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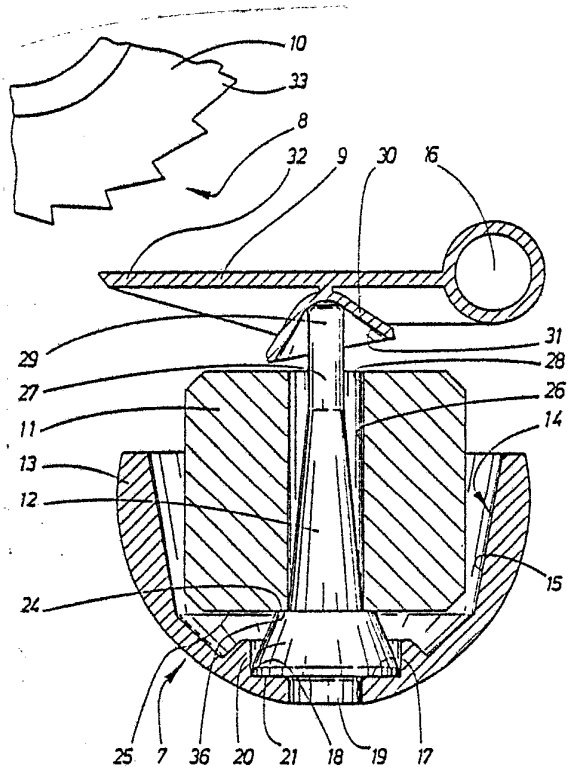
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(57) Abstract

A latch mechanism for safety belts of the roller belt type intended preferably for vehicles and comprising a strap (3) which can be withdrawn from a roll-up mechanism (1) against spring bias. This roll-up mechanism includes a strap roller(2) rotatably mounted therein, a latch mechanism (8) with a ratchet (10) and a latch (9) which can be adjusted between a position releasing the strap roller, and a latching position. An activating means (7) is arranged for adjusting the latch mechanism to the latching position when the activating means is exposed to an acceleration exceeding a predetermined value. An inertia body included into the activating means is supported in the central rest position thereof by a support surface (24) on the transmission element, and a second support surface (17) is located in a space (15) in which the inertia body is located. A transmission element operatively arranged between the inertia body and the latch has a sensing portion (27) which is located in the cavity (26) of the inertia body, spaced from the first support surface (24), and is arranged to be displaced together with the transmission element and then to turn this element about an annular marginal portion (18) of said second support surface by an engagement surface or edge (28) in the cavity (26) of the inertia body being brought to engage the sensing portion. The latch comprises an operating portion (30) having the shape of a bowl turned up and down with a concave operating surface (31) angled in relation to the longitudinal direction of the transmission element. An activating portion (29) of the transmission element is arranged to project into the operating portion and to turn when the inertia body turns and to be displaced at said turning along the operating surface, the latch being adjusted from releasing position to latching position thereby.



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A LATCH MECHANISM FOR SAFETY BELTS

The present invention relates to a latch mechanism of the kind referred to in the preamble of the accompanying claim 1.

Latch mechanisms of the related kind are intended to latch a strap roller against withdrawal of a belt strap wound on said roller and to release the roller for withdrawal of said strap, respectively, in dependence on activating means to be actuated by inertia forces. Strict requirements have been set up as to the function of such activating means concerning e.g. reliability, sensitivity, rapidity, reset function, etc. and it is desired to provide activating means which so far as possible can be dimensioned so as to provide optimum results. Moreover, it is desired to obtain a rapid and distinct change-over movement of the latch.

The purpose of the present invention is therefore to provide a latch mechanism wherein the activating means can be constructed such that the latch is changed over by a short and distinct movement.

Said purpose is achieved by means of a latch mechanism the characteristics of which appear from the accompanying claim 1.

The invention will be described in more detail below by means of an embodiment reference being made to the accompanying drawings in which FIGS. 1 and 2 show a section through a roll-up mechanism incorporated in a roller belt, to which the latch mechanism according to the invention advantageously can be applied, FIGS. 3, 4, and 5 show a vertical central section through a latch mechanism according to the invention in a deactivated position, an intermediary position and a fully activated position, respectively.

