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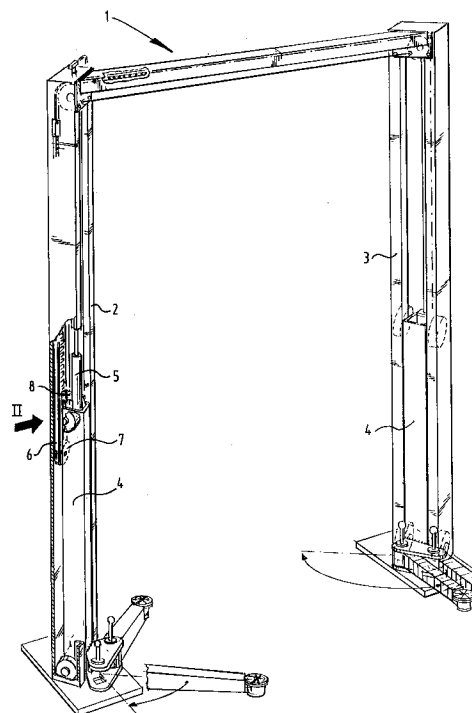
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**NL-2517 GK 's-Gravenhage (NL)**(54) **Safety ratchet device.**

(57) The invention relates to a safety ratchet device (10) for preventing an undesired relative movement of two members (4;2,3;25/21,22) movable relative to one another in a lengthwise direction. The device comprises a series of successive stop elements (15;27) in the longitudinal direction each defining a stop surface (15;28) in a plane transversely of the longitudinal direction on the one member (2,3;25), a support surface (13;30) on the other member (4;21,22) facing toward the stop surfaces (15;28), a ratchet element (12;31) which lies loosely with one end (14;39) against the support surface (13;30) and which is pivotable between a slanting position in which another end can come into contact with a stop element and a retracted position in which the stop elements can pass freely, and urging means (16;33) for urging the ratchet element into the retracted position counter to a bias.

**FIG. 1****EP 0 566 195 A1**

The invention relates to a safety ratchet device for preventing an undesired relative movement of two members movable relative to one another in a lengthwise direction.

Such a safety ratchet device, as known from FR-A-2 143 627, is used for instance in vehicle lifting devices to prevent a lifted vehicle falling downward when a component of the lifting device gives way.

The invention now has for its object to provide a safety ratchet device of the type specified in the preamble, the construction of which is simple and which requires no maintenance, without this adversely affecting reliable operation.

This object is achieved with the safety ratchet device as characterized in claim 1. Because the ratchet element lies loosely against the support surface, no pivot shafts and the like which must be regularly lubricated to guarantee proper movement are necessary. The device is fail-safe because it is normally in the blocking position and must be moved into the inactive position by the urging means.

The location of the centre of gravity ensures at all times that when the urging means are inoperative the ratchet element tilts into the active position.

A very favourable embodiment is characterized in claim 2. The electromagnet can be coupled simply to a control device which controls the movement of the movable members. No separate control therefore need take place with the attendant risk of failure to place the ratchet element in the active position.

An economically very favourable embodiment is characterized in claim 3. Only a minimal number of workings and components is required to realize the safety ratchet device according to the invention.

With the further developed embodiment of claim 4 the advantage is achieved that fitting can take place in very simple manner. The electromagnet can be released and optionally exchanged with a few hand operations. The step of claim 5 gives additional certainty that the ratchet is held in the active position.

The invention will be further elucidated in the following description with reference to the embodiments shown in the figures.

Figure 1 shows a partly broken away perspective view of a vehicle lifting device provided with a safety ratchet device according to the invention.

Figure 2 shows a broken away perspective view according to arrow II of the vehicle lifting device in figure 1.

Figure 3 shows a view corresponding with figure 1 of a vehicle lifting device according to another embodiment.

Figure 4 shows a view corresponding with figure 2 according to arrow IV in figure 3.

Figure 5 shows a sectional side view according to arrow V in figure 4.

Figure 6 is a partial side view on the ratchet element according to arrow VI in figure 5.

The vehicle lifting device 1 shown in figure 1 is a so-called two-column lifting device and accordingly comprises two columns 2 and 3 in each of which is received a carriage 4 movable vertically up and downward. The carriages 4 bear on their bottom end arms on which a vehicle can be supported.

