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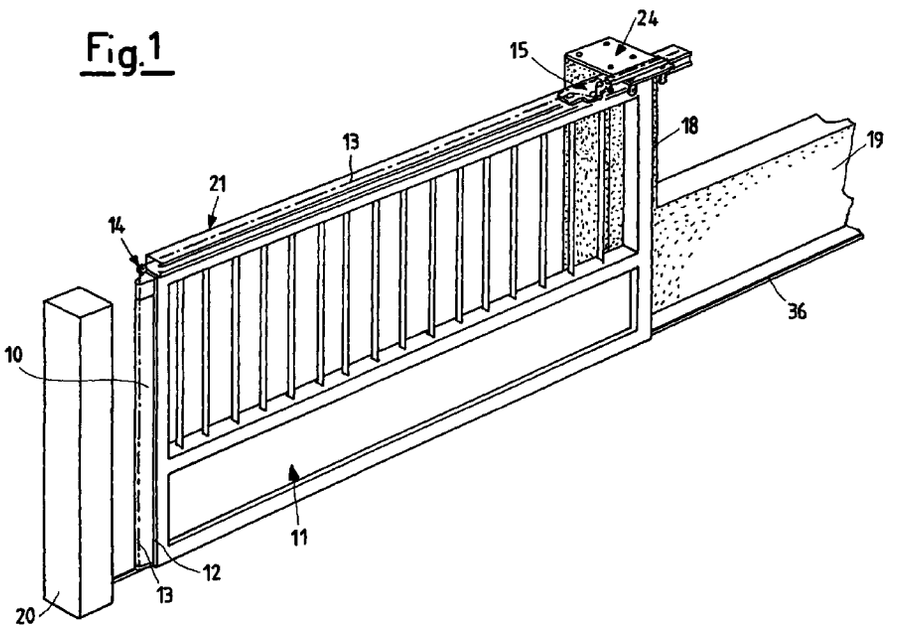
## (54) Safety edge for automatic gates

(57) An electromechanically actuated mobile protection device for automatic gates (11), comprising a protective rib (10) firmly fixed to the top of the advancing front face (12) of the gate (11) along its entire length. A steel cable (13) is vertically positioned inside the rib (10) and connected, by a transmission pulley (14), to a fixed trolley (15). The protection rib (10) is profiled in the shape of a triangular prism and made of flexible rubber, so that at the instant the rubber surface meets an obstacle in its forward motion, the steel cable (13) transmits the resulting deformation to a mobile slide (16) controlling an electronic protection and/or safety device, which in turn acts by interrupting the electrical power feed to the gate actuating motor (11), thus breaking off its motion.

Fig.1

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## Description

**[0001]** This invention refers to an electromechanically actuated mobile protect-ion device for automatic gates.

**[0002]** Automatic access gates to private premises have always presented various shortcomings from the viewpoint of the transiting user's safety and continue to cause serious problems to this date, especially as regards the safety of personnel and vehicles.

**[0003]** It is in fact known that the gates are usually operated by the users from fixed sites, by using opening and closing pushbuttons or keys or remote control devices sending out radio impulses to an electronic panel which takes care of actuating the gate in the desired direction.

**[0004]** Moreover, in the case of remote radio controls, the re-closing of the gate after its opening occurs after sending out a further user command, or automatically after a certain pre-established period of time.

**[0005]** System failures and accidental errors during the operation of the gate have initially resulted in irreparable and occasionally dramatic conse-quences, as it proved impossible, especially in the case of automatic sliding-type gates, to interrupt their closing motion if any immovable obstacles arose along their forward path.

**[0006]** The only possible action involved a need to manually cut-off the electrical power supply to the mobile gate's actuating device, with the inevitable and occasionally dramatic consequences bound due the slowness involved in effecting this action.

**[0007]** For this purpose, based on the evolution of electronics, certain types of electrical and/or electronic protection and safety systems have been adopted which are capable, in case of an impending danger, of slowing down or interrupting the forward motion of an automatic gate without any further human action.

**[0008]** The traditional safety and protection systems generally used on automatic sliding gates are mainly based on the use of a mobile pneumatic rib set on top of the gate, which by a pressure-operated cut-off switch transmits an electric signal to an electronic transmitter contact whenever its internal pressure varies, for instance in case of any accidental contacts or bumps caused by passing vehicles.