A roll-up mechanism of a common type to which the

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latch mechanism according to the invention advantageously can be applied, is diagrammatically shown in FIGS. 1 and 2. According to these figures, the roll-up mechanism 1 comprises substantially a strap roller 2 to which one end of the strap 3 of the safety belt is connected. The strap roller is rotatably mounted in two end pieces 4, 5 and is adapted to roll up and roll off, respectively, the belt strap under the influence of a roll-up spring 6 incorporated into one end piece 4. Incorporated into the other end piece 5 is a latch mechanism shown diagrammatically only, which comprises substantially an activating means 7 and a latch mechanism 8 to be actuated by said activating means, which is adapted to latch the strap roller against withdrawal of the belt strap under specific conditions. The activating means according to the invention is an automatically operating mechanism actuated by inertia forces, which is shown in more detail in the other figures. The latch mechanism 8 is shown in FIG. 2 and comprises basically a latch 9 mounted for pivotal movement in a joint 16, and a ratchet 10. The latch is adapted to co-operate with the ratchet 10 in order to latch the ratchet against rotation in one direction and, alternatively, to release the ratchet, the strap roller 2 as a consequence thereof being latched against rotation in one direction and being released, respectively. For the sake of clarity the mechanism referred to above is shown quite diagrammatically in FIG. 2 and basically it can include a simple embodiment wherein the ratchet 10 is rigidly connected to the strap roller. In such embodiment the latch 9 must, however, take up the load acting on the belt strap, and therefore the latch mechanism 8 in practice is of such embodiment that the mechanism shown is adapted to initiate a second mechanism, relieving the latch 9, which is adapted to take up stresses in the belt strap. Such a

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mechanism can be arranged e.g. in such a way that it is initiated also by the acceleration forces occurring when the belt strap is rapidly withdrawn. However, a description in detail of such a mechanism for the sake of clarity has been excluded from the present application because it is known and because such description is not necessary for the understanding of the function and the basic construction of the present invention.

As is best seen from FIGS. 3, 4, and 5, the activating means 7 is built up substantially of an inertia body 11 and a transmission element 12. The inertia body 11 and the transmission element 12 are positioned in a holder 13 including a space 14 which has an envelope surface 15 formed as a truncated cone turned up and down. At the bottom the space 14 has a support surface 17 for the transmission element 12. The support surface 17 is completely flat and has a circular marginal portion 18 which forms a bearing position for the transmission element, about which this element can turn to an activated position as will be described in more detail below. The support surface 17 is penetrated by a central bore 19 which can be used for attaching the holder 13 in an attachment projecting from the end piece 5 but not shown. The transmission element comprises a base portion 20 which has a flat circular base surface 21, the transmission element being adapted to rest on the support surface 17 at said base surface. The base surface 21 has a circular peripheral marginal portion 22 about which the transmission element can turn against the marginal portion 18 of the support surface. The base portion 20 has substantially the form of a truncated cone with a conical peripheral envelope surface 23. A support surface 24 for the inertia body 11 is arranged above the base portion 20. This support surface 24 is annular and is adapted to support the

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inertia body which in a rest position shown in FIG. 3 rests against this support surface with a portion of the base surface 25 thereof, which is flat.

The inertia body 11 has a through elongated cylindrical cavity 26 through which the transmission element 12 extends. The transmission element tapers conically from below and has a sensing portion 27 spaced from the support surface 24 of the inertia body, said sensing portion being adapted to co-operate with an abutment surface or edge 28 of the cavity 26 of the inertia body. At the top the transmission element 12 has an activating portion 29 which projects into an operating portion 30 of the latch 9. This operating portion 30 is fixedly arranged on the lower side of the latch and is shaped as a bowl turned up and down and having a concave operating surface 31 angled to the longitudinal axis of the transmission element 12, the entire activating means 7 and the operating portion 30 of the latch being rotationally symmetrical about said axis to provide an identical function in all directions in relation to the symmetry axis of the activating means, which accordingly coincides with the longitudinal axis of the transmission element when this element is in the rest position of the activating means according to FIG. 3.

