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(54) Adjusting mechanism for bands, especially headbands

(57) An adjusting mechanism (1) for bands, especially headbands, comprises a housing (2) and a band (3) with a longitudinal slit (4) at each end. Each of the slits (4) has a row of teeth (5) on sides opposite each other, and the slits overlap each other inside the housing (2). Furthermore the housing (2) has an adjusting knob (6) with a cogwheel (7) engaged with the slits' teeth (5) inside the housing (2) and a gripping part (8) outside the housing for manual rotation of the cogwheel (7) about the adjusting knob's (6) axis. The housing (2) has at least one braking section (9) which exerts a rotation-impeding force on a corresponding circular gripping section (10) on the adjusting knob's gripping part (8), which force is great enough to secure the cogwheel (7) in an adjusted position. The braking section (9) and the gripping section (10) are preferably arranged on the outer edge of the gripping part (8).

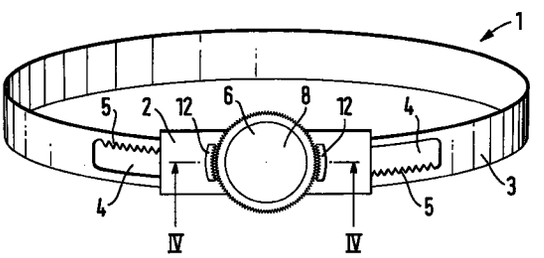

Fig.1

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Description

The invention concerns an adjusting mechanism for bands, especially headbands, comprising a housing and a band with a longitudinal slit at each end, wherein each of the slits has a row of teeth on sides opposite each other, and wherein the slits overlap each other inside the housing, and wherein there is further provided an adjusting knob with a cogwheel engaged with the slits' teeth inside the housing and a gripping part outside the housing for manual rotation of the cogwheel about the adjusting knob's axis.

Adjusting mechanisms for bands are used amongst other things in helmets of different kinds, such as cycle helmets, work helmets and ice hockey helmets, where a band which is fastened inside the helmet fits around the head and keeps the helmet in place.

Bands which are used in helmets can have different adjusting mechanisms, the simplest of which consists of a band which is provided with studs or pins in an area where the ends of the band overlap each other at one end, and at the other end there are corresponding holes, with the result that the length of the band can be varied with different combinations of pins and holes.

The band may also be provided with buckles, which come in a variety of different forms.

These known solutions for an adjusting mechanism are serviceable per se, but they are all encumbered with drawbacks. Both buckles and bands with pins and holes have the disadvantage that they require the use of two hands to adjust them. It is true that some buckles can be tightened with the use of one hand only, but they require the use of two hands to be able to loosen them in a controlled manner.

US 3 329 968 describes a helmet with a band where rows of teeth in longitudinal slits in overlapping end sections of the band are gripped by a cogwheel on an adjusting knob provided in a holder or a housing. This mechanism can be operated with one hand, but it has no device which secures the ends of the band after the adjustment, with the result that the band will slide out of the adjusted position when the adjusting knob is released by the user.

DE 4 022 422 describes an adjustable headband, especially for helmets, where the adjustment can be performed with one hand, substantially in the same way as in US 3 329 968, but where in addition the mechanism has a pin which engages with the adjusting knob's cogwheel. This pin holds the adjusting knob in position, thus permitting the band to remain in the adjusted position when the adjusting knob is released. The mechanism which is described in DE 4 022 422, however, has a major disadvantage: the point at which the pin engages with the cogwheel is located very close to the knob's axis of rotation, which means that the forces between the pin and the cogwheel become very great due to the short torque arm. This in turn means severe wear and tear, or alternatively that the mechanism has to be made of a high tensile material such as a metal, which makes it more expensive and entails an increased risk of head injury if the mechanism should accidentally strike the head.

The object of the invention is to provide an adjusting mechanism for bands, especially headbands, which is not encumbered by the above-mentioned drawbacks, which adjusting mechanism should be able to be operated manually, and should be designed so as to permit the use of reasonably priced construction materials, preferably thermoplastic.

The object is achieved according to the invention with an adjusting mechanism of the type mentioned in the introduction, characterized by the features which are specified in the claims.

Thus the invention consists in an adjusting mechanism for bands, especially headbands, where at least one braking section exerts a rotation-impeding force on a corresponding circular gripping section on an adjusting knob.

