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(54) Band fastener with continuous adjustment

(57) A band fastener with continuous regulation, to be applied, in particular, to accessories, items of clothing and sports footwear as well as to body-protection clothing and footwear, in which prevention against a possible loosening, a continuous and micrometric regulation and a rapid unfastening must be guaranteed. Said fastener being characterised in that it comprises a toothed band (2) which interacts with a disk (3) equipped with a protruding profile (6); such a band and such a disk are contained inside a box-shaped body (4), thus constituting a fastening mechanism between two flaps to be drawn together, where a first flap is attached to the base of the box-shaped body (4) and the other flap is attached to the non-engaged end of the band itself.

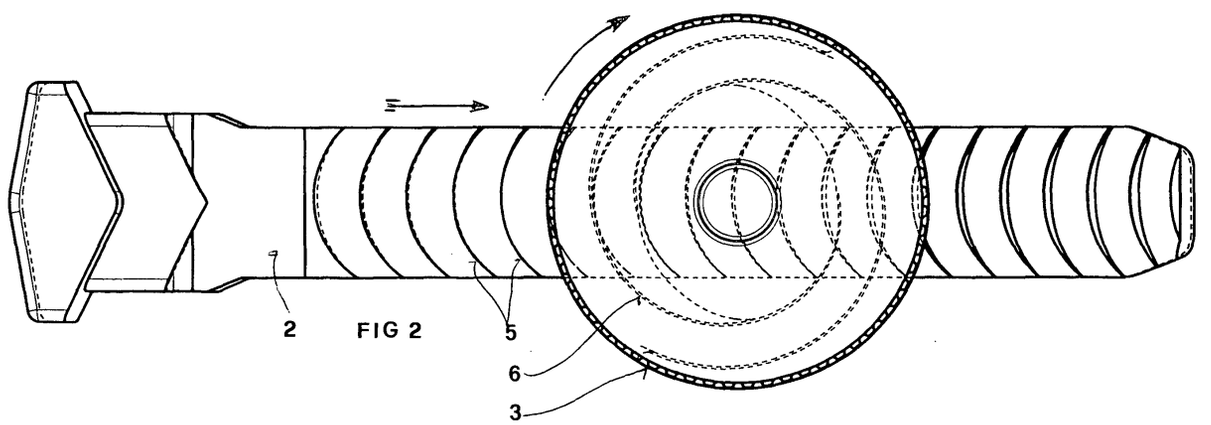

FIG 2

EP 1 236 412 A1

Description

[0001] The finding regards a band fastener with continuous regulation.

[0002] In clothing, especially sports clothing, fasteners which require regulation of the drawing together of the flaps are usually realised through self-adhesive strips of the so-called "Velcro" type.

[0003] When such a fastener has to also guarantee prevention against a possible loosening, for example in fasteners applied to footwear for sports activities, such as cycling, skiing, mountaineering and the like, or else in body-protection clothing or footwear, devices are used substantially consisting of a toothed regulation band upon which a ratchet engages which, jumping from tooth to tooth, determines the displacement of the aforementioned band, at every lock, by an amount equal to the pitch of the teeth.

[0004] When such a type of fastener is also required to have a continuous and micrometric regulation devices are used which operate upon the screw/nut screw principle.

[0005] At the current state of the art such types of fasteners have the drawback of a substantial size and, moreover, require a fairly complex construction, which has a detrimental effect on the final cost of the object.

[0006] The purpose of the present finding is that of foreseeing a continuous regulation fastener which is substantially different with respect to existing products.

[0007] A further purpose of the present finding is that of realising a continuous regulation fastener which consists of a small number of components which are easy to realise and simple to assemble and thus with a reduced cost.

[0008] A further purpose of the present finding is that of realising a continuous regulation fastener which can be applied onto any type of flaps to be drawn together.

[0009] A further purpose of the present finding is that of realising a continuous regulation fastener where the fastening and unfastening actions are carried out easily by the user.

[0010] A further purpose of the present finding is that of realising a continuous regulation fastener which can function in any environment and which is self-cleaning.

[0011] A further purpose of the present finding is that of realising a continuous regulation fastener which is small in size and which is aesthetically pleasing.

[0012] Such purposes are obtained with the realisation of a fastener of the type with a band which is based upon a mechanism for transforming rotational to linear motion essentially consisting of just two elements: a disk plate and a toothed band, interacting with each other so that when the disk rotates about its axis, arranged substantially at a right angle with respect to the plane of movement of the band, it engages said band to translate on said plane.

[0013] The interaction between the two aforementioned elements is realised through a groove, formed on the surface of the disk facing the band, which defines a tooth-shaped protruding profile with a spiral pattern, with one or more threads, said profile engaging successively with each of the protruding teeth of the band.

[0014] Specifically, the spiral pattern of the protruding profile of the disk is shaped according to a curved trajectory which has its starting point closer to the centre of rotation with respect to its end point and the teeth of the band have a profile which is curved so that the contact between protruding profile and tooth is always of the tangent type.

[0015] Such a tangent contact also allows a self-cleaning action of the gear to be realised since there is a permanent engagement between the tooth of the band and the protruding profile of the disk and, moreover, with the rotation of the aforementioned disk the possible dirt which is deposited between the teeth of the band is continuously eliminated.

[0016] Advantageously, for the minimum thickness of both the disk and of the band said two components carry out their movements on planes which are almost parallel and which are close to each other.

[0017] Still advantageously, with the mechanism described above an "effectively continuous" regulation is realised, that is without a fixed and imposed position during the work step.

[0018] The disk and the portion of band engaged with it are contained inside a box-shaped body, also small in size, thus constituting a micrometric fastening mechanism between the two flaps to be held drawn together and where a first flap is attached to the base of the box-shaped body and the other flap is attached to the end of the band itself.

[0019] Operatively, therefore, the finding foresees that with the rotation of the disk in one direction, the rectilinear displacement of the band takes place, i.e. the fastening action of the flaps is realised, whereas with the rotation of the same disk in the opposite direction, the contact between the teeth of the band and the spiral pattern of the disk itself is loosened, so as to allow the withdrawal of the toothed band from the box-shaped body.

[0020] Advantageously, the withdrawal of the band is rendered very fast by the fact that the disk, during rotation in the opposite direction, comes out of its seat and therefore can completely disconnect itself from the underlying toothed band.

[0021] A possible variant to the finding foresees that the disk be kept in fastened position with the teeth of the band through the pushing action of an elastic element, such as a spring, a cam, or another type of leverage, on the disk itself, for which reason the unfastening is obtained by applying a counter pressure on the disk itself, either manually or through a suitable mechanism for the purpose.

[0022] A further variant to the finding foresees that the disk be equipped with a device suitable for easing its rotation, consisting of at least one tab, integral with said

disk, which is engaged and rotated by the user.

[0023] Moreover, it is foreseen that the fastener according to the finding can be coupled with a lever arm attached to a block, attached to one of the two flaps to be drawn together, or else free, but which interacts with the block itself in the fastening step of the two flaps.

