit and

FIG. 4 is a rear view of the attachment housing.

In FIG. 1, the safety helmet 1 is provided with an auditory protection arrangement in the form of ear muffs 2 (only one is shown in the figure) which are displaceable on arms or clamps 4 by means of ear muff holders 3. Each clamp 4 consists of 2 mm thick stainless spring wire that is bent into a U-shape with the open ends of the legs 5 secured in an attachment unit 6 which is attached to the helmet 1.

According to FIG. 2, each ear muff 2 consists of a dome-shaped plastic casing 7, internally provided with about a 10 mm thickness of foam plastic which contacts the walls of said casing 7. A plane edge 9 runs along the periphery of the casing 7. On this edge 9 is a sealing ring 10, which consists of foam plastics 11, enclosed in a supple guard 12 of thin plastics which, by means of a layer of tape 13, is removably secured on the plane edge 9. The purpose of the sealing ring 10 is to obtain good sealing between the casing 7 and the person's head. This requires good contact, which, in turn, demands that the sealing ring 10 retains its suppleness. Since the plastics material tends to age, the sealing ring has been made easily removable thus having a renewing effect on the arrangement and making it more acceptable for use. The sealing ring can be made replaceable in other ways, e.g. by using Velcro tape or by having one or more locking rings press the sealing ring 10 tight against the casing 7.

As is evident from FIG. 1, the ear muff 2 and the arm 4 can be rotated about the attachment unit 6 on the safety helmet 1 so that said ear muff can be turned up on the helmet e.g. to the position indicated by the broken lines. This is made possible by shaping the attachment unit 6, according to FIG. 3, in the following manner. Inside the helmet 1 is an inner fastener 14, in this case a screw, which contacts the inside of the helmet via a washer 15 on said helmet and runs through a hole 16 in the side of the helmet. The diameter of this hole is slightly greater than the diameter of the threaded part of the inner fastener 14. The distance of the hole 16 from the edge 17 of the helmet is adapted to suit the shape of the helmet. Laterally, the hole ought to be placed essentially on a vertical center line through the wearer's ear. An outer fastener 18, shaped as a circular cylinder, is provided in one end with a female-threaded hole 19 and in the other end with a slotted hexagonal head 20. This fastener 18 is in secure engagement with the threaded part of the inner fastener 14 and bears against the outside of the helmet. The outer fastener 18 is made of plastics and thus is insulating. A housing support 21 and an attachment housing 22 are pivotably attached on the outer fastener 18, between the helmet 1 and the hexagonal head 20.

The housing support 21 is made of flexible wear resistant plastics having low friction. Its purpose is to act as a support for the attachment housing 22 against the helmet and, therefore, must be able to conform to the different curvatures on different helmets while at the same time hearing well against the attachment housing 22. To this end, the housing support has in cross section (see FIG. 3) increasing thickness from the center hole 23 towards the periphery and it terminates at the periphery with a knife-like edge 23*a* against the safety helmet 1. On the side 24 facing the housing attachment 22, the housing support 21 is provided with a circumferential groove 25 along its periphery for securing and tightening against said attachment housing 22.

The attachment housing 22 is also made of plastics and is in the shape of a dish which is open to the housing support 21. As is evident from FIGS. 3 and 4, the attachment housing is internally provided with stiffeners and a centrally situated hole 26 through which the outer fastener 18 runs. An additional hole 27 is located on the side of the attachment housing 22 above the hole 26. On the underside of the attachment housing are two guide slots 28 symmetrically situated relative to a plane through the center lines for the holes 26 and 27 and being longitudinally parallel to said planes. Each guide slot 28 is divided up into two mutually parallel, laterally displaced slot portions, an outer slot portion 29 opening into an edge 30 and an inner slot portion 31, both portions being united with a transverse slot 32 which is perpendicular to the longitudinal direction of said portions 29 and 31. The distance between the outer slot portions 29 is greater than the distance between the inner slot portions 31.

During assembly, the legs 5 on the clamp 4 are placed in the outer slot portions 29 and from there they are moved to the inner slot portions 31 where they normally rest and are prevented by the transverse slots 32 from moving out towards the outer slot portions 29. Each leg 5 forms into a coiled spring 33 which has its longitudinal axis perpendicular to the leg 5 and rests between stiffeners in the attachment housing 22 on each side of the hole 26 and somewhat below the center of said hole. The outer part of each coiled spring 33 is shaped to have an end 34 which terminates at the hole 27 where it is held towards the attachment housing 22 by adjusting means 35 consisting of an arm holder 36 attached to an adjusting screw 37 which is easily turnable in the hole 27 from the outside. The arm holder 36 is provided with recesses engaging stiffeners in the attachment housing 22 in order to prevent said clamp holder from rotating when the adjusting screw 37 is turned. This clamp holder also has recesses for the ends 34.

