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(54) **Electric window of motor-vehicle with safety device**

Elektrischer Fensterheber von Kraftfahrzeugen mit Sicherheitsvorrichtung

Lèvre-vitres électrique avec dispositif de sécurité

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(56) References cited:
EP-A- 0 107 531 EP-A- 0 578 529
EP-A- 0 578 534 FR-A- 2 335 681
US-A- 2 225 003

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Description

The present invention relates to safety devices for electric windows of motor-vehicles of the type indicated in the pre-characterizing portion of Claim 1.

In the field of electric windows for motor-vehicles, there have been proposed various solutions in order to prevent injuries as a consequence of the intrusion of a part of the body, typically a hand, through the window aperture during movement of the latter towards the closed position. A conventional solution to this problem lies in controlling the current absorbed by the electric motor which controls the window pane when this is closed and driving automatically the interruption of the operation and/or the opening of the window in case the absorbed current passes a predetermined value. This solution however does not ensure adequate safety, particularly in case in which the intruded body provides a relatively weak resistance to the closing of the window, such as in the case of a finger of a child.

Safety devices for electric windows of motor-vehicles are also known, which comprise sensor means including an elongated hollow element of elastically deformable material arranged along the upper edge of the window aperture and containing inside two metal foils which come into contact with each other closing an electric circuit as soon as the intruded body is pushed by the edge of the pane against the elongated hollow element, so as to activate the window control device in order to stop and/or invert the actuating electric motor. This solution is disclosed for example in European patent application No. 300550, in German patent No. 3.427.771 and in German patent application No. 3.206.466. The main drawback of devices of this kind lies in that they imply the arrangement of said metal foils inside the elongated hollow element, with resulting losses of time during manufacture and relatively high costs.

A device as set forth in the preamble of the attached Claim 1 is disclosed in EP-A-578 529. However in this known solution the support element of the pane is pulled by the auxiliary element during closing of the pane through coupling means which are complicated and expensive and cannot be provided easily to windows originally lacking of a safety device.

The object of the present invention is that of providing a safety device for electric windows of motor-vehicles which is of extremely simple and economic manufacture, which may be adapted easily also to windows initially not provided with a safety device, and which at the same time is characterized by a high precision and reliability and ensures therefore a high degree of safety.

In order to achieve this object, the invention provides a safety device for an electric window of a motor-vehicle as set forth in Claim 1.

Preferably, the sensor means are comprised of a proximity electric switch and a striker element cooperating therewith which are supported by the support element and the auxiliary element and come into engage-

ment with each other as a consequence of a relative movement of said elements.

In a preferred embodiment, said spring means are comprised of at least a helical spring mounted on a guide pin carried by said support element and slidably engaged within a corresponding hole of said auxiliary element.

Due to said features, the device according to the invention is much simpler and more economic with respect to the known devices, it may be adapted easily to a window which is initially not provided with a safety device, and also is characterized by a great precision of operation and by a resulting high degree of safety.

The invention will be now described with reference to the annexed drawings, in which:

figure 1 is a diagrammatic view, partially in cross-section, of a motor-vehicle door provided with a safety device according to the invention, figure 2 shows at an enlarged scale a detail of figure 1, and figure 3 is a front view of the detail of figure 2.

In figure 1, reference numeral 1 generally designates a motor-vehicle door whose structure comprises a lower panel 2 and a window frame 3 defining a window aperture 4. Reference numeral 5 designates the window pane, which is slidably mounted within guides 6, 7, 8, provided in the door structure, between a lowered opened position (shown in figure 1) and a raised closed position.

At the base of the pane 5 there is connected a support element 9 which is slidably guided within guide 7 and is moved along this guide by an electric motor 10 whose output shaft, in the case of the illustrated embodiment, is connected through a flexible connecting member 11 to a screw which engages a nut connected to the support element 9.

The structure and arrangement of electric motor 10 and driving shaft 11 may be provided in any known way and do not fall, taken *per se*, within the scope of the invention. For this reason, and also in order to render the drawings more simple and easy to understand, said construction details have not been illustrated herein.

With reference to figures 2, 3, the screw, driven by the electric motor 10 through the flexible connecting shaft 11 is illustrated with reference numeral 12. Screw 12 engages a nut 13 which is carried by an auxiliary element 14 which is separate from the support element 9 and is slidably mounted on guide pins 15 of the support element 9 along a direction substantially parallel to the sliding direction of pane 5. The sliding movement of the auxiliary element 14 with respect to the support element 9 is also guided by the engagement of a pin 16 of the auxiliary element 14 in a slot 17 of the support element 9. Helical springs 18 are mounted on guide pins 15.