[0024] With such a system the conservation of the locking memory, even after the complete opening of the lever arm, is combined with the continuous micrometric regulation of the fastener and this is constructively possible by pivoting the box-shaped body so that it can tilt at the lever arm, so as to have an angular rotation of the band, attached to the other flap.

[0025] The finding shall be better defined through the description of some possible embodiments, given as an illustrative example and not for limiting purposes, with the help of the attached tables of drawings, where:

- figs. 1 and 2 (Tav. 1) represent elevated and plan views respectively, of the band/disk group
- fig. 3 represents two different exploded views of the group according to fig. 1;
- fig. 4 represents three possible embodiments of the spiral pattern of the disk;
- figs. 5,6 and 7 (Tav. II) represent a first embodiment of the fastener according to the finding in an elevated and a section view, in fastened and unfastened position, and in a plan view, respectively;
- figs. 8 and 9 represent overall and exploded perspective views of the fastener according to fig. 5;
- figs. 10,11 and 12 (Tav. III) represent a second embodiment of the fastener according to the finding in an elevated and a section view, in fastened and unfastened position, and in a plan view, respectively;
- figs. 13 and 14 represent overall and exploded perspective views of the fastener according to fig. 10;
- figs. 15,16 and 17 (Tav. IV) represent three orthogonal plan, front and section views, respectively, according to the line XVI-XVI of fig. 15 and a side view of the fastener according to the finding, equipped with a device for easing the rotation of the disk;
- figs. 18 to 21 (Tav. V) represent the successive steps of lifting and rotating the disk with the device according to figs. 15-17 by 180°;
- fig. 22 represents an exploded view of the fastener according to figs. 15-17;
- figs. 23,24 and 25 (Tav. VI) represent a front view and two plan views of the fastener according to the finding attached to a lever arm;
- figs. 26 and 27 represent overall and exploded perspective views of the fastener according to fig. 23;
- figs. 28 to 31 (Tav. VII) represent the fastening steps of the fastener according to fig. 26;
- figs. 32 and 33 (Tav. VIII) represent the types of fastener applied to a sports shoe.

[0026] As can be seen in the figures the fastener 1 according to the finding substantially consists of a toothed band 2 upon which a disk 3 interacts arranged inside the box-shaped body 4 upon which the band itself slots and slides.

[0027] As can be seen in figures 1 and 2 the band 2 and the disk 3 interact with each other through the coupling between the teeth of the band and the profile 6 which protrudes from the lower surface of the disk.

[0028] Advantageously, the teeth 5 have a curved profile such as to always ensure a tangent point of contact with the profile 6 which is shaped according to a single, double or triple thread (see fig.4), for which reason upon the rotation of the disk in a clockwise direction a continuous rectilinear displacement of the band is realised (see direction of the arrows).

[0029] As can be seen in fig. 5, in a first embodiment, the disk 3, in fastened position, is rested against the body 4 for which reason by rotating in a clockwise direction the advance of the band 2 is generated.

[0030] On the other hand, as can be seen in fig. 6, with an angular rotation in an anticlockwise direction the disk 3 unlocks from the teeth 5 and with a tilting motion on the pivot point 10 of the support base it is displaced backwards thus allowing the rapid withdrawal of the band 2.

[0031] The longitudinal displacement of the disk 3 inside the box-shaped body 4 is regulated by an extension 7 which protrudes on the upper surface of the disk which is forced to move inside a seat 8, formed on the inner part of the body 4.

[0032] As can be seen in fig. 10, in a second embodiment the disk 3 is kept in the fastened position through the pushing action of an elastic element 9 which is present inside the body 2.

[0033] As can be seen in fig. 11, to obtain the unfastening the action of the elastic element 9 must be overcome by applying a counter pressure on the disk (see arrow "P") so that said disk, being mounted so as to tilt on the pivot point 10 of the body 2, can be slightly inclined so as to unlock itself from the teeth and allow the rapid withdrawal of the band 2.

[0034] As can be seen in figures 15 to 17, to make the rotation of the disk 3 easier for the user the finding foresees that a the disk itself be equipped with a grip device, wholly indicated with the reference numeral 20 and arranged above the box-shaped body 4.

[0035] In detail, said device 20 consists of a hub 21, integral with the disk 3, which protrudes outside of the box-shaped body 4, through the slot 22, to allow the insertion of the small pin 23 upon which the tab 24 mates idly.

[0036] As can be seen in fig. 17 and in the succession of figures from 18 to 21, the rotation of the small pin 23 according to line "K" and therefore about the axis "Z", generates, accordingly, the rotation of the underlying disk 3, for fastening/unfastening the fastener.

[0037] The device 20 is completed by a covering element 25, which encloses the upper end of the small pin 23 which has a solely aesthetical function, being shaped to match the shape of the tab 24, with which it is coupled.

[0038] Finally, as can be seen in figures 25 to 31, the fastener 1 can be mounted so as to tilt, through the pin 11, on the lever arm 12 which interacts with a block 13, attached to one of the two flaps to be drawn together.

[0039] The operation of the lever arm 12, as can be seen in the succession of figures from 28 to 31 is the following: firstly the end 14 of the lever arm 12 fastens onto the pins 15 of the block 13, then, with the rotation of the aforementioned arm, the flap 16 arranged at the end of the band 2 moves close to the aforementioned block (locking memory) and finally takes care of the micrometric regulation acting on the fastener 1.

Claims

1. BAND FASTENER WITH CONTINUOUS REGULATION, to be applied, in particular, to accessories, items of clothing and sports footwear as well as to body-protection clothing and footwear, in which prevention against a possible loosening, a continuous and micrometric regulation and a rapid unfastening must be guaranteed,
   said fastener **characterised in that** it comprises a toothed band which interacts with a flat disk which has in its lower face, that being the one facing the band, a tooth shaped protruding profile with a spiral pattern, said profile successively engaging with each of the protruding teeth of the band, said disk and the portion of said band engaged with it being contained within a box-shaped body, thus constituting a fastening mechanism between the two flaps to be held drawn together, where a first flap is attached to the base of the box-shaped body itself and the other flap is attached to the non-engaged end of the band itself.

2. BAND FASTENER WITH CONTINUOUS REGULATION, according to claim 1, **characterised in that** it is based upon a mechanism for transforming rotational motion to linear motion consisting of the flat disk and of the toothed band, interacting with each other so that when the disk rotates about its axis, arranged substantially perpendicular with respect to the plane of movement of the band, it engages said band to translate on said plane and thus the mutual drawing together of the two flaps is realised.

3. BAND FASTENER WITH CONTINUOUS REGULATION, according to claims 1 and 2, **characterised in that** the spiral pattern of the protruding profile of the disk is configured according to a curved trajectory which has its starting point closer to the centre of rotation with respect to its end point as well as **in that** the teeth of the band have a profile which is curved so that the contact between protruding profile and teeth is always of the tangent type.

4. BAND FASTENER WITH CONTINUOUS REGULATION, according to claims 1 to 3, **characterised in that** with the rotation of the disk in the opposite direction to that which realises the drawing together of the edges, the contact between the teeth of the band and the spiral pattern of the disk itself loosens, which allows said disk to leave its seat so as to allow the rapid withdrawal of the toothed band from the box-shaped body.