The invention will now be explained in more detail in connection with a description of a specific embodiment and with reference to the drawing, in which

fig. 1 is a view of an adjusting mechanism for a band according to the invention,

fig. 2 is a view of a housing with an adjusting knob according to the invention,

fig. 3 is a view of an adjusting knob according to the invention,

fig. 4 is a cross section through the adjusting mechanism in fig. 1, along the intersecting line IV-IV,

fig. 5 illustrates the bands which are used in the adjusting mechanism, in a cross section along the intersecting line V-V in fig. 2,

fig. 6 illustrates the adjusting knob's gripping part 8 and the protrusion 12 in closer detail, and

fig. 7 illustrates an alternative embodiment of an adjusting knob according to the invention.

The same reference numerals are employed for corresponding parts in all the figures.

Fig. 1 illustrates an adjusting mechanism 1 for bands, especially headbands, comprising a housing 2 and a band 3 with a longitudinal slit 4 at each end, where each of the slits 4 has a row of teeth 5 at sides opposite each other. An adjusting knob 6, of which only a gripping part 8 is visible in fig. 1, can be rotated manually with one hand in order to adjust the length of the band 3. Fig. 1 also illustrates two protrusions 12 which project from the housing 2, whose function will be described in more detail in the following.

The headband can be used to secure a helmet around the head, the band being fastened to the inside

of the helmet in positions along the band. This is prior art and will not be described further.

Fig. 2 illustrates the housing 2 viewed from the side, where the shape of the adjusting knob's 6 gripping part 8 and the protrusions 12 can be seen more clearly. Also illustrated here is a recess 20 between the section which constitutes the abutment for the adjusting knob's gripping part 8 and the protrusion or the protrusions 12. In the illustrated embodiment, the housing's 2 upper surface is a circular surface, with the result that due to the recess 20 the housing 2 becomes elastically yielding in the area of the recess, thus giving the protrusion or the protrusions 12 an elastic attachment in the housing. The braking section 9 consequently has an elastic abutment against the gripping section 10.

Fig. 3 illustrates the adjusting knob 6 from the side. It can be seen here how the adjusting knob consists of two integrated parts, a gripping part 8 and a cogwheel 7. During adjustment of the mechanism the gripping part 8 is gripped with one hand, usually between the thumb and index finger, and is rotated in such a manner that the cogwheel 7 is rotated correspondingly. In this embodiment the adjusting knob's gripping part 8 is in the form of a flat disc 15, with a gripping surface 14 for the fingers arranged along the circumference. Also illustrated is a gripping section 10, which in this embodiment of the gripping part is identical to the gripping surface 14, and which will be discussed in more detail in the following.

Fig. 4 is a cross section through the housing 2 along the intersecting line IV-IV in fig. 1. The band is omitted in order to make the figure clearer. Here it can be seen how the adjusting knob's 6 gripping part 8 in the form of a disc 15 is arranged on the outside of and abuts against an upper section of the housing 2, with the cogwheel 7 arranged inside the housing. The cogwheel 7 is secured in the axial direction by a washer 16 and a screw 17 placed in a recess 18 in a lower opposite section of the housing 2. It can further be seen how the protrusions 12 abut against the circumference of the disc 15.

Fig. 5 is a cross section through the housing 2 along the intersecting line V-V in fig. 2. The actual housing is omitted here for reasons of clarity. It can be seen here how one end 3 of the band with a longitudinal slit 4 with a row of teeth 5 overlaps an end 3' with a longitudinal slit 4' with an opposite row of teeth 5'. The cogwheel 7 is located between the rows of teeth, in engagement therewith, with the result that a rotation of the cogwheel leads to a movement of the rows of teeth 5, 5' in relation to each other and consequently the ends 3, 3' of the band in the band's longitudinal direction.

Fig. 6 illustrates the adjusting knob's gripping part 8 and the protrusion 12 in closer detail. Here it is shown how the protrusion 12 has a braking section 9 in the form of grooves, ridges or teeth 11, which engage with corresponding grooves, ridges or teeth 11 which are arranged in a circular gripping section 10 on the gripping part 8. The gripping section's teeth point radially outwards from the adjusting knob's axis 19, and the braking section's teeth point radially inwards towards the axis, the braking section having a curvature which corresponds to the gripping section's curvature.