The support element 9 and the auxiliary element 14 are also provided respectively with a proximity micro-

switch 19 and a striker member 20 constituted by a screw adjustable in position which come into contact with each other as a result of a movement of support element 9 and auxiliary element 14 towards each other. With reference to figure 1, door 1 is also provided with a limit switch 21 able to detect the reaching of the raised position by pane 5 and to deactivate accordingly the safety device, in order to allow the normal closing of the window pane. Alternatively, the limit switch can be provided on the auxiliary element 14, so that it is not necessary to deactivate the safety device in the final portion of the closing stage.

The operation of the above described device is as follows.

During normal operation of the electric window, electric motor 10 is activated to move pane 5 between its opened and closed position. The rotation of the output shaft of the electric motor 10 is transmitted by the driving shaft 11 to screw 12 which causes a resulting displacement of nut member 13 thereon, since the latter is prevented from rotating. Auxiliary element 14 moves along with nut member 13. In case of a downward movement, the auxiliary element 14 transfers its movement to the support element 9, and also to pane 5, through pin 16 which engages the lower end of slot 17 of the support element 9. During an upward movement, such movement is transferred to the support element 9 by helical springs 18, which have a load sufficient to be exploited to this end.

If a foreign body intrudes in the window aperture during its closing, opposing the raising of pane 5, the support element 9 consequently stops or slows down, whereas the auxiliary element 14 continues its movement under the action of screw 12. The auxiliary element 14 therefore moves upwardly (with reference to figure 2) with respect to support element 9, biasing spring 18 and bringing screw 20 in contact with micro-switch 19, whose activation is used, in a way known per se (not illustrated herein) to stop or invert rotation of electric motor 10.

In the annexed drawings, for simplicity, the auxiliary element 14 has been illustrated as sliding in a vertical direction with respect to the support element 9, whereas the latter is moved along with pane 5 along a direction which is slightly inclined with respect to the vertical direction. As a matter of fact, this different inclination does not cause inconveniences, since the guide pins 14 engage the corresponding holes of auxiliary element 14 with play and since the stroke of the auxiliary element 14 with respect to the support element 9 necessary to activate micro-switch 19 is very reduced and at maximum of some millimetres. At any rate, it is clearly apparent that guide pins 15 and slot 17 may be provided along the same direction of guide 7 which is slightly inclined with respect to the vertical direction.

As it is clearly apparent, the safety device according to the invention is extremely simple and economic to manufacture and at the same time is very effective and

reliable. It also may be adapted with simple operations to an electric window which is initially not provided with a safety device of this kind.

In a possible variant, the closed position of the pane 5 is defined by a stop member (not shown) carried by the door structure, which cooperates with support element 9 to stop the pane in its closed position without causing any compression of springs 18. The use of microswitch 21 is thereby avoided. In a further variant (not shown), microswitch 19 is carried by the fixed structure of the door, so as to avoid any electric cable connected to moving parts, whereas screw 20 cooperates with a movable button which transmits its movement to the microswitch through a mechanical transducer, such as a flexible cable.

Claims

1. Safety device, for an electric window of a motor-vehicle comprising a window pane (5) which is slidably mounted within guide means (6, 7, 8) between an opened position and a closed position, said device including a support element (9) rigidly connected to the window pane (5) and control means (10 - 13) to move said support element (9) in a direction substantially parallel to the sliding direction of the window pane (5) to cause movement of the window pane (5) between its opened position and its closed position, wherein:

- said control means (10 - 13) act directly on an auxiliary element (14) separate from said support (9),
- said auxiliary element (14) is slidably mounted on the support element (9) in a direction substantially parallel to the sliding direction of the window pane (5),
- spring means (18) are interposed between the auxiliary element (14) and the support element (9),

so that an upward movement of the auxiliary element (14) caused by said control means is transferred to the support element (9) and the window pane (5) connected thereto, which move along with the auxiliary element (14), whereas in the case a closing movement of the window pane (5) is opposed by the intrusion of a foreign body in the window aperture (4), the auxiliary element (14) moves with respect to the support element (9) against the action of said spring means (18), there are provided sensor means (19, 20) for sensing a relative movement of the auxiliary element (14) with respect to the support element (9), to stop and/or invert the

movement of the window pane (5) in case the closing of the window pane is opposed,

characterized in that said auxiliary element (14) is arranged so as to push said support element (9) through said spring means (18) when the window pane (5) is being closed, whereas said spring means (18) are compressed and the auxiliary element (14) moves closer to the support element (9) triggering said sensor means (19, 20) when the closing movement of the pane is opposed, said device further comprising cooperating abutment elements (16, 17) on the auxiliary element (14) and the support element (9) to cause the latter to move along with the auxiliary element (14) when the window pane is being opened.