5. BAND FASTENER WITH CONTINUOUS REGULATION, according to claims 1 to 3, **characterised in that** the disk is kept in fastened position with the teeth of the band through the pushing action of a mechanism of the elastic type such as a spring or of the mechanical type such as a cam or a leverage, on the disk itself for which reason the unfastening is obtained by applying a countering action on the disk itself, either manually or through a mechanism suitable for the purpose.

6. BAND FASTENER WITH CONTINUOUS REGULATION, according to one or more of the previous claims, **characterised in that** it realises a self-cleaning action of the gear since there is a permanent engagement between the tooth of the band and the protruding profile of the disk and moreover with the rotation of the aforementioned disk the possible dirt which is deposited between the teeth of the band is eliminated in a continuous manner.

7. BAND FASTENER WITH CONTINUOUS REGULATION, according to one or more of the previous claims, **characterised in that** it realises an "effectively continuous" regulation, i.e. without a fixed and imposed position, during the work step.

8. BAND FASTENER WITH CONTINUOUS REGULATION, according to one or more of the previous claims, **characterised in that** it is coupled with a lever arm locked to a block, attached to one of the two flaps to be drawn together, or else being free, but which interacts with the block itself in the fas-

tening step of the two flaps.

9. BAND FASTENER WITH CONTINUOUS REGULATION (1), according to one or more of the previous claims, consisting of a toothed band (2) upon which interacts a disk (3) arranged inside the box-shaped body (4) and upon which the band itself slots and slides, said band and said disk interacting with each other through the coupling between the teeth (5) of the band and the profile (6) which protrudes from the lower surface of the disk.

10. BAND FASTENER WITH CONTINUOUS REGULATION (1), according to claim 9, **characterised in that** the teeth (5) have a curved profile such as to always ensure a tangent point of contact with the profile (6).

11. BAND FASTENER WITH CONTINUOUS REGULATION (1), according to claim 10, **characterised in that** the profile (6)is shaped according to a spiral with one or more threads.

12. BAND FASTENER WITH CONTINUOUS REGULATION (1), according to claim 9 to 11, **characterised in that** in fastened state the disk (3) rests against the body (4) for which reason rotating it generates the advance of the band (2).

13. BAND FASTENER WITH CONTINUOUS REGULATION (1), according to claim 9 to 12, **characterised in that** by rotating the disk (3) in the opposite direction it unlocks from the teeth (5) and with a tilting movement on the pivot point (10) of the support base it is displaced backwards thus allowing the rapid withdrawal of the band (2).

14. BAND FASTENER WITH CONTINUOUS REGULATION (1), according to claims 9 to 13, **characterised in that** the movement of the disk (3) inside the box-shaped body (4) is regulated by an extension (7) which protrudes on the upper surface of the disk, forced to move inside a seat (8) formed on the inner part of the aforementioned body.

15. BAND FASTENER WITH CONTINUOUS REGULATION (1), according to claims 9 to 11, **characterised in that** the disk (3) is kept in the fastened state through the pushing action of an elastic element (9) which is present inside the body (2).

16. BAND FASTENER WITH CONTINUOUS REGULATION (1), according to claim 15, **characterised in that** to obtain the unfastening the action of the elastic element (9) must be overcome by applying a counter pressure on the disk (3) so that said disk, being mounted so as to tilt on the pivot point (10) of the body (2), can be slightly inclined so as to unlock itself from the teeth and to allow the rapid withdrawal of the band (2).

17. BAND FASTENER WITH CONTINUOUS REGULATION (1), according to one or more of the previous claims, **characterised in that** it foresees a device (20), suitable for easing the rotation of the disk (3), which foresees the use of at least one tab, integral with said disk, which is gripped and rotated by the user.

18. BAND FASTENER WITH CONTINUOUS REGULATION (1), according to claim 17, **characterised in that** it foresees a hub (21), integral with the disk (3), which protrudes outside of the box-shaped body (4), through the slot (22), to allow the insertion of the small pin (23) upon which the tab (24) mates idly, said tab first of all being lifted, rotating on the small pin and then being rotated, generating, accordingly, the rotation of the underlying disk.

19. BAND FASTENER WITH CONTINUOUS REGULATION (1), according to claim 18, **characterised in that** it foresees a covering element (25), which encloses the upper end of the small pin (23), said element being shaped to match the shape of the tab (21) with which it is coupled.

20. BAND FASTENER WITH CONTINUOUS REGULATION (1), according to one or more of the previous claims, **characterised in that** it is mounted so as to tilt, through the pin (11), on the lever arm (12) which interacts with the block (13), attached to one of the two flaps to be drawn together.