The carriages 4 are driven for vertical movement using a hydraulic cylinder 5. The latter engages directly between the column 2 and the carriage 4. The movement is transmitted onto the carriage 4 in column 3 by means of a chain 6 which is fixedly connected to a support 8 of carriage 4 and guided to the carriage 4 in column 3 via a number of guide wheels, one of which is shown at 7.

To prevent undesired downward movement of the carriages 4, for example as a result of a disturbance in the hydraulic system of which the cylinder 5 forms part, a safety ratchet device 11 is arranged which is shown in more detail in figure 2.

The ratchet device 10 comprises a stop frame 11 which is fixed to the one member, in this case the stationary column 2, and which comprises a series of successive stop elements 15 in vertical lengthwise direction. These stop elements 15 each form a stop surface transversely of the longitudinal direction. A ratchet element 12 co-acts with these stop surfaces 15. This ratchet element lies with one end, in the embodiment shown the top end 14, against a support 13 which is fixedly connected to the carriage 4 which forms the other of the two members movable relative to one another in lengthwise direction. The ratchet element 12 is urged into an inclined position shown in figure 2 by urging means 16 which, as shown, can be an electromagnet 16 but which in other embodiments may also be formed by further self-evident mechanical or hydraulic means. In this slanted position the bottom end of the ratchet element 12 protrudes into the path of the stop surfaces 15 so that when the carriage 4 descends relative to column 2 the bottom end of the ratchet element comes into contact with one of the stop surfaces 15. In this situation the carriage 4 cannot descend further. The load of carriage 4 is transmitted directly via the support 13 and ratchet element 12 onto the stop frame 11 fixedly connected to the column 2.

When it is desired to have the carriage 4 move downward the electromagnet 16 is activated to retract the ratchet element 12 out of the path of the

stop surfaces 15. When the ratchet is loaded the carriage is first moved slightly upward using the drive comprising cylinder 5; thereafter the carriage 4 can move freely downward.

When the carriage 4 is moved upward in column 2 the ratchet element 12 can lie in the shown active slanted position. When it passes over the stop elements 15 the ratchet element 12 is pressed aside and does not therefore obstruct the upward movement.

Figure 3 shows a lifting device 20 of the same type in a renewed embodiment. In similar manner as in lifting device 1 a carriage 25 is received in each of the columns 21 and 22. Each carriage 25 is driven by means of its own cylinder 23, 24 which are connected such that synchronous operation is ensured. The safety ratchet device according to the invention as applied in this embodiment is shown in figure 4.

Likewise used herein is a stop frame 26 which, however, is not fixed to the stationary column 21 but to the movable carriage 25. Conversely, the ratchet element 31 is mounted on the stationary column 21.

The stop frame 26 comprises in this embodiment a series of protruded stop elements 27 defining a slanting front surface and a stop surface 28. The latter lies transversely of the relative movement of direction of the carriage 24 in relation to the column 21.

Instead of the stop frame 26 with protruded stop elements 27 a stop frame with holes could be used, wherein the upper boundaries of the holes form the stop surfaces.

Welded fixedly to the column 21 is a support element 29 which defines on the top side a support surface 30 facing toward the stop surfaces 28.

The ratchet element 31 used in this embodiment rests with its bottom end 39 on the support surface 30. The bottom end 39 is rounded so that it can easily pivot on the support surface 30. The contact area is shifted towards the column, so that the center of gravity of the ratchet element 31 is positioned at the side of the stop surfaces 28 relative to the supporting surface 30.

The ratchet element 31 is held in place by means of a locking element 40 which is screwed to the wall of column 21 by means of a bolt 37. Due to the shoulder of the element 40 the ratchet element 31 cannot move away from the support 29. The opening 41 in ratchet element 31 which co-acts with the locking element 40 has considerably larger dimensions than the locking element 40 so that a very loose closure is obtained. In normal operation there is no or hardly any contact between the locking element 40 and the inner wall of hole 41.

The ratchet element 31 has an upper end surface 32 which can co-act with the stop surfaces 28. This co-action takes place when the ratchet element 31 is pivoted into the slanting active position shown in figure 4. This slanting active position is the rest position. The ratchet element 31 pivots automatically to the right because its centre of gravity as seen in figure 5 lies to the right of the contact point with the support 29. The safety ratchet device is thus normally active and is moved out of the active position by a specific action. The safety ratchet device is therefore fail-safe.