2. Device according to claim 1, characterized in that said auxiliary element (14) is slidably mounted on the support element (9) through a pin-and-slot coupling (16, 17).
3. Device according to claim 2, characterized in that said spring means (18) are constituted by helical springs (18) mounted on guide pins (15) carried by the support element (9) and engaged within corresponding holes of the auxiliary element (14).
4. Device according to claim 1, characterized in that said sensor means are constituted by a proximity micro-switch (19) and a striker element (20) carried by the support element (9) and the auxiliary element (14).
5. Device according to claim 4, characterized in that said striker element (20) is constituted by a screw adjustable in position.
6. Device according to claim 4, characterized in that it comprises a proximity micro-switch (21) able to detect the closing of the window to deactivate the safety device at the reaching of the closed position.
7. Device according to claim 1, characterized in that a stop member is provided, carried by a fixed structure, adapted to cooperate with said support element (9) to stop the pane (5) in its closed position without causing any compression of said spring means (18).
8. Electric window for a motor-vehicle, characterized in that it comprises a safety device according to any of Claims 1-7.

Revendications

1. Appareil de sécurité, destiné à une fenêtre électri-

que de véhicule à moteur, comprenant un vitrage (5) qui est monté afin qu'il coulisse à l'intérieur d'un dispositif de guidage (6, 7, 8) entre une position d'ouverture et une position de fermeture, l'appareil comprenant un élément (9) de support raccordé rigidement au vitrage (5), et un dispositif de commande (10-13) destiné à déplacer l'élément de support (9) en direction pratiquement parallèle à la direction de coulisement du vitrage (5) afin qu'il provoque un déplacement de ce vitrage (5) entre ses positions d'ouverture et de fermeture, dans lequel :

- le dispositif de commande (10-13) agit directement sur un élément auxiliaire (14) séparé du support (9),
- l'élément auxiliaire (14) est monté afin qu'il coulisse sur l'élément de support (9) en direction pratiquement parallèle à la direction de coulisement du vitrage (5), et
- un dispositif à ressort (18) est placé entre l'élément auxiliaire (14) et l'élément de support (9),

si bien qu'un déplacement vers le haut de l'élément auxiliaire (14) provoqué par le dispositif de commande est transmis à l'élément de support (9) et au vitrage (5) qui lui est raccordé, qui se déplacent avec l'élément auxiliaire (14), alors que, dans le cas où un mouvement de fermeture du vitrage (5) rencontre l'opposition due à l'entrée d'un corps étranger dans l'ouverture (4) de fenêtre, l'élément auxiliaire (14) se déplace par rapport à l'élément de support (9) malgré l'action du dispositif à ressort (18), et

un dispositif capteur (19, 20) est destiné à détecter un mouvement relatif de l'élément auxiliaire (14) et de l'élément de support (9) afin qu'il arrête le déplacement du vitrage (5) et/ou l'inverse dans le cas où la fermeture du vitrage rencontre une opposition,

caractérisé en ce que l'élément auxiliaire (14) est disposé afin qu'il pousse l'élément de support (9) par l'intermédiaire du dispositif à ressort (18) lorsque le vitrage (5) est en cours de fermeture, alors que le dispositif à ressort (18) est comprimé et l'élément auxiliaire (14) se rapproche de l'élément de support (9) et déclenche le dispositif capteur (19, 20) lorsque le mouvement de fermeture du vitrage rencontre une opposition, l'appareil comportant aussi des éléments coopérants de butée (16, 17) placés sur l'élément auxiliaire (14) et l'élément de support (9) afin que ce dernier se déplace avec l'élément auxiliaire (14) lorsque le vitrage est en cours d'ouverture.