When a right-hand threaded adjusting screw is turned clockwise, the arm holder 36 is moved outwards from the helmet and brings the ends 34 with it. The result is that the coiled springs 33 force the legs inwards, towards the helmet. The force of the spring is determined by the amount of the turning. Turning in the other direction results, of course, in decreased spring force — i.e. decreased contact pressure against the head of the wearer. The attachment housing 22 is externally provided at the hole 27 with two arrows indicating different turning directions and is marked with + (increased pressure) and − (decreased pressure).

For the putting on and taking off of the auditory protection arrangement, the legs 5 are swingable outwards — position 5' on FIG. 3 — from the head and the helmet to an extent determined by the length of the inner slot portions 31. The inward movement towards the head and the helmet is limited by the transverse slots 32. Therefore, the positions of said transverse slots can be adapted, together with the shape of the legs 5 and the prestressing in the coiled springs 33, to conform to the smallest possible contact pressure against the head.

The above described arrangement can, of course, have varied detail embodiments without, however, deviating from the idea of the invention. For example, the clamp 4 can be pivotably secured in the upper part of the attachment housing 22 and its lower part can be

affected by adjusting means which can consist of a spring element, e.g. a coiled spring, situated between the outside of the attachment housing 22 and the clamp 4. The compression of the spring element is controlled by an externally turnable adjusting screw located inside the attachment housing. The compression of this coiled spring increases the contact pressure. Obviously, other types of spring elements can be used. Similarly, the internal positioning of these elements and the clamp 4 can be varied, as well as the choice of material and shape of the clamp. In combination with a suitable spring element, the clamp 4 can be made of e.g. strip steel having adapted thickness, width and bend.

What I claim is:

1. An auditory protection device to be mounted on a safety helmet or the like, comprising an ear muff, a support arm on which said ear muff is mounted, an attachment unit, means mounting the upper end of the arm on said attachment unit for pivotal movement about a forwardly and rearwardly extending axis relative to said attachment unit, means mounting said attachment unit on said safety helmet or the like for forward and rearward vertical swinging movement of said arm and ear muff between a position in which the ear muff is on the ear and a position in which the ear muff is off the ear, spring means acting on the upper end of the arm to bias the ear muff against the head with a contact pressure, and adjusting means to adjust said contact pressure.

2. A device according to claim 1, in which the spring means comprises a separate spring element that is so mounted that it is engaged by the upper end portion of the arm.

3. A device according to claim 1, in which the arm is made of flexible material, said upper end of the arm being lengthened to form said spring means.

4. A device according to claim 3, in which the spring means is a coil spring coaxial with said axis.

5. A device according to claim 4, in which the arm comprises two substantially parallel legs that are joined to each other at their ends close to the ear muff, the upper end of each leg being shaped as a coil spring and thus forming said spring means.

6. A device according to claim 3, in which the attachment unit comprises a support attachable to the safety helmet, said support carrying pivotably an attachment housing in which is mounted said upper end of the arm, the spring means and the adjusting means.

7. A device according to claim 6, in which the arm comprises two substantially parallel legs that are joined to each other at their ends close to the ear muff, the upper end of each leg being shaped as a coil spring and thus forming said spring means, the legs of the arm being led through the side of the attachment housing facing the ear muff in separate guide slots, which allow the legs to swing out, said guide slots each comprising two mutually parallel, laterally displaced slot portions, an inner and an outer slot portion, which slot portions are connected by a transverse slot positioned perpendicular to the longitudinal direction of the slot portions, said outer slot portion opening into the edge of the attachment housing facing the helmet.

8. A device according to claim 6, in which the adjusting means comprises an adjusting screw that is mounted in the attachment housing and can be turned from the outside, said screw having on the inside of said attachment housing an arm holder for the free end of the arm, so that said arm holder is displaced by turning the adjusting screw, thereby altering the contact pressure for the ear muff.

9. A device according to claim 6, in which between the attachment housing and the helmet is mounted a housing support that engages the housing as well as the helmet.

10. A device according to claim 6, in which at least the attachment housing and an end portion of said support are made of electrically insulating material.

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