At constant speed of the vehicle and normal speed changes the latch mechanism is in the releasing position according to FIG. 3, the latch 9 being pivoted with the engagement portion 32 thereof in a lower position and with said portion spaced from the latch teeth 33 of the ratchet 10. Then, the withdrawal of the strap is allowed in order to permit some freedom of movement of the belt user. Also when the vehicle is not moving with the exception of steep inclination of the vehicle the latch mechanism is in the releasing position so as to make

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possible that the safety belt is brought into use. In the releasing position of the activating means the transmission element 12 is in rest position as will be seen from FIG. 3, resting with the base surface 21 thereof against the support surface 17 in the holder, while the inertia body 11 is in the rest position thereof resting with the base surface 25 thereof against the annular support surface 24 of the transmission element 12. Then, the latch 19 rests with the bowl-formed operating portion 30 thereof against the activating portion 29 of the transmission element, i.e. the upper end of said element. It should be noted that the operating portion 30 in its entirety is somewhat inclined, i.e. it has a rotationally symmetrical axis including an angle with the longitudinal axis of the transmission element. The purpose of this angular position is to compensate for the varying distance of the operating surface 31 to the pivot axis 16 of the latch 9. Moreover, it should be noted that the transmission element at a portion which is received by the lower end of the cavity 26 has substantially the same diameter as the cavity with a small play in order to allow the movement of the inertia body in relation to the transmission element. Due to the fact that the transmission element tapers upwards in the cavity 26 the element will have a substantially smaller diameter than the cavity at the upper end thereof.

At an unnormal speed change of the vehicle the activating means 7 will be exposed to inertia forces causing the inertia body 11 to turn from the rest position thereof, shown in FIG. 3, to an activated position, shown in FIG. 5, at a predetermined speed change, the inertia body engaging the conical envelope surface 15 in the space 14 of the holder 13 at a portion of the cylindrical envelope surface 34 thereof in said

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activated position. At the beginning of the turning movement of the inertia body the transmission element will be maintained in the neutral rest position thereof while the inertia body turns about the supporting position thereof formed by the outer marginal portion 35 of the support surface 24, the inertia body thus turning about said marginal portion at an inner portion 36 of the base surface 25 thereof. When the inertia body 11 has reached the intermediary position shown in FIG. 4, the inertia body 11 will engage the sensing portion 27 of the transmission element 12 at the abutment edge 28 thereof. As a consequence thereof the transmission element 12 will follow the turning movement and will turn about the bearing point thereof, i.e. the marginal portion 22 will swing about a point on the outer marginal portion 18 of the support surface 17. In order to obtain a proper movement the inertia body 11 should be made of a relatively heavy material such as metal, e.g. brass, while the transmission element 12 should be made of a relatively light material as should the latch 9, e.g. plastics. When the transmission element 12 turns, the activating portion 29 thereof moves sidewards from the central position of said portion in the very back of the bowl-shaped operating portion 30 of the latch. This means that the activating portion due to the angled operating surface 31 of the operating portion will slide against this surface and thus will swing the latch 9 upwards to engagement with one of the teeth 33 of the ratchet 10 at the engagement portion 32. Then, the latch accordingly has been changed over to the latch position and the activating means is in the activated position with the inertia body 11 as well as the transmission element 12 turned and the inertia body resting with the envelope surface 34 thereof against a position on the conical envelope surface 15 in the space 14 of

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the holder 13.

When the speed change has decreased to a predetermined value, the activating means will be reset from the activated position to the rest position thereof in the same manner as described above but in the opposite direction and order. Thus, the inertia body 11 as well as the transmission element 12 will again swing to the neutral position thereof and then will pass the intermediary position according to FIG. 4 wherein the transmission element first takes the neutral position and the inertia body then takes the rest position thereof according to FIG. 3. As soon as the transmission element swings back towards the rest position thereof, the activating portion 29 of the transmission element slides along the operating surface of the bowl-shaped operating portion 30, the latch being allowed to swing downwards from the latch position to the releasing position which has been reached already in the intermediary position of the activating means according to FIG. 4.

Thanks to the construction of the mechanism according to the invention there are obtained distinct and rapid movements of the latch due to the fact that the inertia body 11 moves by inertia before the inertia body abuts the transmission element. This avoids blocking or jamming of the mechanism due to delayed action because friction forces and the like are not overcome. By the rapid movements of the latch it is guaranteed that the latch is rapidly changed over to the latch position without any risk of the latch being blocked in an uncompleted engagement position.