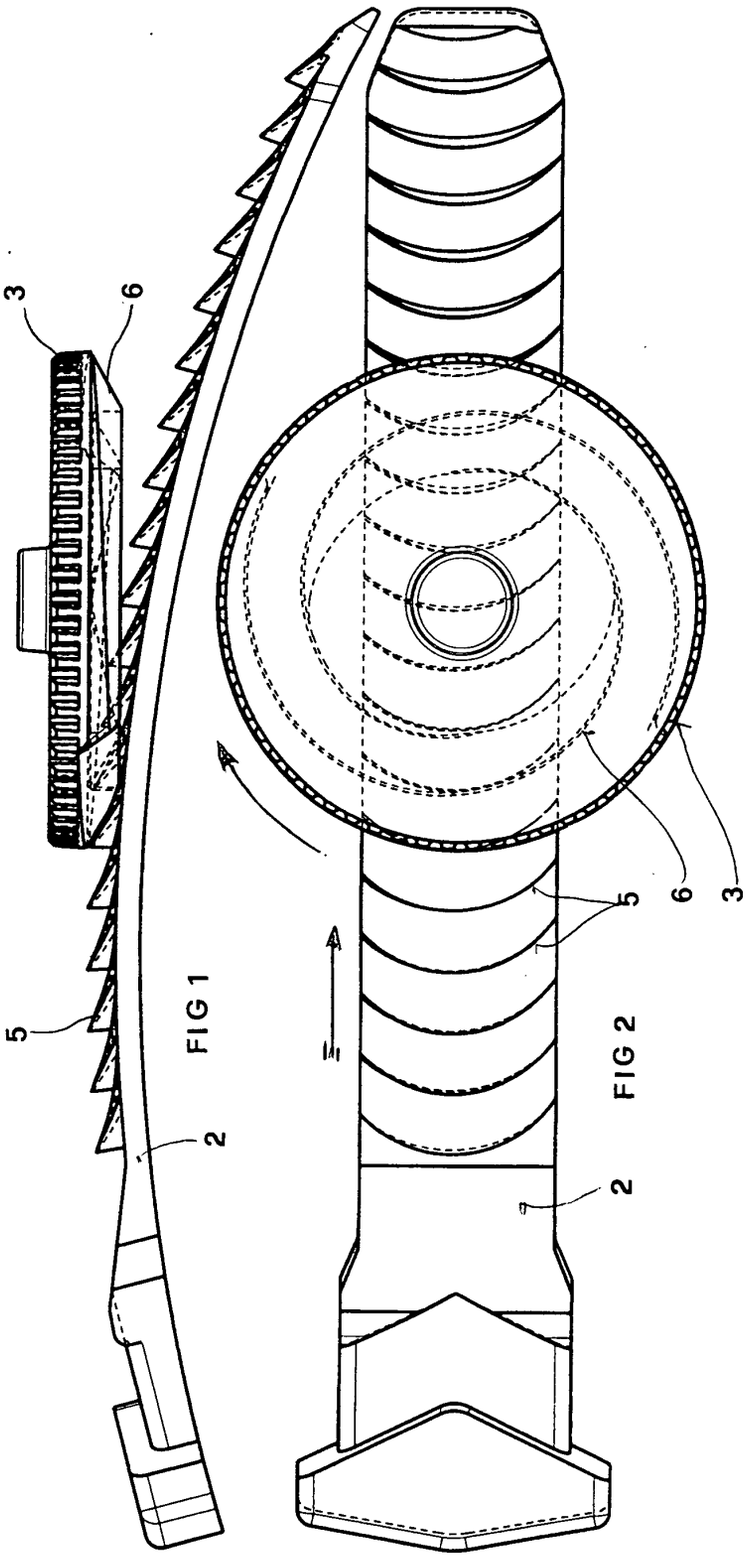

FIG 1

FIG 2

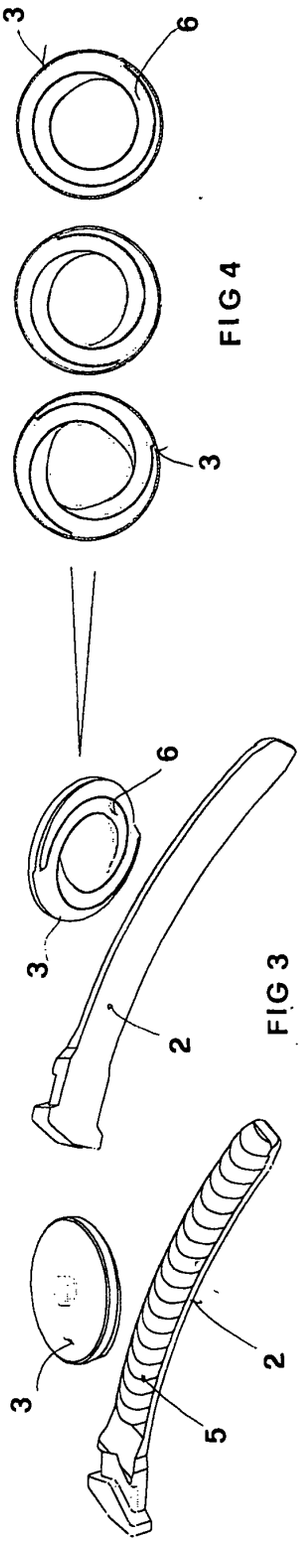

FIG 4

FIG 3

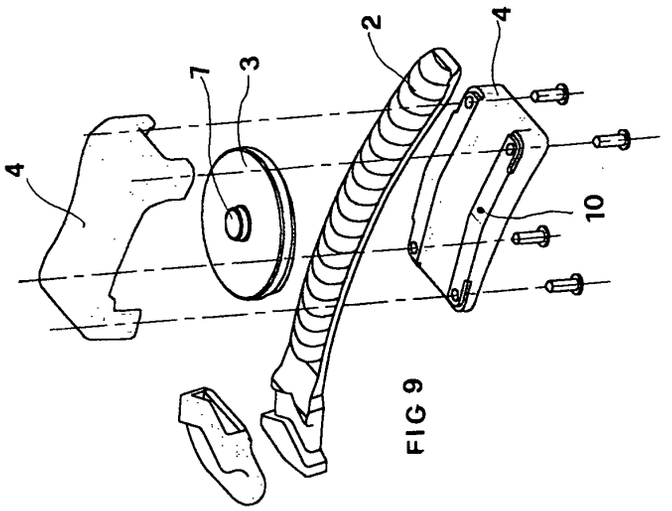

FIG 9

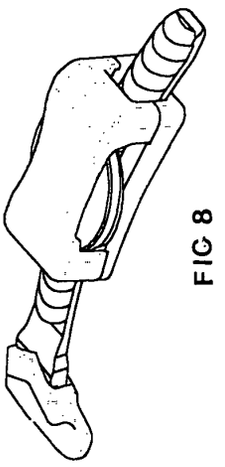

FIG 8

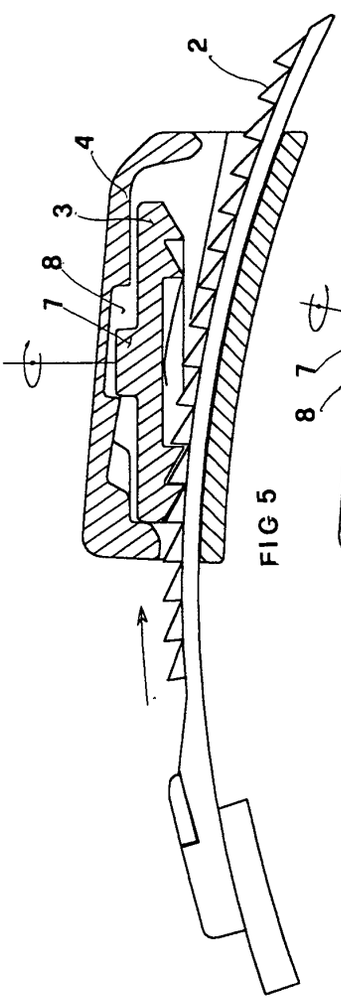

FIG 5

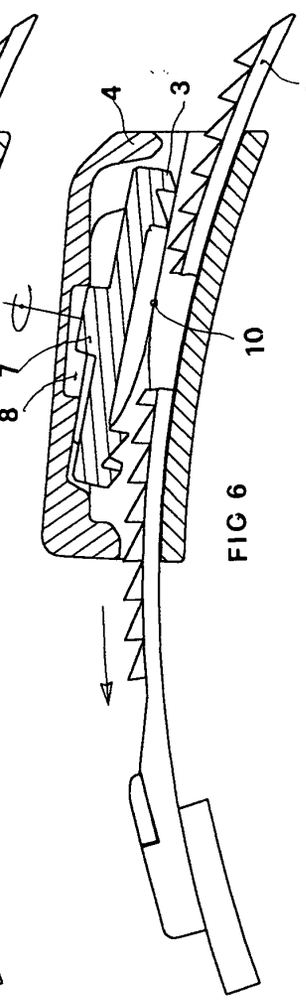

FIG 6

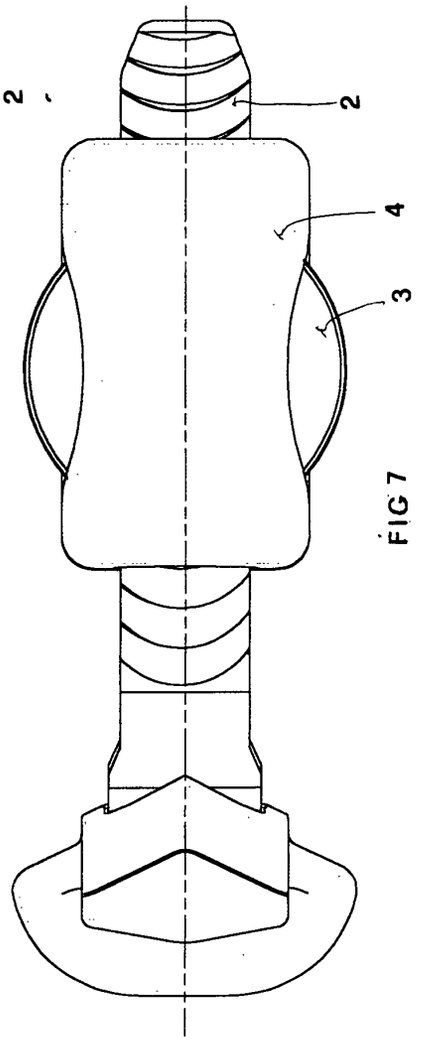

FIG 7