2. Appareil selon la revendication 1, caractérisé en ce

que l'élément auxiliaire (14) est monté afin qu'il coulisse sur l'élément de support (9) par l'intermédiaire d'un accouplement (16, 17) à broches et fente.

3. Appareil selon la revendication 2, caractérisé en ce que le dispositif à ressort (18) est constitué par des ressorts en hélice (18) montés sur des broches de guidage (15) portées par l'élément de support (9) et coopérant avec des trous correspondants de l'élément auxiliaire (14). 5 10
4. Appareil selon la revendication 1, caractérisé en ce que le dispositif capteur est constitué d'un microcontact (19) de proximité et d'un élément (20) de frappe porté par l'élément de support (9) et l'élément auxiliaire (14). 15
5. Appareil selon la revendication 4, caractérisé en ce que l'élément de frappe (20) est constitué par une vis de position réglable. 20
6. Appareil selon la revendication 4, caractérisé en ce qu'il comprend un microcontact (21) de proximité qui peut détecter la fermeture du vitrage pour désactiver l'appareil de sécurité lorsque la position de fermeture est atteinte. 25
7. Appareil selon la revendication 1, caractérisé en ce qu'un organe d'arrêt est incorporé, est supporté par une structure fixe, et est destiné à coopérer avec l'élément de support (9) afin qu'il arrête le vitrage (5) en position de fermeture sans provoquer aucune compression du dispositif à ressort (18). 30
8. Fenêtre électrique pour véhicule à moteur, caractérisée en ce qu'elle comprend un appareil de sécurité selon l'une quelconque des revendications 1 à 7. 35

Patentansprüche 40

1. Sicherheitsvorrichtung für ein elektrisch angetriebenes Fenster eines Kraftfahrzeuges, das eine Fensterscheibe (5) umfaßt, die in Führungseinrichtungen (6, 7, 8) zwischen einer geöffneten Stellung und einer geschlossenen Stellung verschiebbar angebracht ist, wobei die Vorrichtung ein Trägerelement (9) enthält, das starr mit der Fensterscheibe (5) verbunden ist, sowie eine Steuereinrichtung (10-13), die das Trägerelement (9) in einer Richtung im wesentlichen parallel zu der Verschieberichtung der Fensterscheibe (5) bewegt, so daß sich die Fensterscheibe (5) zwischen ihrer geöffneten Stellung und ihrer geschlossenen Stellung bewegt, wobei: 45 50 55
 - die Steuereinrichtung (10-13) direkt auf ein Hilfselement (14) wirkt, das von der Trägerein-

richtung (9) getrennt ist,

- das Hilfselement (14) in einer Richtung im wesentlichen parallel zur Verschieberichtung der Fensterscheibe (5) verschiebbar auf dem Trägerelement (9) angebracht ist,
- Federeinrichtungen (18) zwischen dem Hilfselement (14) und dem Trägerelement (9) angeordnet sind,

so daß eine Aufwärtsbewegung des Hilfselementes (14), die durch die Steuereinrichtung bewirkt wird, auf das Trägerelement (9) und die damit verbundene Fensterscheibe (5) übertragen wird, die sich zusammen mit dem Hilfselement (14) bewegen, während sich das Hilfselement (14) gegen die Wirkung der Federeinrichtungen (18) in bezug auf das Trägerelement (9) bewegt, wenn die Einführung eines Fremdkörpers in die Fensteröffnung (4) einer Schließbewegung der Fensterscheibe (5) Widerstand entgegengesetzt.

wobei Sensoreinrichtungen (19, 20) vorhanden sind, die eine Bewegung des Hilfselementes (14) in bezug auf das Trägerelement (9) erfassen und die Bewegung der Fensterscheibe (5) unterbrechen und/oder umkehren, wenn dem Schließen der Fensterscheibe Widerstand entgegengesetzt wird,

dadurch gekennzeichnet, daß das Hilfselement (14) so angeordnet ist, daß es das Trägerelement (9) über die Federeinrichtungen (18) schiebt, wenn die Fensterscheibe (5) geschlossen wird, während die Federeinrichtungen (18) zusammengedrückt werden und sich das Hilfselement (14) näher auf das Trägerelement (9) zu bewegt und so die Sensoreinrichtungen (19, 20) auslöst, wenn der Schließbewegung der Scheibe Widerstand entgegengesetzt wird, wobei die Vorrichtung weiterhin zusammenwirkende Anschlageneinrichtungen (16, 17) an dem Hilfselement (14) und dem Trägerelement (9) umfaßt, die bewirken, daß sich letzteres zusammen mit dem Hilfselement (14) bewegt, wenn die Fensterscheibe geöffnet wird.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet**, daß das Hilfselement (14) über eine Zapfen-Schlitz-Kupplung (16, 17) verschiebbar auf dem Trägerelement (9) angebracht ist.
3. Vorrichtung nach Anspruch 2, **dadurch gekennzeichnet**, daß die Federeinrichtungen (18) durch Spiralfedern (18) gebildet werden, die auf Füh-