The invention is not limited to the illustrative embodiment described above and shown in the drawings but can be modified within the scope of the following claims. E.g. the inertia body as well as the trans-

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mission element can be shaped in another way. E.g. it is conceivable that the transmission element is not tapered, the through cavity 26 in the inertia body instead flaring in a direction from below and upwards to provide the necessary space between the engagement edge of the inertia body and the sensing portion of the transmission element in order that the desired action can be obtained. Moreover, the operating portion 30 of the latch 9 can have another form, e.g. a fully curved operating surface 31. The inertia body 11 can have another shape and e.g. can have a foot at the lower end, at which the inertia body rests on the support surface of the transmission element. The enlarged base portion 20 of the transmission element can be replaced e.g. by two flanges, an upper annular flange forming the support surface of the inertia body, and a lower annular flange by means of which the transmission element rests against the support surface in the holder 13.

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CLAIM

A latch mechanism for safety belts of the roller belt type, intended preferably for vehicles and comprising a strap (3), which can be withdrawn from a roll-up mechanism (1) against spring bias, including a belt roller (2) rotatably mounted in the roll-up mechanism, a latch mechanism (8) with a ratchet (10) and a latch (9) which can be adjusted between a position releasing the strap roller, and a latching position wherein the strap roller is latched against rotation in one direction, and an activating means (7) for adjusting the latch mechanism to the latching position when the activating means is exposed to an acceleration exceeding a predetermined value and including an inertia body (11) having a defined base surface (14), which body can take a central rest position with the base surface resting on a first support surface (24), or a peripheral activated position in which the inertia body is turned about a first bearing point (45); a transmission element (12) arranged to rest against a second support surface (30) and provided with an activating portion arranged for co-operation with an operating portion (30) on the latch, and a sensing portion (33) arranged to sense the position of the inertia body by co-operation therewith; and a holder (13) with a space (14) in which the inertia body and the transmission element are located, the transmission element being arranged to rest against said second support surface when the inertia body is in the rest position thereof, in which the transmission element with the activating portion takes a position wherein the latch is free to take the releasing position thereof while said latch, when the inertia body is actuated by said acceleration exceeding the predetermined value is displaced from the rest position thereof to the activated position and displaces the transmission element causing

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displacement of the activating portion, said latch being arranged to take the latch position under the influence of the displacement of the activating portion and said inertia body having a through cavity (26) through which the transmission element extends, c h a r a c t e r i z e d in that the inertia body is supported in the central rest position thereof by a support surface (24) on the transmission element which constitutes said first support surface, that said second support surface (17) is located in the space (15) of the holder (13), that the sensing portion (27) of the transmission element is located in the cavity (14) of the inertia body, spaced from said first support surface (24) and is arranged to be displaced together with the transmission element and to turn the transmission element about an annular marginal portion (18) of said second support surface by an engagement surface or edge (28) in the cavity (26) of the inertia body being engaged with the sensing portion, that the operating portion (30) of the latch has the shape of a bowl turned up and down with a concave operating surface (31) angled in relation to the longitudinal direction of the transmission element, and that the activating portion (29) of the transmission element is arranged to project into the operating portion and to be displaced at said turning along the operating surface, the latch being adjusted from releasing position to latching position thereby.

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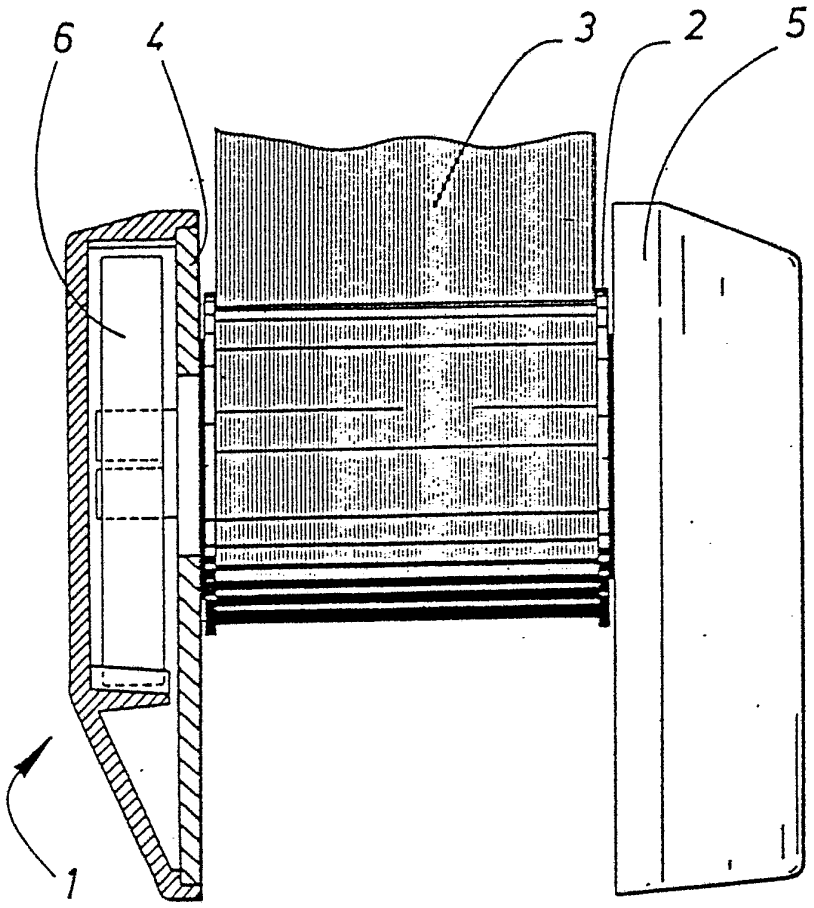