**[0009]** In fact, whenever a vehicle hits the rib, the electronic transmitter immediately sends out an impulse to a receiver operated by radio contact and installed at a nearby point, which instantly acts to shut-off the electrical power supply to the system.

**[0010]** As a result, if the gate is in motion it immediately stops in its position.

**[0011]** However, even these systems exhibit various drawbacks, most of which derive from a poor reliability of the electronic and pressure-sensing controls, which are affected by numerous external factors, such as temperature changes, frequency disturbances from the ether, excessive levels of humidity or mechanical strains.

**[0012]** Moreover, the occurrence of any violent bumping or shaking effects on the gate, occasioned by the passage of vehicles, may cause the air chamber inside the pneumatic rib to crack or fail without being noticed in time by the user, thus causing an undesirable malfunctioning of the system.

**[0013]** Finally, the electronic transmitter is fed by a local battery, which may be suddenly discharged and impede the operation of the safety device in case of actual need.

**[0014]** Alternatively, it will periodically be necessary to check the transmitter battery's charge, with a resulting increase of the system's operating costs and delays in its maintenance schedule.

**[0015]** A radical solution of this problem, which has actually been proposed but promptly abandoned, envisaged the direct coupling of the system to a 230 V power source, thus entailing predictable hazards for the safety of the user.

**[0016]** On the other hand, such a system could prove incompatible with the latest national and EU-directives in electrical safety.

**[0017]** The purpose of this invention is to produce an electromechanically actuated mobile protection device for automatic gates, capable of overcoming the mentioned drawbacks.

**[0018]** In particular, the scope of this invention is to indicate an electro-mechanically actuated mobile protection device for automatic sliding gates, capable of acting more quickly than that of the prior art in case of an imminent danger, for instance whenever an object obstructs the access path during the forward motion of the gate, meaning its opening or closing phase.

**[0019]** Another scope of this invention is to produce a mobile protection device for automatic gates, less affected by wear or aging in time with respect to any known designs.

**[0020]** A further scope of this invention is to indicate a mobile protection and/or safety device for automatic gates, capable of being operated by an electromechanical device and thus more reliably than the traditional designs of an electrical and/or electronic type.

**[0021]** An additional scope of this invention is to indicate an electromechanically operated mobile protection device for automatic gates, capable of functioning in a precise and proper manner in every situation.

**[0022]** A further scope of this invention is to indicate a mobile protection device for automatic gates, capable of being easily and economically produced, while employing simple manufacturing technologies and relatively inexpensive components.

**[0023]** These scopes are achieved by an electromechanically actuated mobile protection device for automatic gates according to claim 1, being referred to for brevity.

**[0024]** In an advantageous manner, a protection rib is produced from a flexible material and firmly affixed to the top of an automatic gate, so as to also prove mobile,

during the motions of the gate, in the direction of the gate's forward motion, both during a gate opening or closing phase.

**[0025]** The rib houses in its interior a small tensioned steel cable, placed vertically so as to mechanically transmit any accidental contact or impact against the rib over rollers to a fixed trolley inserted inside a rail-like section bar firmly attached to the structure of the gate and connected by a guide plate to one of the concrete pillars delimiting the access to the private area.

**[0026]** The trolley comprises a spring-actuated control slide, which sends an acceptance signal to an electronic triggering and/or safety device (microswitch) which in turn shuts-off the electrical power supply to the gate-driving motor, thereby instantly locking it in the position assumed at the instant of contact with the foreign object.

**[0027]** Further scopes and advantages of this invention will become evident from the description and attached drawings that follow, supplied for purely exemplifying and non-limiting purposes, in which:

- Figure 1 is a partial perspective view of a sliding automatic gate mounted between two pillars and comprising an electromechanically actuated protection rib, according to the invention;
- Figure 2 shows an enlarged detail of Figure 1, relating to the protection rib and the transmission mechanism of the steel cable, according to this invention;
- Figure 3 shows an enlarged and exploded detail of Figure 1, relating to a fixed control trolley, a guiding plate for the gate and a portion of the trolley's containing rail, according to this invention;
- Figure 4 shows an exploded, enlarged and more detailed view then Figure 3 of the fixed control trolley and of a portion of the containing rail, according to the invention.