The movement out of the active slanting position shown in figure 4 to the retracted position shown in figure 5 in which the carriage 25 can move freely in relation to the column 21 takes place in this embodiment by means of an electromagnet 33. This latter is mounted simply by means of a bracket 34 and a bolt 35 engaging in a screw threaded hole 36 of the column 21. For the sake of clarity the fastening means 34, 35, 36 are shown in figure 5 rotated upward through 90° relative to figure 4.

The electromagnet 33 has a plunger 42 which is received for free movement in a channel of the electromagnet 33. When electromagnet 33 is energized the plunger 42 is pulled inward, that is, to the left as seen in figure 5.

According to a preferred feature the electromagnet 33 is of the type with a plunger loaded outward, that is, to the right as seen in figure 5, by spring means. This spring loading supports the bias brought about by the force of gravity which will normally hold ratchet element 31 in the slanting active position.

The plunger 42 has a head 43 and a portion 44 located thereunder with a smaller diameter. The ratchet element 31 is, as shown more clearly in figure 6, provided with a keyhole-like gripping opening 45 comprising a wide portion 46 and a slot-like portion 47 connecting thereto. The head of the plunger 42 can be pushed through the wide portion 46 of the opening, whereafter the thinner portion 44 of plunger 42 can be pushed into the slot-like portion 47 of the opening. The dimensioning of plunger 42 and opening 45 is again such that a very broad clearance results.

It will be apparent that due to the keyhole connection the electromagnet 33 can be released and removed very simply and if necessary replaced with a new one when damaged. It will also be apparent that the ratchet device is itself extremely simple in construction and comprises in addition to electromagnet 33 only one moving part, the ratchet element. The mounting of this safety ratchet device is also extremely simple and requires only a few operations.

The operation of the shown preferred embodiment of the ratchet device is electrical and can thus be connected in simple manner to the control of the drive of the lifting device.

The invention is not limited to the preferred embodiments shown in the figures. The urging means for example can also be mechanical or for instance hydraulic means. Nor of course is the application of the safety ratchet device limited to the use shown with a vehicle lifting device. In all situations where it is desired to enable blocking of two organs movable relative to one another in a longitudinal direction the device according to the invention can be used in the one or other embodiment.

### Claims

1. Safety ratchet device for two organs movable relative to one another in a longitudinal direction comprising a series of successive stop elements in the longitudinal direction each defining a stop surface in a plane transversely of the longitudinal direction on the one member, a support surface on the other member facing toward the stop surfaces, a ratchet element which lies loosely with one end against the support surface and which is pivotable between a slanting position in which another end can come into contact with a stop element and a retracted position in which the stop elements can pass freely, and urging means for urging the ratchet element into the retracted position counter to a bias, in which retracted position the center of gravity of the ratchet element is positioned at the side of the stop surfaces, relative to the support surface.
2. Safety ratchet device as claimed in claim 1, wherein the urging means comprise an electromagnet, a plunger of which grips onto the ratchet element.
3. Safety ratchet device as claimed in claim 2, wherein the ratchet element and the electromagnet are mounted on either side of a wall and the plunger grips the ratchet element through an opening in the wall.
4. Safety ratchet device as claimed in claim 2 or 3, wherein the plunger of the electromagnet comprises on its end a head with a portion of smaller diameter thereunder and the ratchet element is provided with a keyhole-like gripping opening with a wide portion and a connecting slot-like portion, wherein the head of the plunger fits through the wide portion and the portion of the plunger with smaller diam-

eter can be pushed with clearance into the slot-like portion.

5. Safety ratchet device as claimed in any of the claims 2-4, wherein the electromagnet is of a type with a plunger loaded outward by spring means.