rungsstiften (15) angebracht sind, die von dem Trägerelement (9) getragen werden, und in entsprechende Löcher des Hilfselementes (14) eingreifen.

4. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet**, daß die Sensoreinrichtungen durch einen Näherungs-Mikroschalter (19) und ein Aufschlagelement (20) gebildet werden, die von dem Trägerelement (9) und dem Hilfselement (14) getragen werden. 5
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5. Vorrichtung nach Anspruch 4, **dadurch gekennzeichnet**, daß das Aufschlagelement (20) durch eine Schraube gebildet wird, deren Position verstellt werden kann. 15

6. Vorrichtung nach Anspruch 4, **dadurch gekennzeichnet**, daß sie einen Näherungs-Mikroschalter (21) umfaßt, der das Schließen des Fensters erfassen kann, um die Sicherheitsvorrichtung beim Erreichen der geschlossenen Position außer Betrieb zu setzen. 20

7. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet**, daß ein Anhalteteil vorhanden ist, das von einer stationären Struktur getragen wird und mit dem Trägerelement (9) zusammenwirkt, um die Scheibe (5) in ihrer geschlossenen Position anzuhalten, ohne daß die Federeinrichtungen (18) zusammengedrückt werden. 25
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8. Elektrisch angetriebenes Fenster für ein Kraftfahrzeug, **dadurch gekennzeichnet**, daß es eine Sicherheitsvorrichtung nach einem der Ansprüche 1 - 7 umfaßt. 35