**[0028]** It is to be mentioned at this point that the following description relating to an example of a preferred embodiment refers to an application of the mobile device, according to the invention, to automatic gates of a sliding type, in which a small steel cable firmly fixed to a protection rib is led to a fixed trolley housed inside a rail horizontally positioned on top of the gate.

**[0029]** Alternatively and indifferently, the mobile protection device object of this invention may also be applied to automatic gates of a different design, for example to those of an oscillating or a double gate type, just as the cable-guiding rail may be installed in a different position, such as for instance in the lower part of the gate.

**[0030]** With reference to the mentioned drawings, 10 generally indicates a protection rib built of rubber or at any rate of a flexible material and essentially shaped like a triangular prism, 11 indicates an automatic sliding gate, and 12 the advancing front face of the gate 11 holding the attached rib 10, as shown in Figure 1.

**[0031]** The automatic gate 11 slides inside a guide 36 attached to the ground and provides access to a private area, delimited at the extremities by a pillar 18 attached to an enclosing wall 19 and by an upright support 20.

**[0032]** A steel cable 13 slides inside the rib 10, as represented by a dashed and dotted line in the Figures 1 - 3 and arranged in a vertical manner, immediately below the rubber surface of the rib 10.

**[0033]** By using a transmission pulley 14, the cable 13 is therefore inserted inside the section steel indicated by 21, which is horizontally positioned along the upper face of the gate 11.

**[0034]** The section bar 21 is profiled in the form of a U-shaped rail, so as to allow inserting a trolley 15, attached opposite the pillar 18 by a fastening arm 22 and a plate 24.

**[0035]** The fastening arm 22 can be attached to the trolley 15 and alternatively to the points 25 and 26 by using a spherical joint 23, which constitutes an appendix of the arm 22, and by a screw 27.

**[0036]** The arm 22 is moreover connected to the plate 24 fitted at its lower surface with two guide rollers, shown by 31, for the gate 11.

**[0037]** The trolley 15 is also equipped with a set of guide rollers 32, which act as a stop against the internal walls of the section bar or rail 21.

**[0038]** The steel cable 13 passed over the pulley 14 and horizontally positioned inside the rail 21 therefore rests on the trolley 15 where it follows a winding path while leaning against the three transmission rollers indicated by 29, fastened to the trolley 15 and arranged at the tips of a hypothetical isosceles triangle.

**[0039]** Finally, the cable 13 is blocked opposite the terminal extremity 28 of the section bar 21, at the point indicated by 35 in the Figure 3, by using the head fastening devices indicated by 30.

**[0040]** Moreover, the trolley 15 comprises a control slide 16 connected to one of the transmission rollers 29 and to at least one tensioning spring 33 for the slide 16, arranged in a fixed and pre-established position.

**[0041]** The slide 16 automatically governs the operation of an electronic triggering device 17, such as for instance a microswitch, by using a transmission element 34.

**[0042]** The operation of the electromechanically actuated mobile protect-ion device for automatic gates is as follows. The access of the vehicles to the private area is allowed when the gate 11 is fully or partially opened.

**[0043]** The opening of the gate 11 occurs on the other hand in a traditional manner by a remote control actuated by the user or by a signal originated by a wall-type remote control or pushbutton panel.

**[0044]** In case the automatic gate 11 should, because of a malfunction of the electrical moving system of the gate 11 or an erroneous commands by the user, start moving and closing off the access, while any personnel and/or vehicles are still present in the direction of the forward motion of the wall 12, the mobile rib 10 firmly

attached to the wall 12 allows taking an instant action in the interest of protection and/or safety, by interrupting the motion of the gate 11.

**[0045]** In the opposite case, the advancing motion of the sliding wall 12 toward the upright support 20 would have dramatic consequences for any personnel and/or vehicles standing near the access of the private area.

**[0046]** Even if the gate 11 should remain partially open and any contact of the vehicle occur against the rib 10, the wall 12 would, if moving, instantly interrupt its motion.

**[0047]** This is obtained since the deformation of the flexible material of the rib 10 is transmitted to the cable 13 and, thus, by the transmission rollers 29 of the trolley 15, to the slide 16, that varies its initial position by inducing a proportional deformation on the tensioning springs 33.