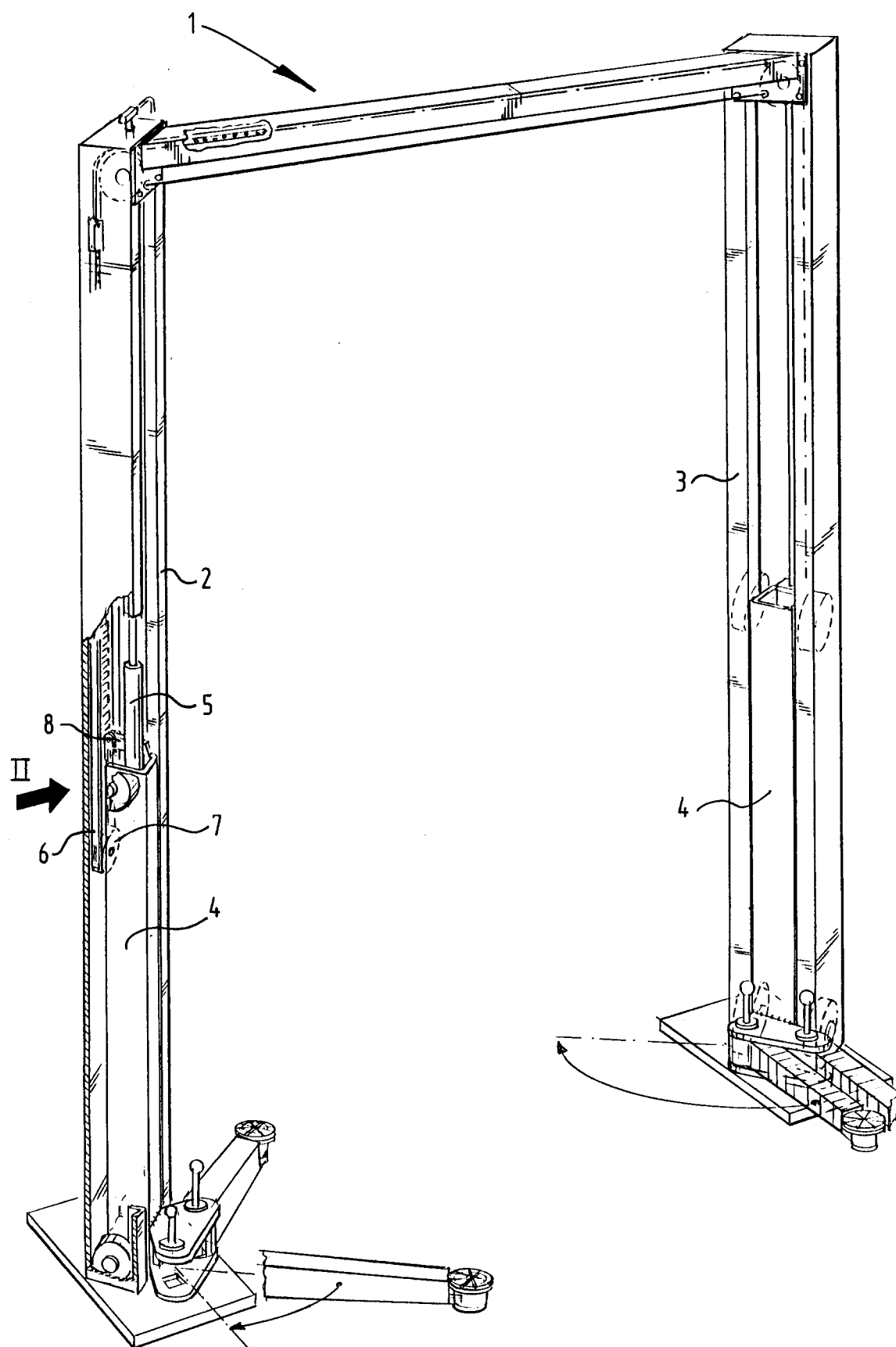


FIG. 1

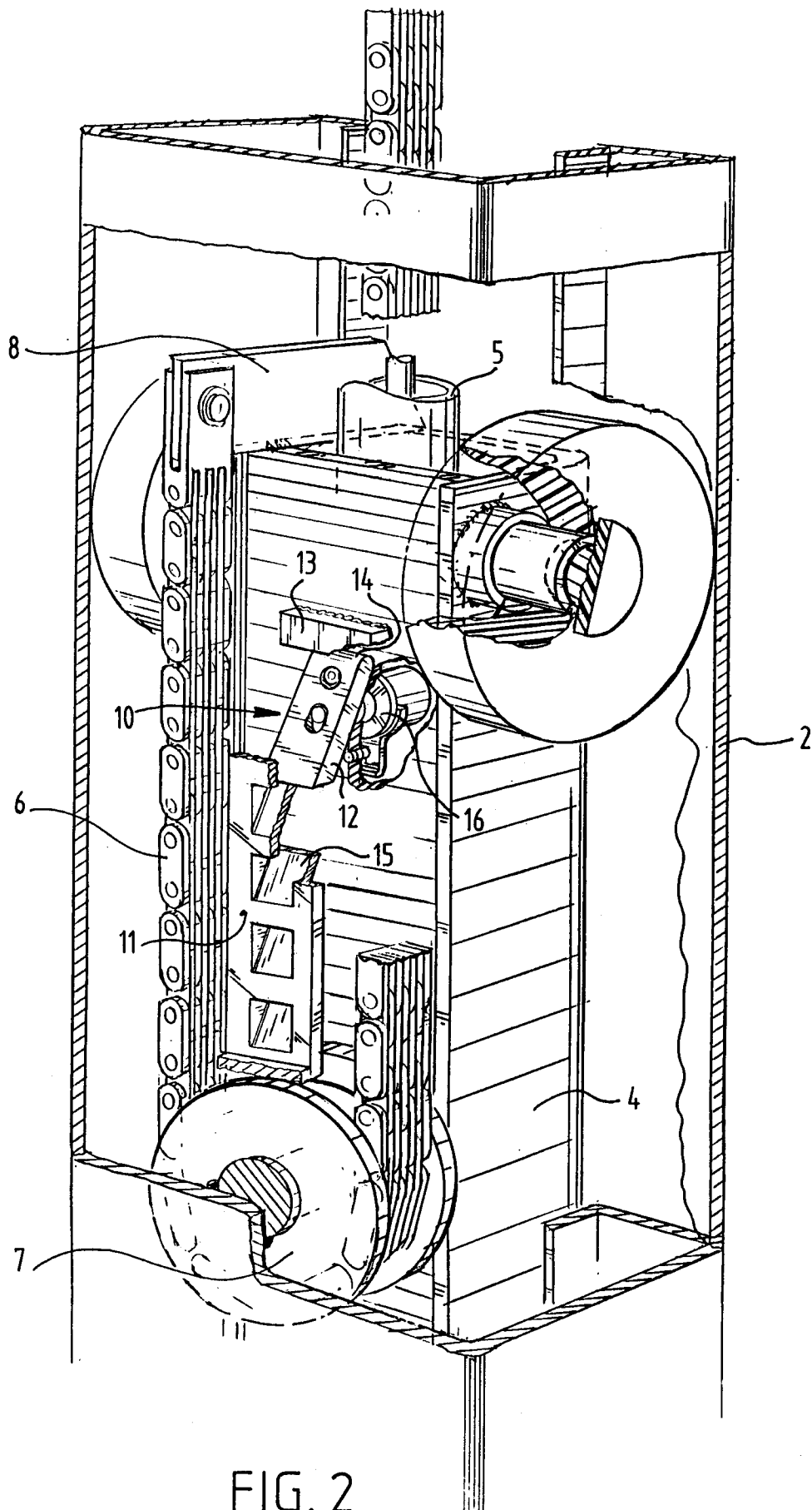


FIG. 2

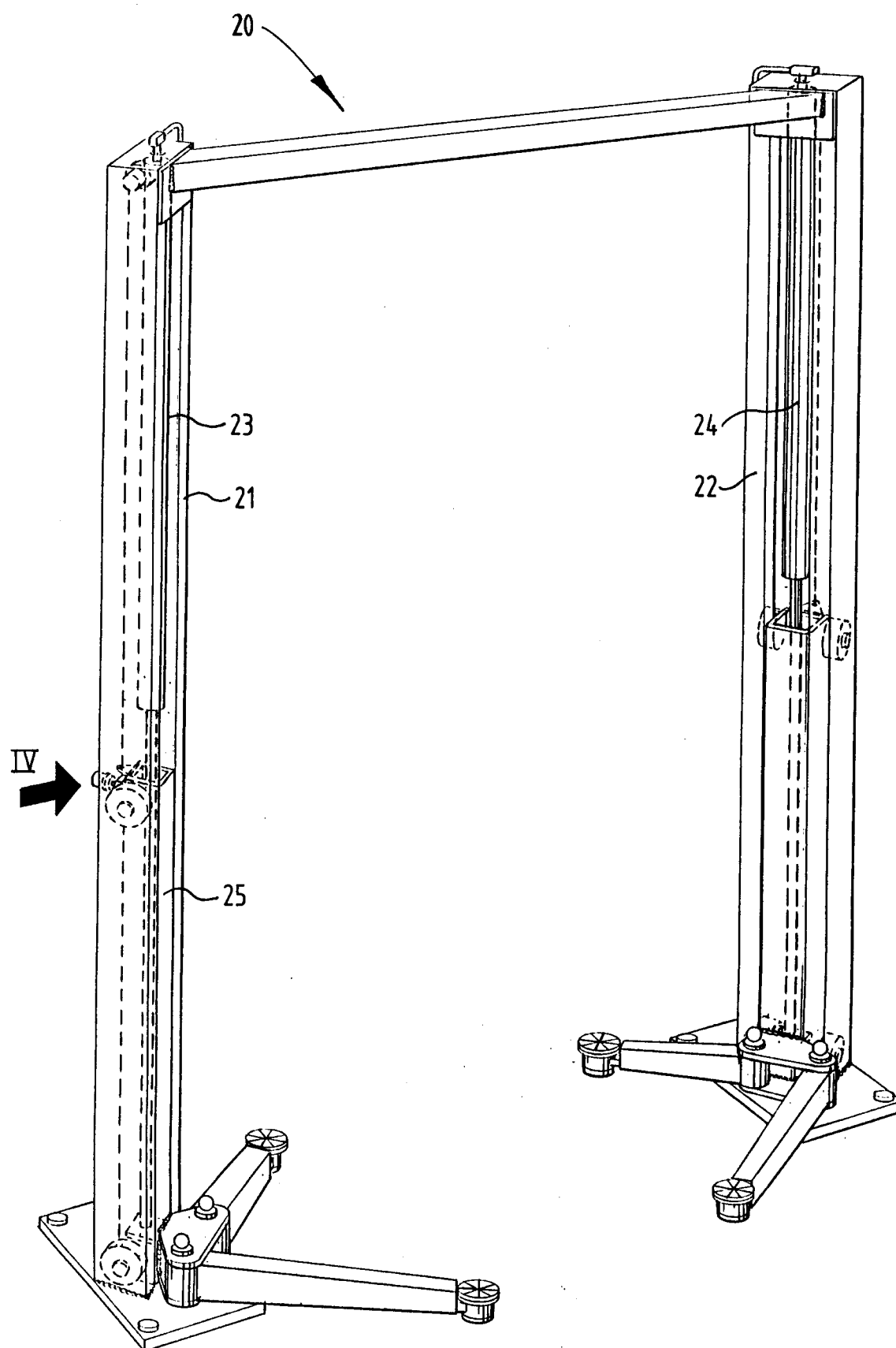


FIG. 3

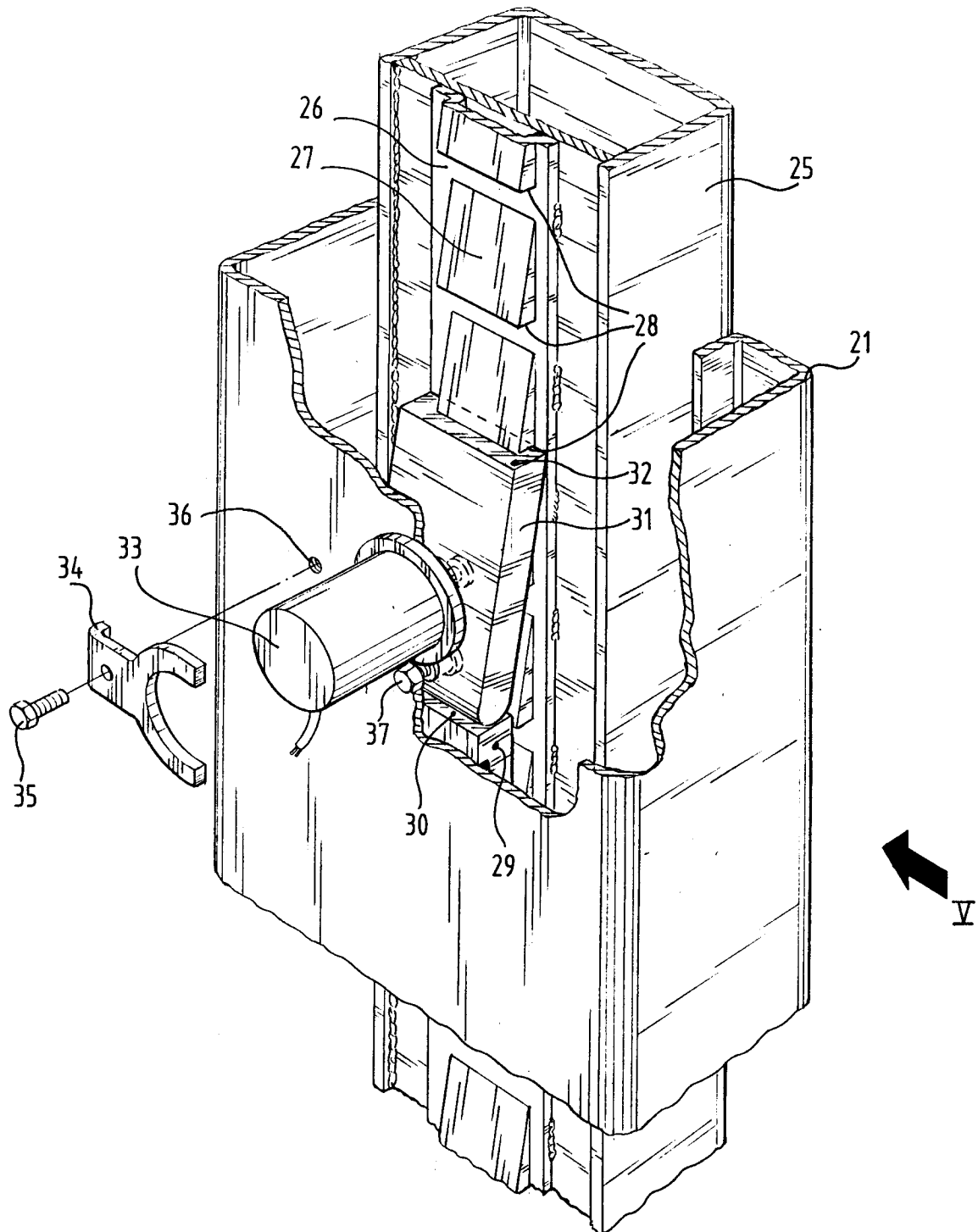


FIG. 4



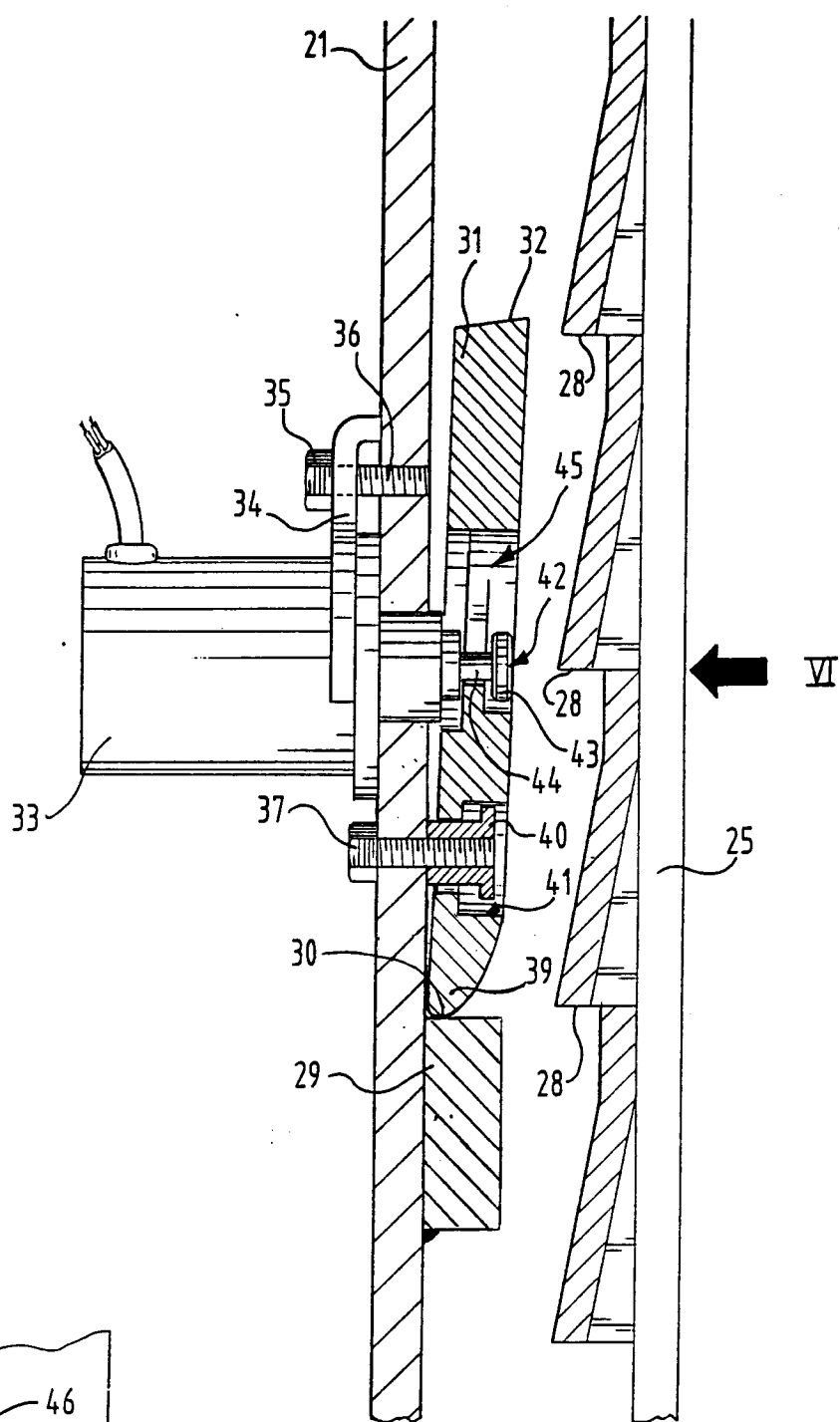


FIG. 5

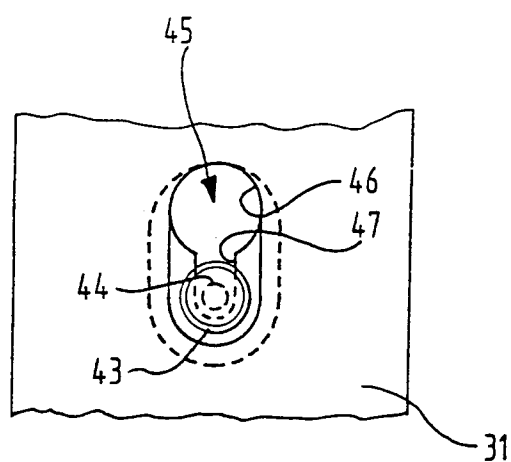


FIG. 6