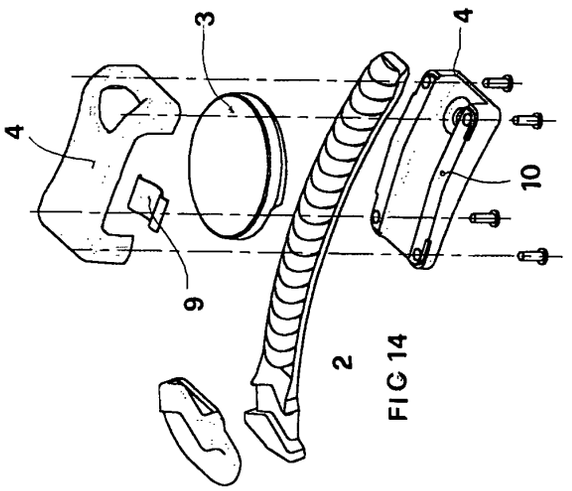

FIG 14

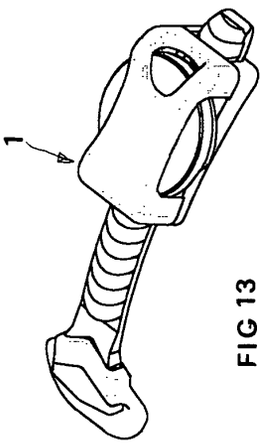

FIG 13

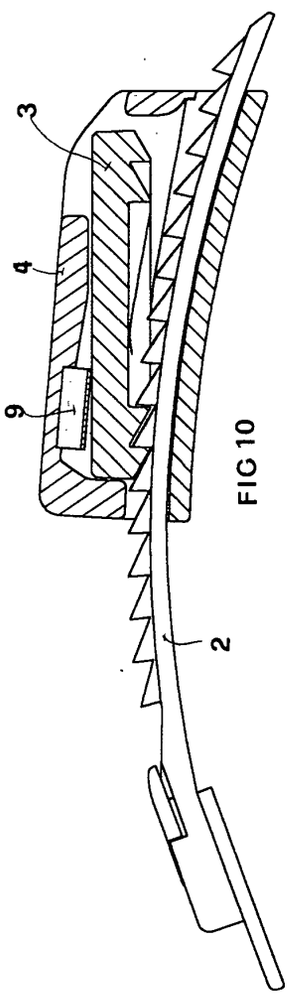

FIG 10

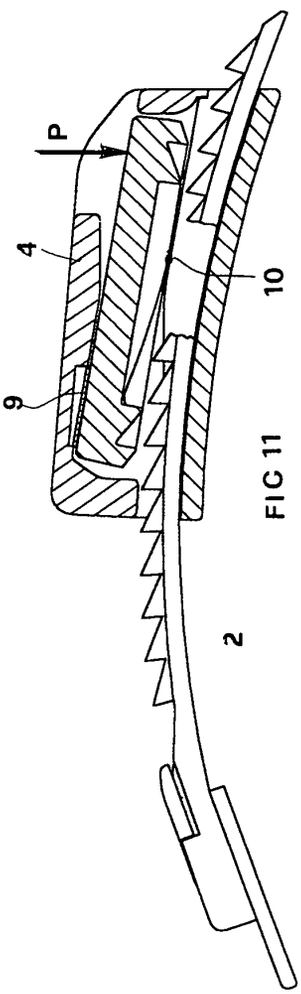

FIG 11

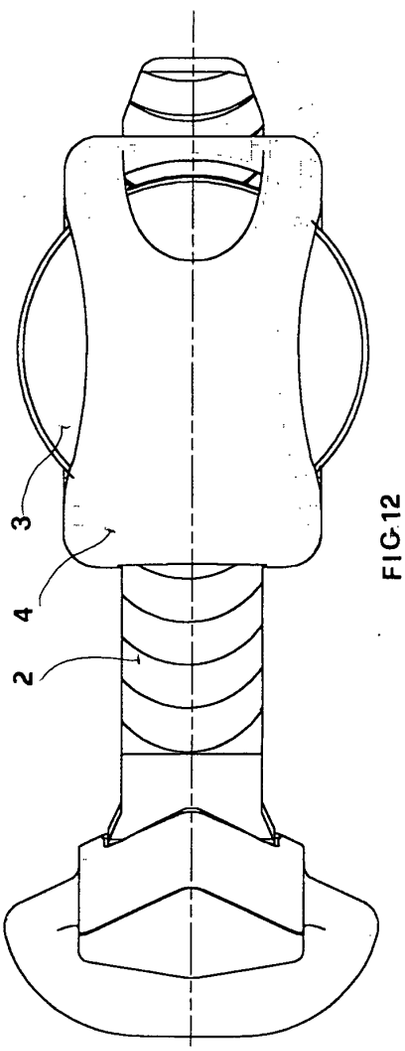

FIG 12

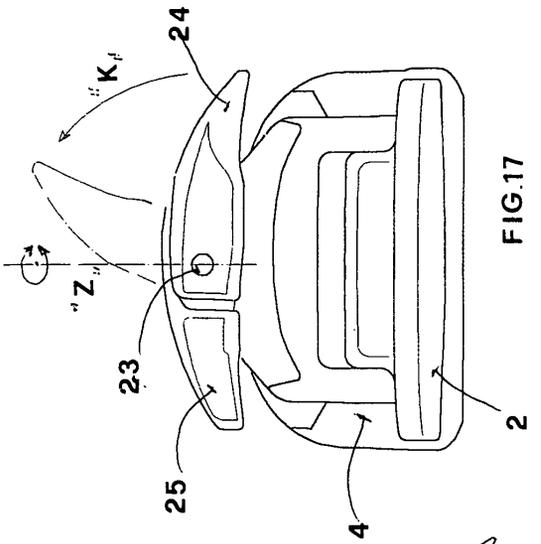

FIG.17

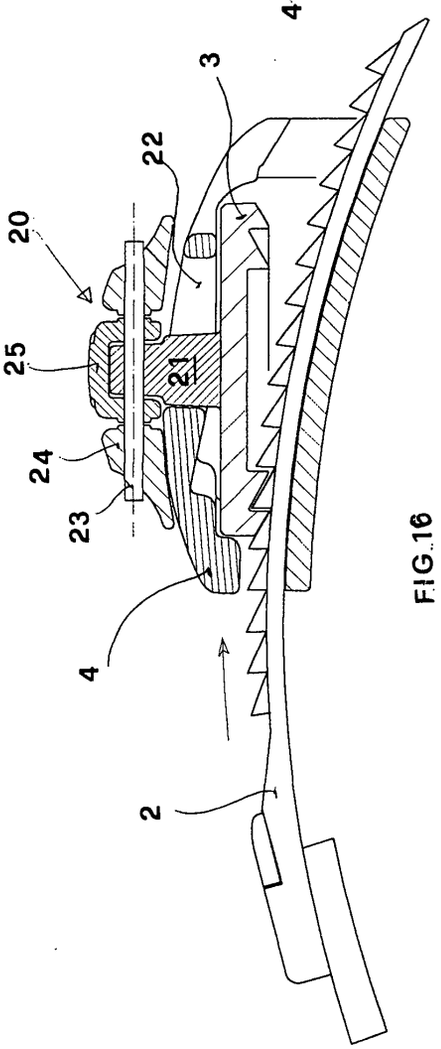

FIG.16