**[0048]** The motion of the slide 16 triggers the electronic device 17 and mechanically actuates the connecting element 34.

**[0049]** The device 17, being electrically coupled to an electrical panel which is in turn directly connected to the driving motor of the gate 11, acts by instantly interrupting the electrical power supply to the mentioned motor.

**[0050]** In summary, by a purely mechanical actuation, the mobile protection device described by this invention allows preventing any dangerous problems inherent in moving an automatic gate 11, by quickly and precisely acting on the electrical system moving the gate 11, even if the rubber or flexible material constituting the rib 10 is damaged.

**[0051]** The above description clarifies the characteristics and the advantages of the mobile protection device for automatic gates, object of this invention. In particular, these cover the following aspects:

- greater sensitivity and speed of action with respect to the prior art,
- less wear with respect to the prior art,
- unassailability by atmospheric agents and by even sudden changes in seasonal climate;
- precise and proper operation, even if the material constituting the protective rib is damaged;
- reliability of the system;
- adequate safety and observance of the existing electrical standards, as no high voltage electrical power supply sources are directly available to a user;
- moderate costs with respect to those according to the prior art.

**[0052]** It is in any case apparent that numerous variants may be applied to the mobile protection device for automatic gates, object of this invention, without thereby abandoning the principles of novelty inherent in the inventive principle, and that in the practical implementation of the invention the materials, shapes, and dimensions of the illustrated details may be of any kind depending on the requirements, and that the same may be substituted by other technical equivalents.

## Claims

1. An electromechanically actuated mobile protection device for automatic gates (11), in particular for automatic gates (11) sliding in guides (36) and operated to close and alternatively to open at least one access to a private area, delimited at its extremities by sections of wall (19) and/or by pillars (18, 20), characterized in that it comprises a protective rib (10) containing at least one length of cable (13) in its interior and arranged underneath a surface made of flexible material, wherein said cable (13), being fixed at one extremity (35) and connected by at least one transmission device (14, 29) to the mobile element (16) of a trolley (15), said mobile element (16) being set in an initially preestablished position and mechanically connected to at least one electronic triggering device (17), is capable of blocking the run of said gate (11) when the latter is in motion, at the instant a pressure is exerted on the flexible material of said rib (10).

2. A mobile protection device according to claim 1, characterized in that said rib (10) is firmly affixed to a front wall 12 of said gate (11), while the said gate (12) is set in a vertical position perpendicular to the direction of motion of the gate (11), said direction of motion being parallel to the longitudinal extension of the said sliding guide (36) installed on the ground.

3. A mobile protection device according to claim 1, characterized in that said cable (13) is made of steel and connected to said trolley (15) by at least one pulley (14) and a plurality of transmission rollers (29).

4. A mobile protection device according to claim 3, characterized in that said pulley (14) is attached to a section steel (21) guiding said trolley (15), while said cable (13) slides inside said section steel (21).

5. A mobile protection device according to claim 4, characterized in that said guiding section steel (21) is profiled to have a U-shape.

6. A mobile protection device according to claim 5, characterized in that said pulley (14) is set on top of said rib (10) and that said guiding section steel (21) is set horizontally above said gate (11).

7. A mobile protection device according to claim 1, characterized in that said trolley (15) is fastened opposite said sections of wall (19) and/or pillars (18, 20) by at least one fastening arm (22) and at

least one plate (24).

8. A mobile protection device according to claim 7, characterized in that said fastening arm (22) can be attached to said trolley (15) by at least one spherical joint (23) which constitutes an appendix of said arm (22), and by at least one blocking device (27).

9. A mobile protection device according to claim 7, characterized in that said plate (24) holds at least one guide roller (31) for said gate (11).

10. A mobile protection device according to claim 4, characterized in that said trolley (15) is equipped with a multiple number of guide rollers (32) which form stops against the internal walls of said section steel (21).

11. A mobile protection device according to claim 1, characterized in that said cable (13) is fitted on said trolley (15) where it follows a sinuous path, while running over a plurality of transmission rollers (29) arranged on said trolley (15).

12. A mobile protection device according to claim 3, characterized in that said mobile element (16) is constituted by a control slide connected to one of said transmission rollers (29) and to at least one spring (33), where said slide automatically governs the operation of said electronic triggering device (17) by using a transmission element (34).