In this embodiment the housing has a braking section on each side of the adjusting knob, with the result that the braking sections are arranged symmetrically about the adjusting knob's axis. This has the effect that radially corresponding forces which are exerted by the two braking sections on the adjusting knob balance each other.

Fig. 7 illustrates an alternative embodiment of the adjusting knob 6. Here the adjusting knob's gripping part 8 is designed with a wing-shaped ridge 13, the gripping surfaces 14 for the fingers being formed from the ridge's lateral surfaces. The gripping section 10 is in the form of axial teeth or grooves 11 and arranged along the gripping part's outer edge, for engagement with corresponding braking sections 9 on the housing (not shown).

When the gripping part 8 is rotated the braking section 9 will exert a rotation-impeding force on the gripping section 10, directed towards the gripping part's direction of rotation, which rotation-impeding force secures the mechanism during use of the helmet. The rotation-impeding force must be so great that forces which are exerted on the gripping part from the cogwheel due to tension in the band, which can be due to accelerations, impact and other random external influences, do not overcome the rotation-impeding force, thus causing the gripping part to rotate and the band to slacken. At the same time the rotation-impeding force must not be greater than that which can be overcome by the user when exerting a reasonable amount of force during adjustment of the mechanism.

The forces which act between the cogwheel's teeth and the band's rows of teeth is a result of conditions which are associated with the use of the band, and will thus be approximately the same independently of the design of the mechanism which ensures that the band is secured . According to the invention the braking section and the gripping section are provided at the outer edge of the gripping part. This ensures that both the rotation-impeding force and the force which is exerted by the user when adjusting the helmet have a large torque arm in relation to the torque arm of the forces which act between the cogwheel's teeth and the band's rows of teeth. Compared with the adjusting mechanism which is described in DE 4 022 422, where the rotation-impeding force acts on the cogwheel and has a torque arm which is as great as or less than the forces which act between the cogwheel's teeth and the band's rows of teeth, in similar geometric conditions associated with the band's rows of teeth and the cogwheel's diameter, the invention therefore provides an adjusting mechanism where the rotation-impeding force can be much smaller.

The relation between forces which act between two surfaces and the wear and tear on the surfaces is relatively complicated, and will not be discussed in detail

here, but in simplified form it can be said that a reduction in forces between two surfaces gives a reduction in wear.

The braking section and the gripping section, which are moved in relation to each other during adjustment of the mechanism and thus are highly subject to wear, will be the critical part of the mechanism with regard to the choice of materials.

The above-mentioned conditions associated with the required size of the rotation-impeding force mean that the braking section and the gripping section can be designed in such a manner that the forces between them are relatively small, which in turn means less wear. The parts of the mechanism can therefore be designed in a reasonably priced material with low wear durability, such as a thermoplastic, which is inexpensive and easy to shape. With the exception of the screw and the washer, the entire mechanism can thereby be made of thermoplastic, for example polypropylene, which is a great advantage with regard to recycling of the material.

In the illustrated example the braking section and the gripping section are in the form of grooves, ridges or teeth, as this is assumed to be the most favourable design, but it is also possible to design these section in other ways, since any design which generates a force between the braking section and the gripping section can be employed in the invention.

In the above the braking section or the braking sections are referred to and illustrated in connection with protrusions provided on the housing. However, it will also be possible to design the braking sections in other ways, for example as lateral surfaces in a recess for the gripping part.

The above-mentioned and similar variants will be able to be implemented by a person skilled in the art within the scope of the claims.

Claims

1. An adjusting mechanism (1) for bands, especially headbands, comprising a housing (2) and a band (3) with a longitudinal slit (4) at each end, wherein each of the slits (4) has a row of teeth (5) on sides opposite each other, and wherein the slits overlap each other inside the housing (2), and wherein there is further provided an adjusting knob (6) with a cogwheel (7) engaged with the slit's teeth (5) inside the housing (2) and a gripping part (8) outside the housing for manual rotation of the cogwheel (7) about the adjusting knob's (6) axis, characterized in that the housing (2) has at least one braking section (9) which in both directions exerts a rotation-impeding force on a corresponding circular gripping section (10) on the adjusting knob's gripping part (8), which force is great enough to secure the cogwheel (7) in an adjusted position.

2. An adjusting mechanism according to claim 1, characterized in that the braking section (9) and the gripping section (10) are provided at the outer edge of the gripping part (8).