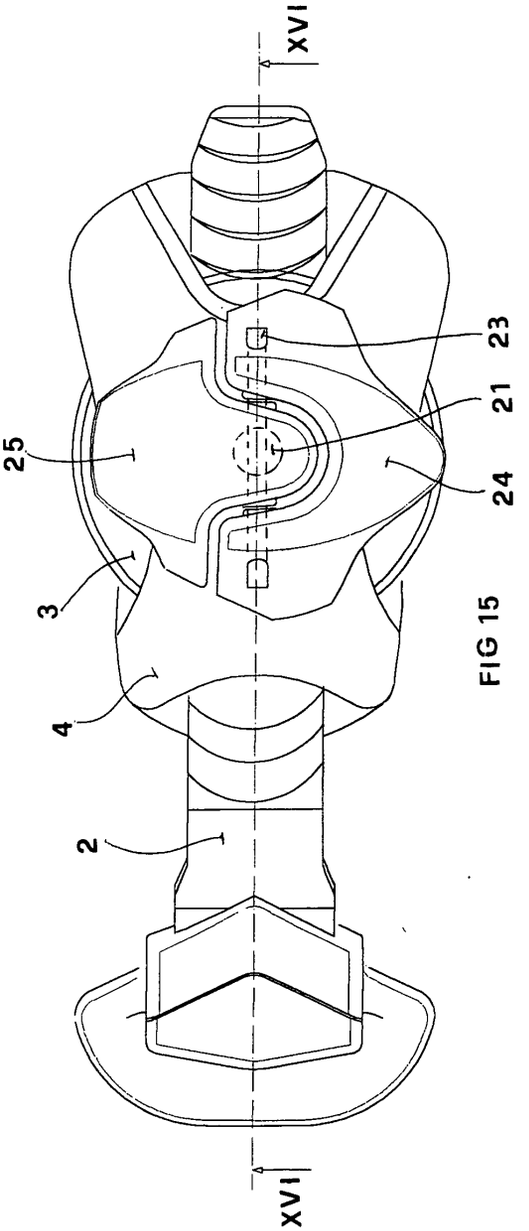

FIG 15

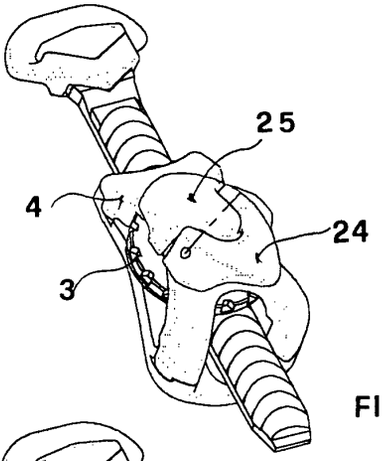

FIG. 18

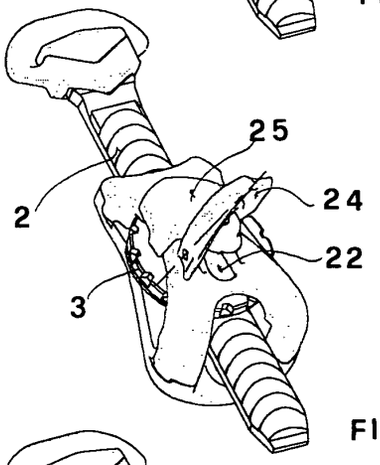

FIG 19

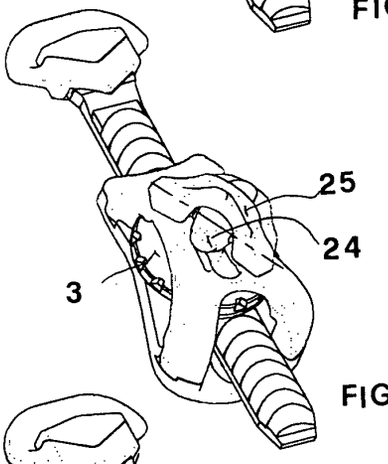

FIG 20

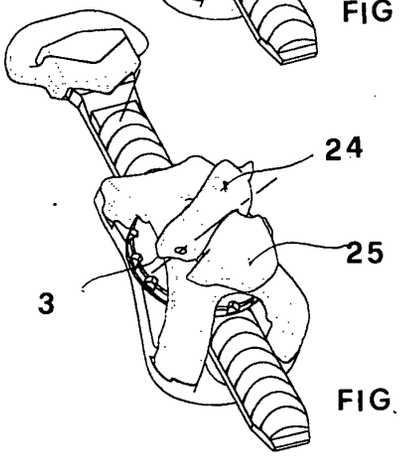

FIG. 21

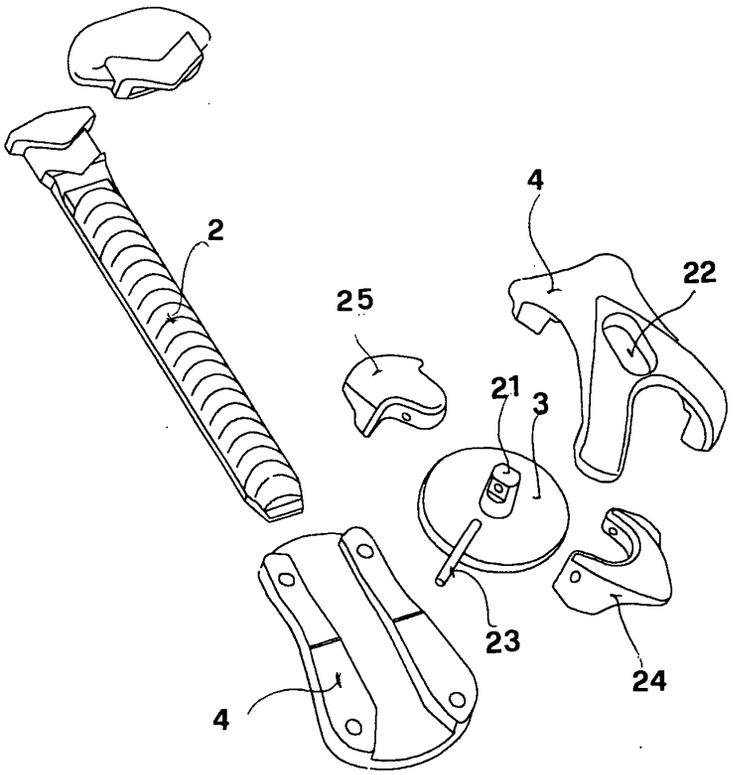

FIG. 22

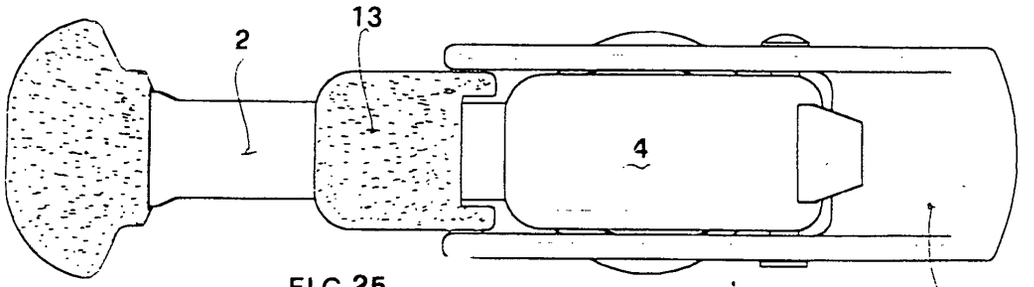

FIG 25

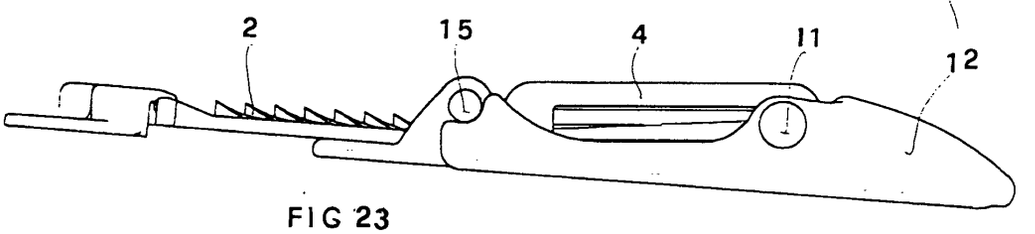