FIG.1

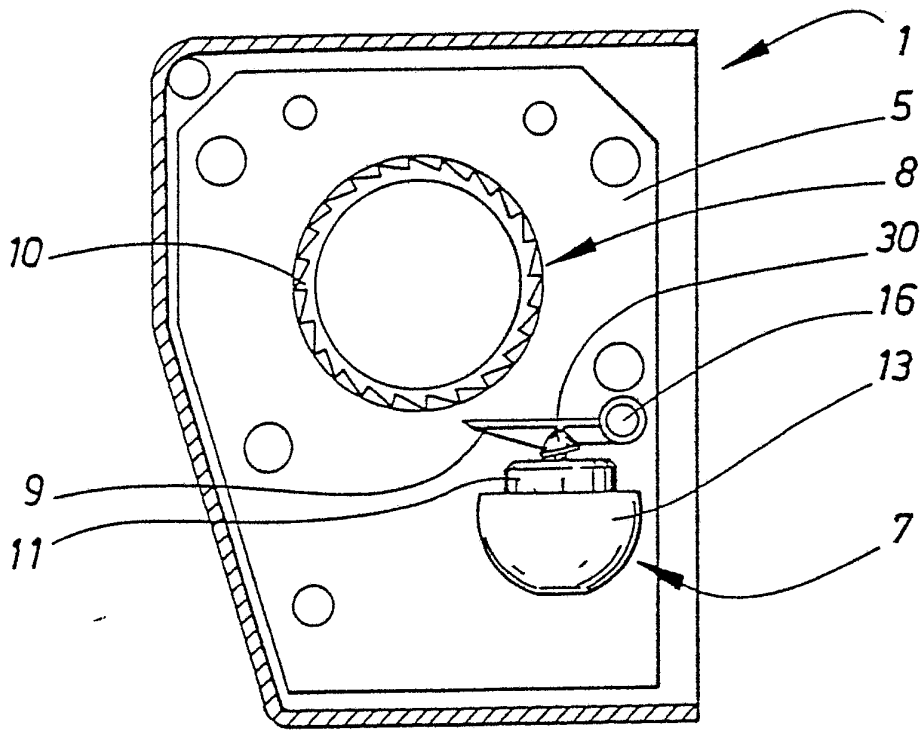


FIG.2