3. An adjusting mechanism according to claim 1 or 2, characterized in that the gripping section (10) and the braking section or the braking sections (9) are provided with meshing grooves, ridges or teeth (11).

4. An adjusting mechanism according to claim 3, characterized in that the gripping section's (10) teeth point radially outwards from the adjusting knob's axis (19), and that the braking section's or the braking sections' (9) teeth point radially inwards towards the adjusting knob's axis.

5. An adjusting mechanism according to one of the preceding claims, characterized in that the braking section or the braking sections (9) are provided in protrusions (12) which project from the housing (2) and have a curvature corresponding to the curvature of the gripping section (10).

6. An adjusting mechanism according to one of the preceding claims, characterized in that the braking sections (9) are arranged symmetrically about the adjusting knob's axis (19).

7. An adjusting mechanism according to one of the preceding claims, characterized in that the gripping part (8) has a wing-shaped ridge (13) which constitutes a gripping surface (14) for the manual rotation of the gripping part.

8. An adjusting mechanism according to one of the claims 1 to 6, characterized in that the gripping part (8) is in the form of a flat disc (15), with the gripping section (10) arranged along the circumference of the disc (15), and where the gripping section simultaneously constitutes a gripping surface (14) for the manual rotation of the gripping part.

9. An adjusting mechanism according to one of the claims 5 to 8, characterized in that the housing's (2) upper section has a recess (20) between the section which constitutes an abutment for the adjusting knob's gripping part (8) and the protrusion or the protrusions (12), with the result that at this point the housing (2) becomes elastically yielding and the protrusion or the protrusions (12) have an elastic attachment in the housing (2), and the braking section (9) has an elastic abutment against the gripping section (10).