FIG 23

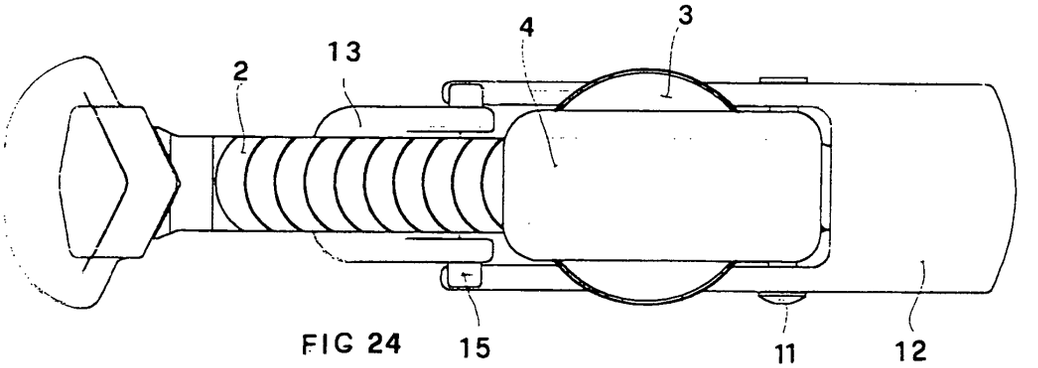

FIG 24

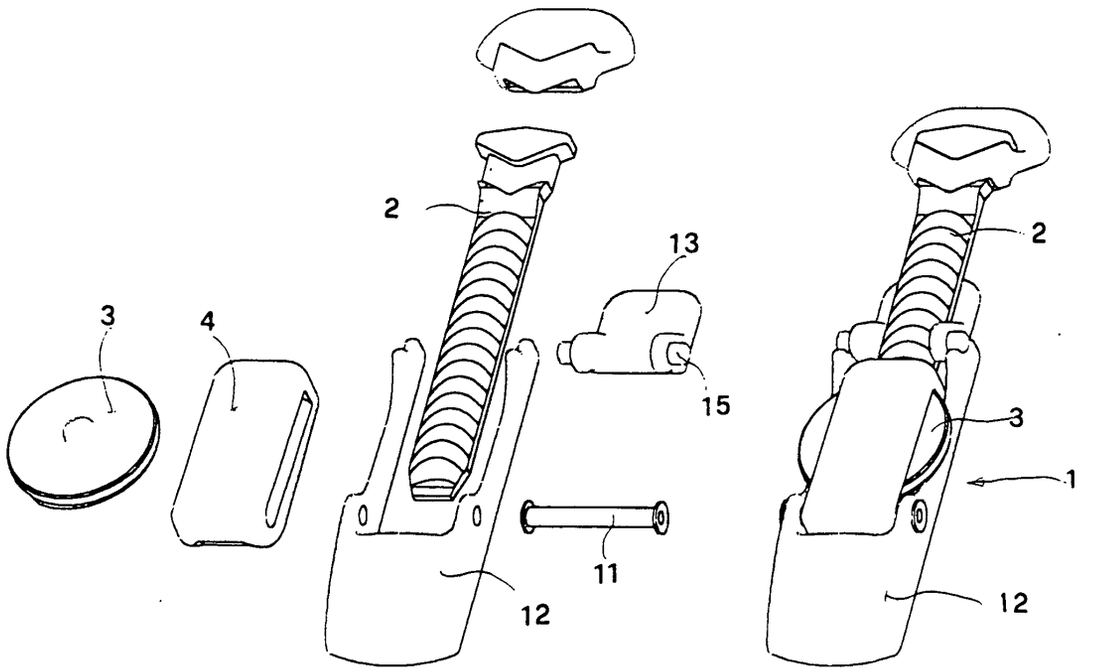

FIG27 FIG26

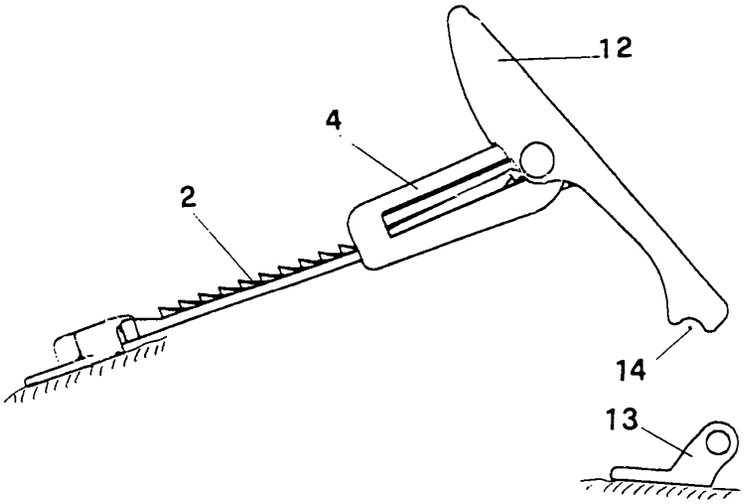

FIG 28

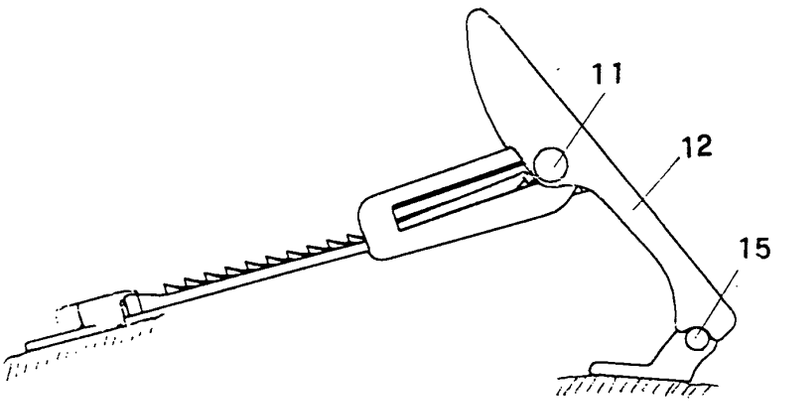

FIG 29

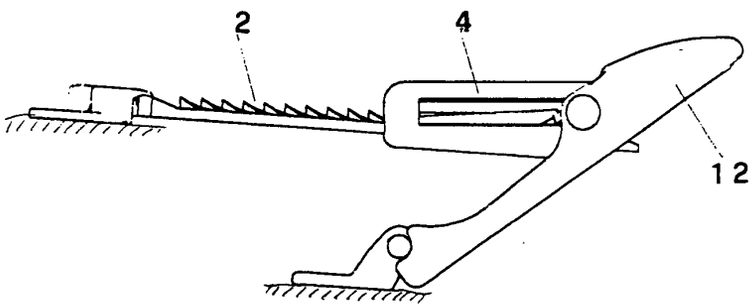

FIG 30

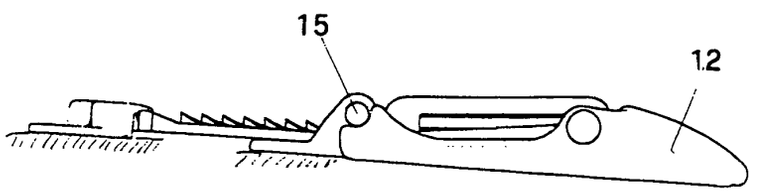

FIG 31

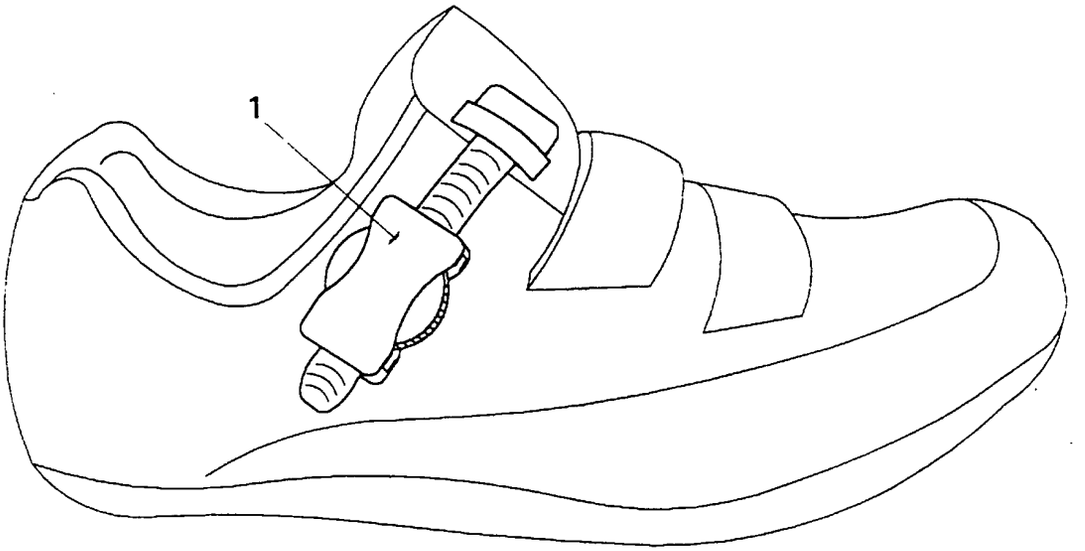