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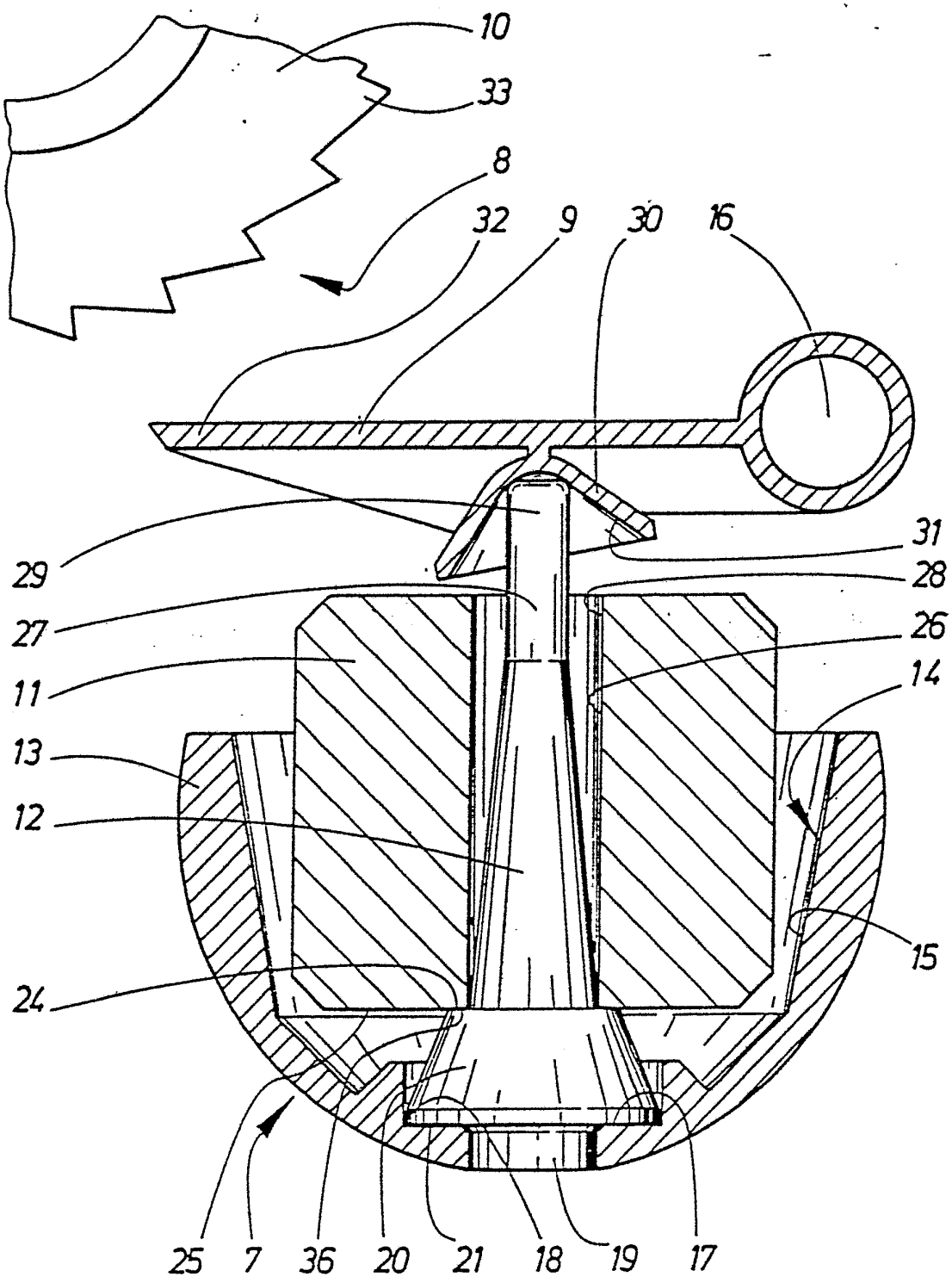