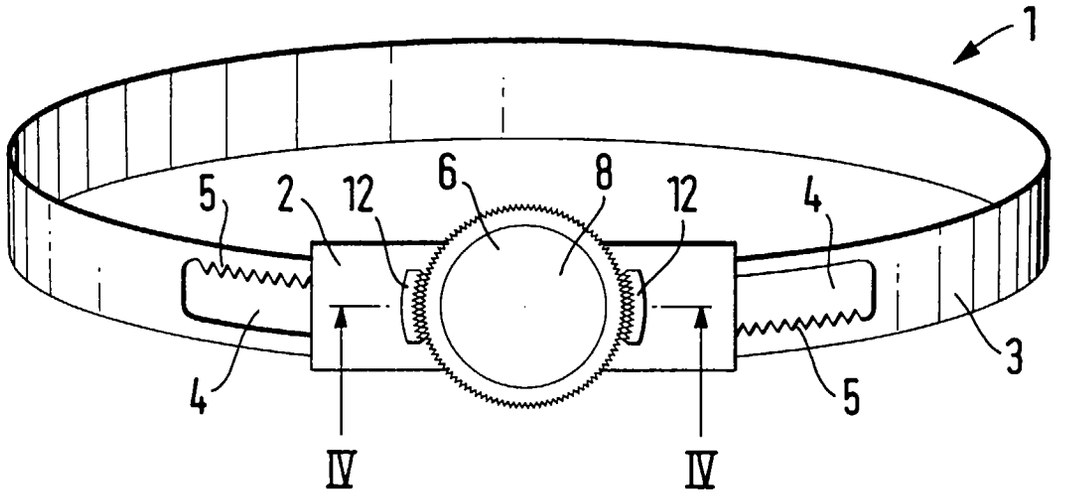

Fig. 1

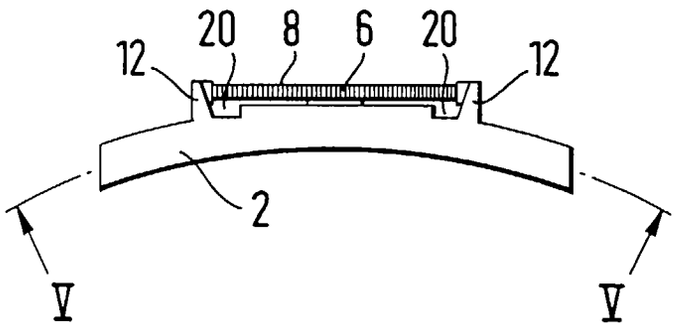

Fig. 2

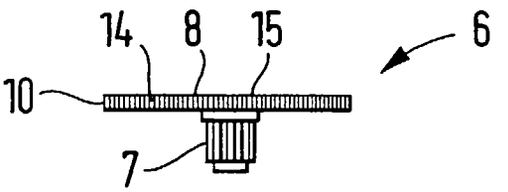

Fig. 3

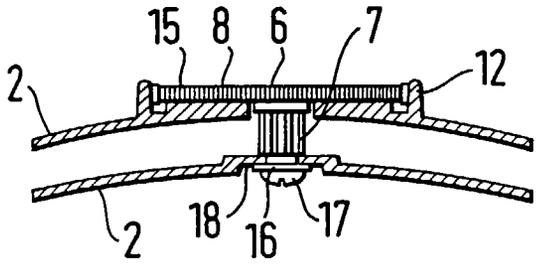

Fig.4

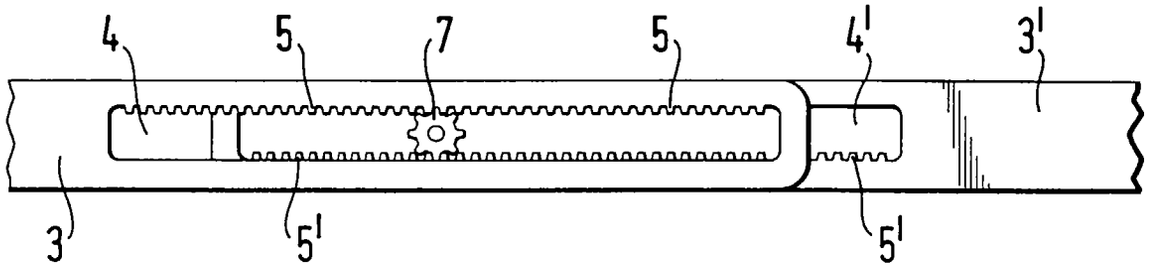

Fig.5

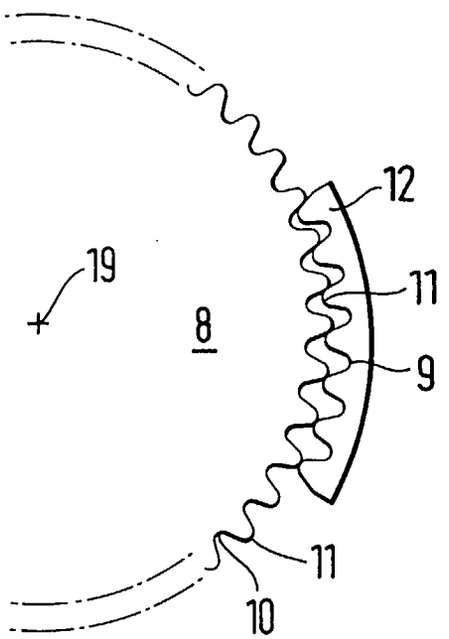

Fig.6

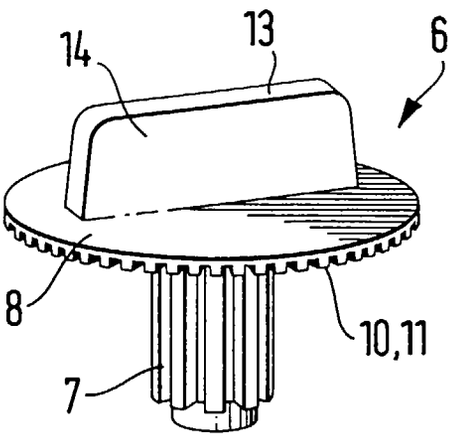

Fig.7

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 10 4847

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 5 357 654 A (HSING-CHI HSIEH) 25 October 1994 * column 2, line 44 - column 3, line 34; figures 3-7 *	1-4,7	A42B3/14 A44B11/06
X	US 3 325 824 A (DONEGAN WILLIAM J) 20 June 1967 * column 2, line 4 - column 3, line 26; figures *	1	
X	US 5 373 588 A (HEDE JEAN MARC ET AL) 20 December 1994 * column 2, line 39 - column 3, line 56 * * column 4, line 64 - column 5, line 33; figures *	1-5	
A	EP 0 580 556 A (OPTREL AG) 26 January 1994 * page 4, line 5 - line 26; figures 1-3 *	1	
A,D	US 4 942 628 A (FREUND PAUL X) 24 July 1990 * abstract; figures *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

A42B
A44B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	21 May 1997	Kock, S

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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