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Fig. 1

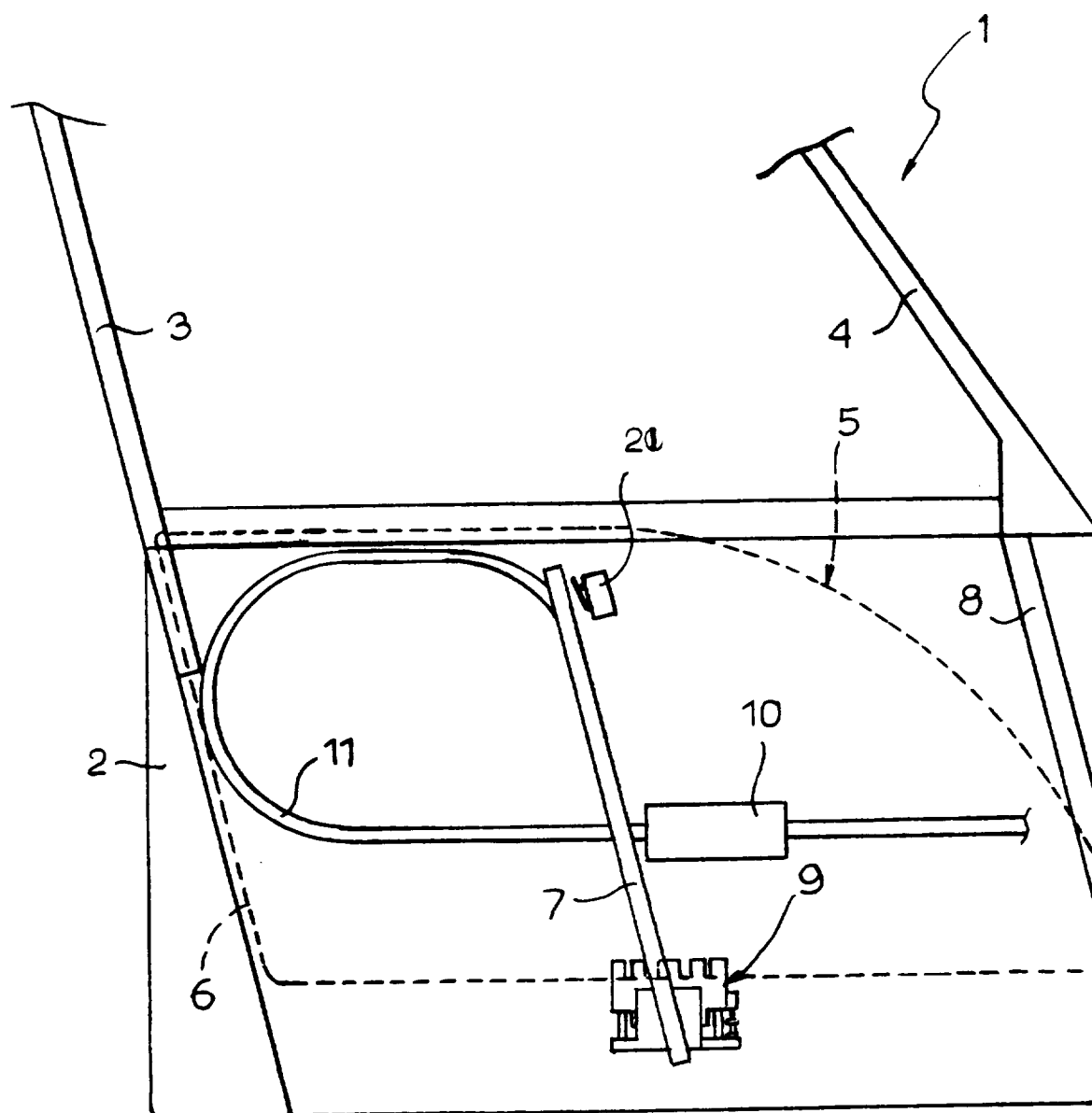


Fig. 2

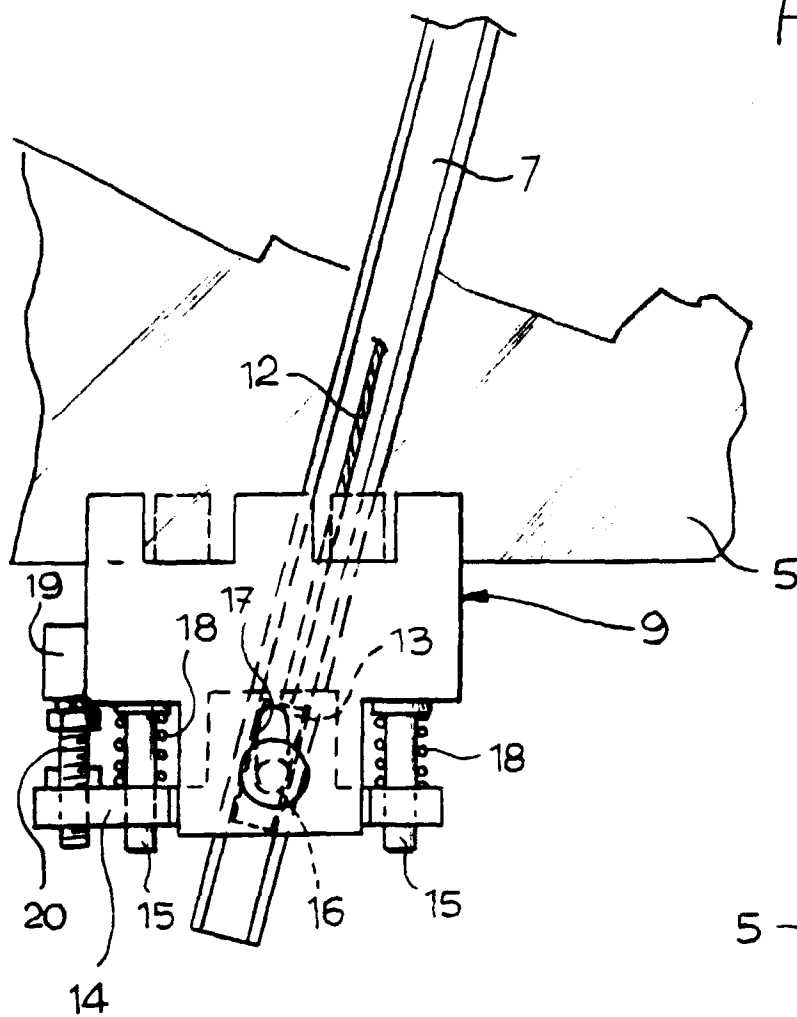


Fig. 3