FIG.3

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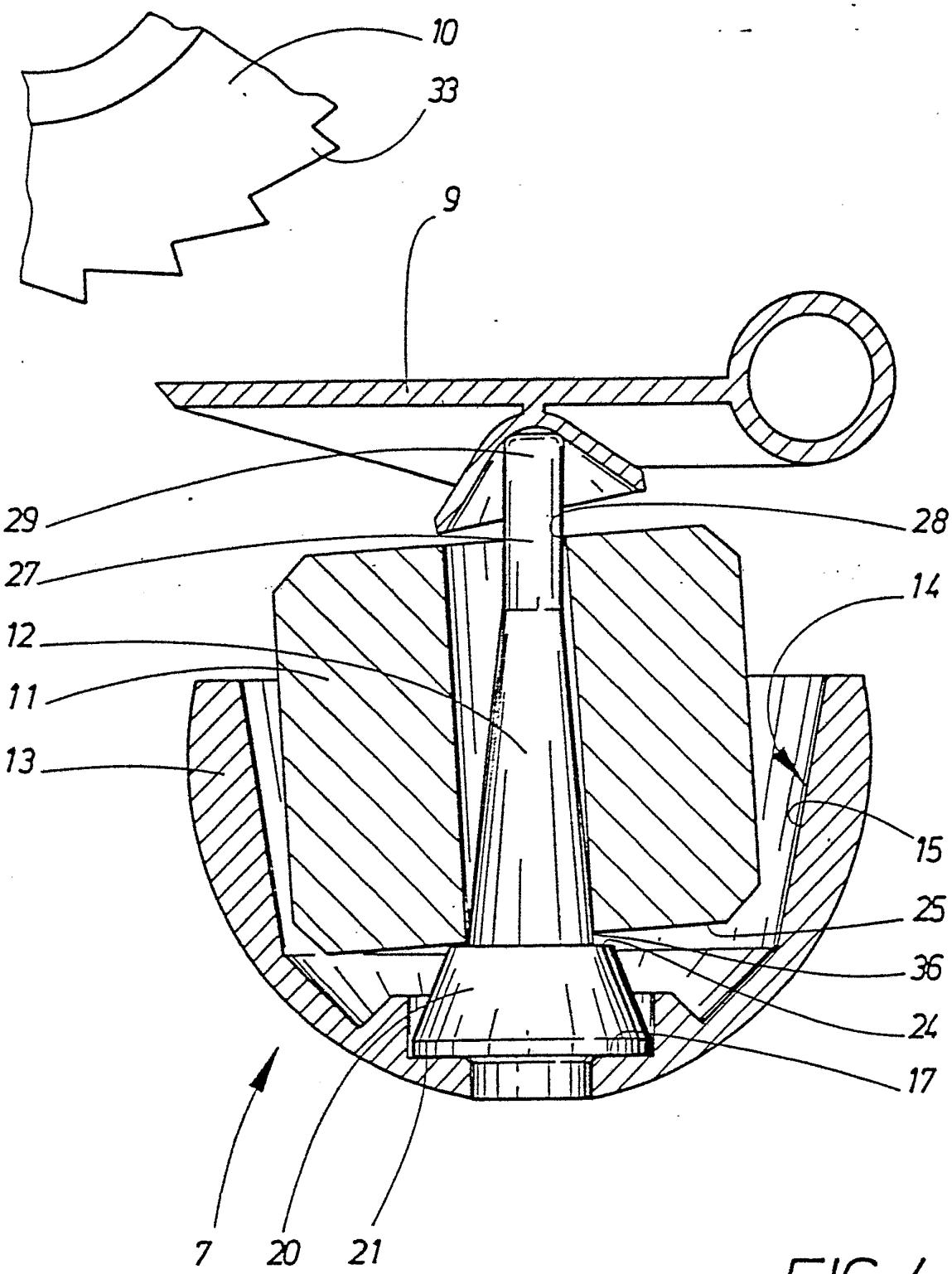