13. A mobile protection device according to claim 12, characterized in that said electronic triggering device (17) is constituted by a micro-switch.

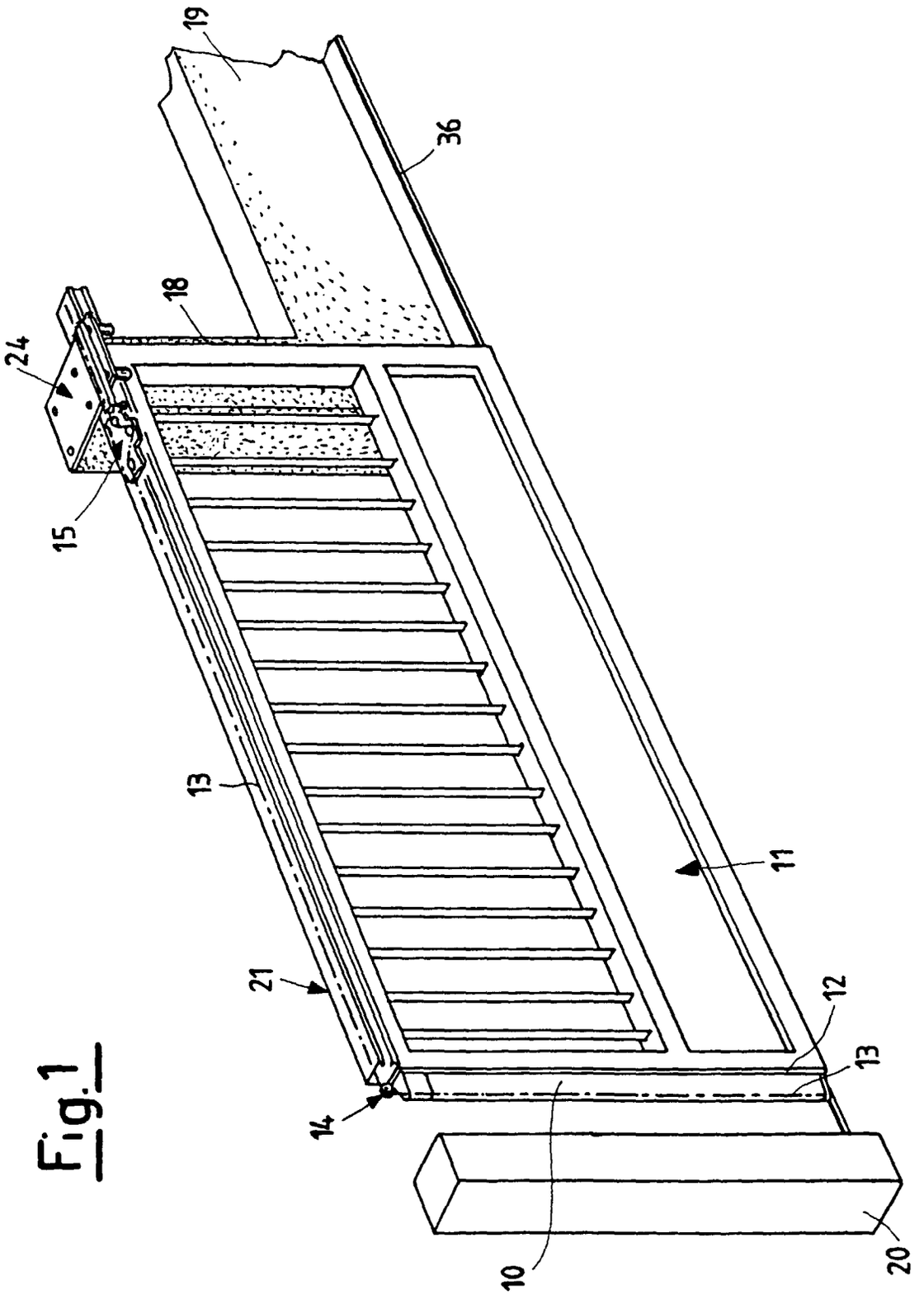



Fig.1

Fig.2

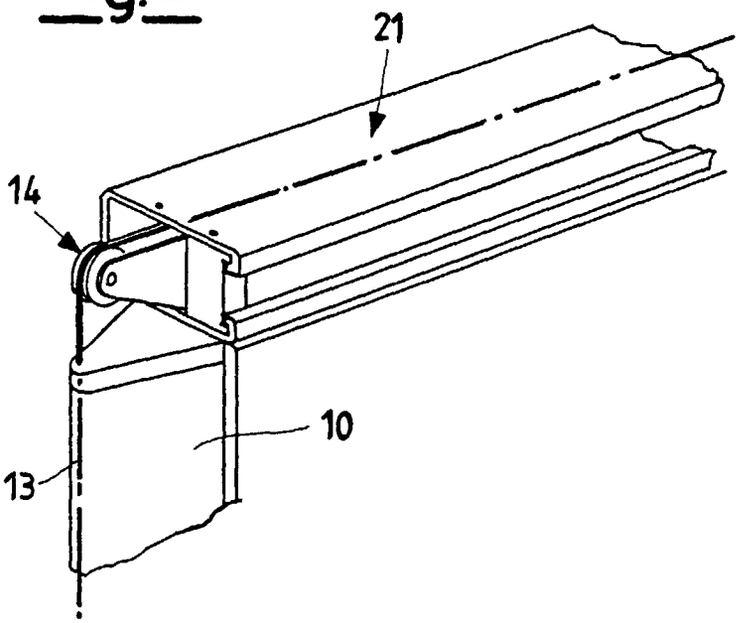
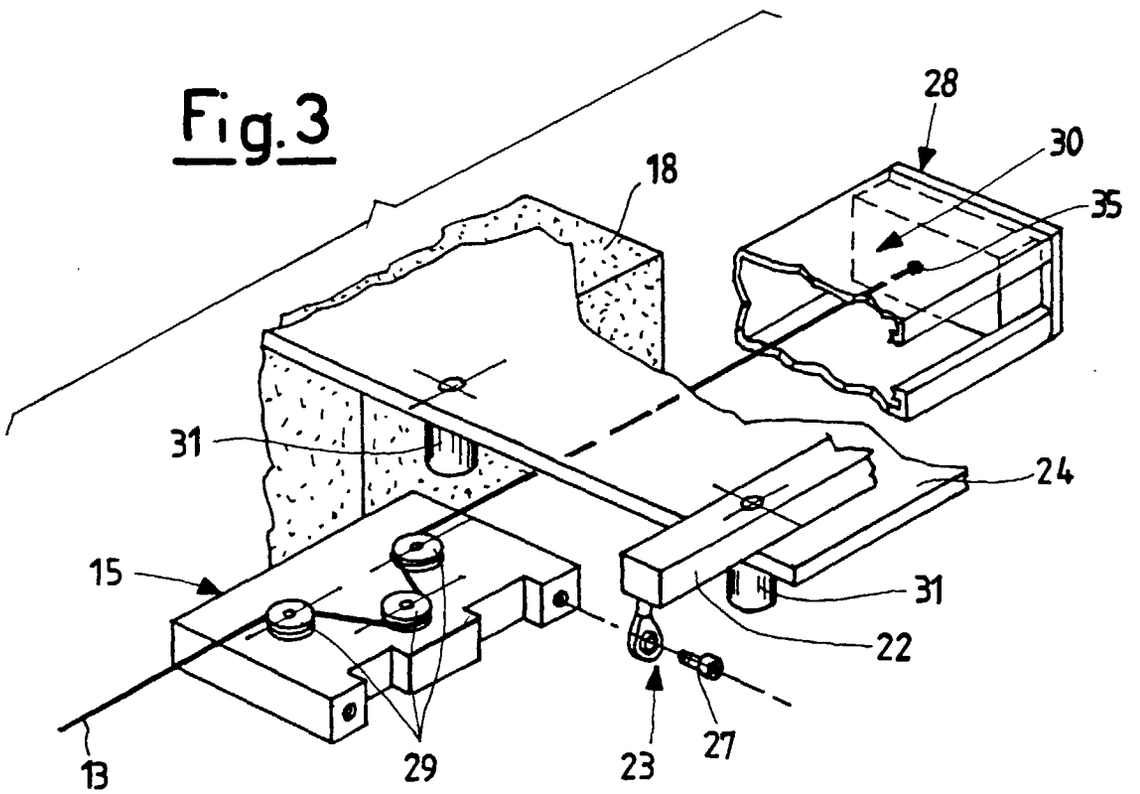