FIG 32

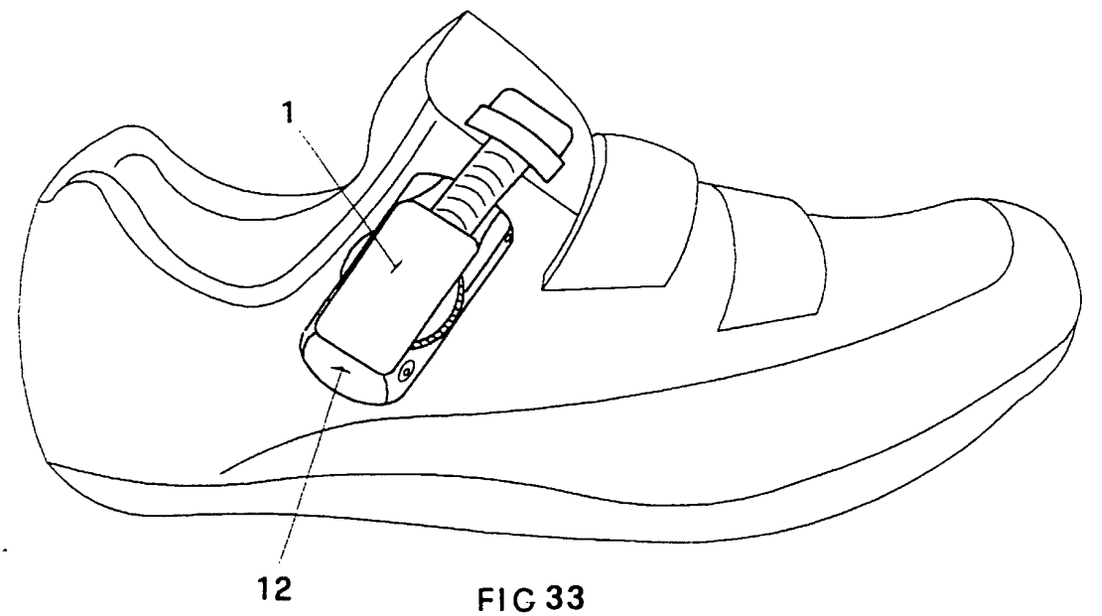

FIG 33

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EUROPEAN SEARCH REPORT

Application Number
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Place of search	Date of completion of the search	Examiner
THE HAGUE	20 June 2002	Cianci, S

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