FIG. 4

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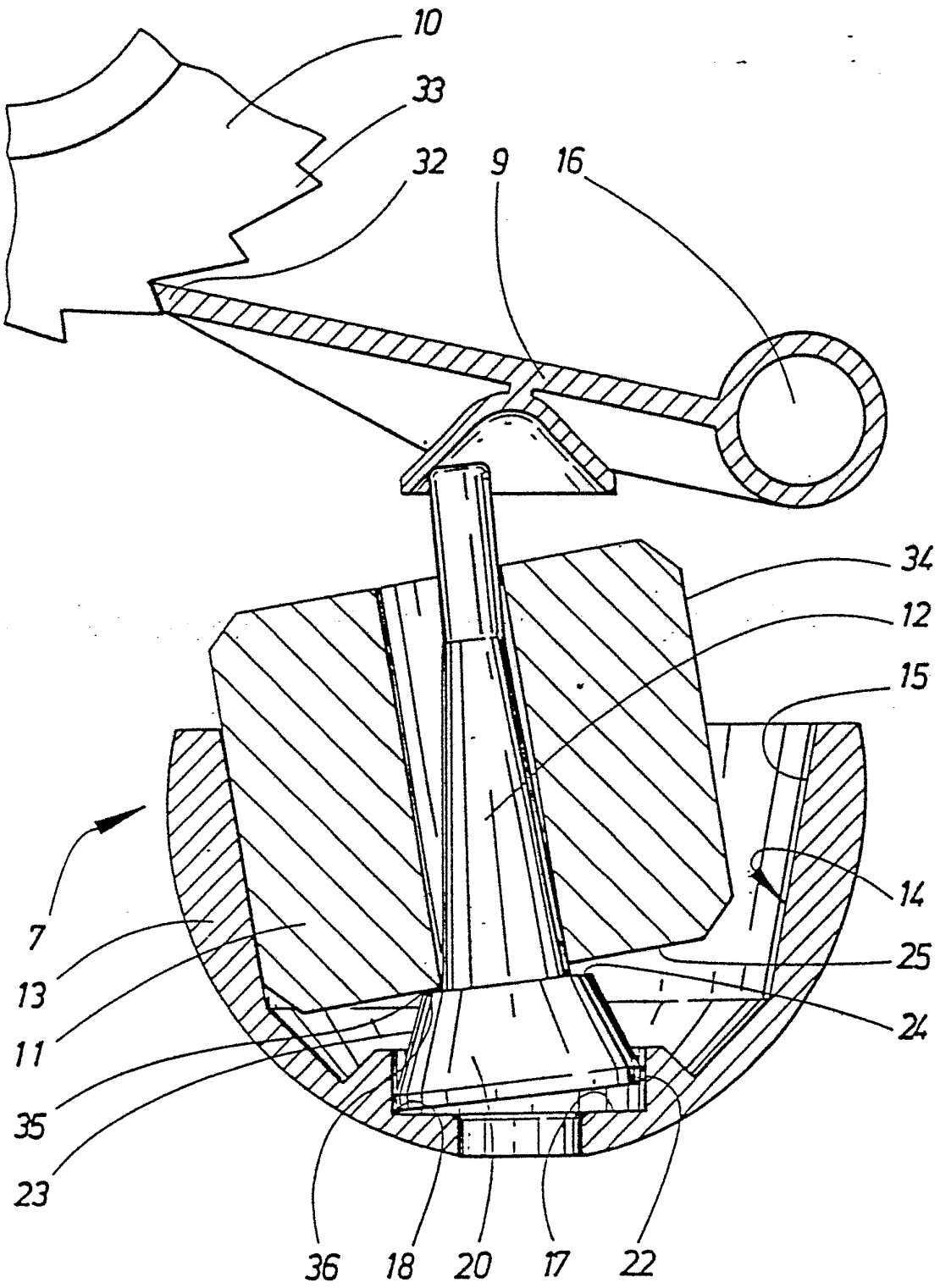


FIG.5

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INTERNATIONAL SEARCH REPORT

International Application No PCT/SE82/00180

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC 3

A 62 B 35/02 // B 60 R 21/10

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
IPC 3	A 62 B 35/00,35/02, B 60 R 21/10, B 64 D 25/06, B 65 H 23/06-23/12,75/30,75/34,75/38,75/44,75/48
National Cl	63c:70

.../...

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
A	SE, A, 7607640-5 (AMERICAN SAFETY EQUIPMENT CORPORATION) 12 February 1977	
	& DE, A, 2 614 603	
A	SE, A, 7611398-6 (STIG MARTIN LINDBLAD) 15 April 1978	
	& DE, A, 2 746 091	
Y	SE, A, 7901949-3 (STIG MARTIN LINDBLAD) 6 September 1980	
	& WO, A, 80/01877	
A	SE, B, 387 854 (O L LINDBLAD) 20 September 1976	
	& DE, A, 2 454 990	
Y	SE, B, 399 183 (SIGMATEX AG) 6 February 1978	
	& DE, A, 2 355 046	
A	DE, A, 2 537 392 (LINDBLAD OSKAR LENNART) 11 March 1976	

.../...

* Special categories of cited documents: [15]

"A" document defining the general state of the art which is not considered to be of particular relevance

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
1982-07-30	1982 -08- 03
International Searching Authority [1]	Signature of Authorized Officer [20]
Swedish Patent Office	Hans Nordström

Form PCT/ISA/210 (second sheet) (October 1981)

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FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

II Fields Searched (cont)

US Cl 242:107, 107.4
280:727, 801, 803, 806, 807
297:464, 474-481

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE [10]

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers ..... , because they relate to subject matter [12] not required to be searched by this Authority, namely:

2. ☐ Claim numbers ..... , because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out [13], specifically:

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING [11]

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

☐ The additional search fees were accompanied by applicant's protest.

☐ No protest accompanied the payment of additional search fees.

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III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, [16] with indication, where approopriate, of tne relevant passages [17]	Relevant to Claim No [18]
A	DE, A, 2 736 025 (S A FRANCAISE DU FERODO) 16 February 1978	

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