Fig.3



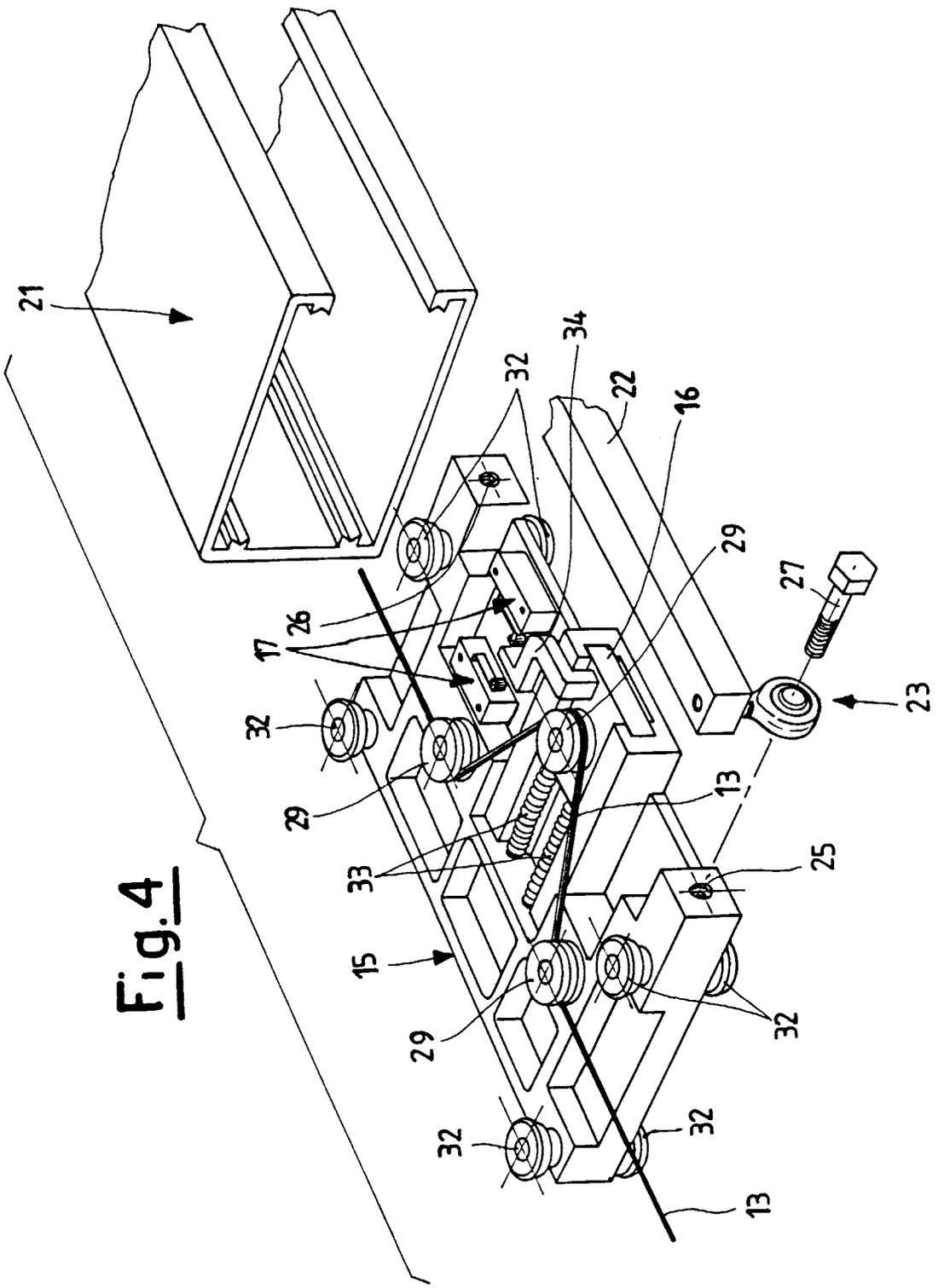



Fig.4