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## EUROPEAN SEARCH REPORT

Application Number

EP 93 20 1038

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.5)
A,D	FR-A-2 143 627 (BOURETTE) * page 2, line 38 - page 3, line 36; figures *	1,2	B66F7/04 B66F7/02
A	US-A-4 892 028 (STIVERS) * figure * * column 5, line 1 - line 25 *	1	
A	DE-A-3 032 917 (BREMER STAHLBAU G.M.B.H.) * page 9, line 8 - line 24 * * figures *	1	
A	FR-A-2 312 450 (MACCARONE) * page 6, line 10 - line 22 * * figure 5 *	1,2	
A	EP-A-0 478 035 (STERTIL B.V.) * column 4, line 24 - line 41 * * figure 2 *	1,2	
A	US-A-5 015 146 (BARNES ET AL.) * column 6, line 55 - column 7, line 4; figure 9 *	1,2	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	FR-A-2 578 525 (REIDENBACH) * page 4, line 1 - line 15; figures 2,3 *	1,2	B66F
A	US-A-4 457 401 (TAYLOR ET AL.) * column 6, line 21 - line 37; figure 7 *	1	
A	EP-A-0 017 765 (LAUPPER) * page 5, line 24 - page 6, line 1; figure 3 *	1	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 11 JUNE 1993	Examiner GUTHMULLER J.A.
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application I : document cited for other reasons & : member of the same patent family, corresponding document			