



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
09.03.2022 Bulletin 2022/10

(51) International Patent Classification (IPC):
B65F 3/00 (2006.01)

(21) Application number: **20798048.3**

(52) Cooperative Patent Classification (CPC):
A62B 35/00; B60R 22/18; B65F 3/00

(22) Date of filing: **30.04.2020**

(86) International application number:
PCT/ES2020/070280

(87) International publication number:
WO 2020/221950 (05.11.2020 Gazette 2020/45)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(71) Applicant: **Isanimar Seguridad, S.L.**
Vigo, 36330 (ES)

(72) Inventor: **SOLER SÁEZ, Nicolás**
36330 Vigo (ES)

(30) Priority: **30.04.2019 ES 201930684 U**

(54) **A PNEUMATICALLY-CONTROLLED FALL PREVENTION MODULE FOR THE REAR OF A TRUCK, AND A DEVICE FOR THE FASTENING OF THIS MODULE TO A SAFETY HARNESS**

(57) A pneumatically -controlled fall prevention module for the rear of a truck, such as a refuse collection truck, consisting of a metal box located at the area where the operative is mounted while travelling, and which incorporates a pneumatically -controlled system for the anchoring of a ball-hitch to the safety harness. The system enables the ball of the anchoring device to be locked upwards in the box when inserted therein through an

opening in the front cover by means of the retractable microswitch of a valve which in turn activates the flow distributor of a pneumatic cylinder connected to the compressed air supply of the truck. which may be a smaller locking cylinder, or maybe supplemented by a secondary cylinder with locking pins for the main plunger; the ball may only be disengaged and released from the box by pressing a lateral mushroom-head deactivation button.

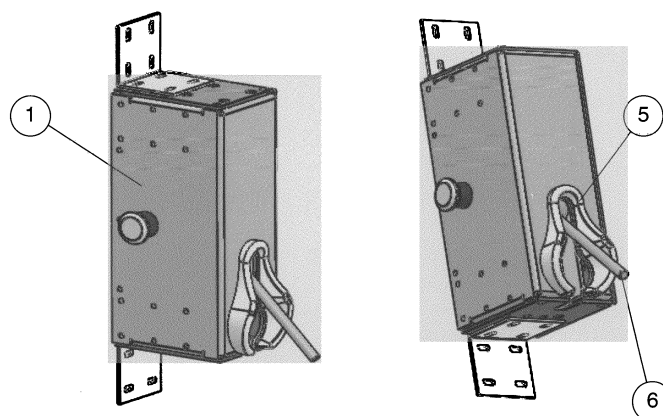


Fig. 1

Description

[0001] The invention describes and claims a fall prevention module for workers and operatives transported at the rear of a truck, such as a refuse collection truck, in which these persons are travelling standing on a platform at the back of the truck, consisting of a metal box located at the area where the operative holds on with their hands, integrating a pneumatically-controlled system for the anchoring of the ball-shaped head of the attachment device of the safety harness.

[0002] This new system enables the ball of the anchoring device to be locked upwards within said box when inserted therein by the user through an opening in the front cover, by the activation by means of a retractable microswitch when housed in an intended support of a valve which in turn activates the flow distributor of a pneumatic cylinder connected to the compressed air supply of the truck, which can be a stroke lock cylinder, of a smaller size, or it can be complemented with a secondary pneumatic cylinder with locking pins for the main rod, thus maintaining a small size and easily installable set. In any embodiment, the ball may only be disengaged and released from the box by the user himself by pressing a lateral deactivation mushroom-head button.

[0003] The main advantage provided by this system compared to the traditional mechanical anchoring of the safety harness to certain structural elements of the rear of the trucks, is the ease and speed with which the worker is effectively attached to the truck chassis, which in the event of an accidental slipping from the transport skid, is held upwards by their harness, without actually touching the ground.

TECNICAL FIELD.-

[0004] The technical field of the invention is that of fall prevention systems for workers travelling on the rear of vehicles specially adapted for the collection of rubbish or urban waste, and also in that of pneumatically-controlled anchoring systems of safety elements in vehicles.

STATE OF THE ART.-

[0005] Within this technical field there are several known solutions to prevent the fall of workers who are mounted on the back of trucks, some of which are limited to the installation of structural elements that hold or facilitate the restraint of the worker, such as the anti-fall system of the national patent with publication number ES2551977-A1, which provides a means of support and rigid fastening for installation on the back of garbage trucks, consisting of three parts, one that fits the truck, as a support for the system, another, which is the support element of the worker that prevents the fall of the same, and the joint axis on which the support element rotates in a 90° path from the opening position to the closing position; or the European patent with national validation

number ES2121287-T3, for a refuse collection vehicle characterized in that the worker's support plane is located directly next to the plane defined by the side of the body and that the two handholds are arranged in the immediate vicinity of this plane, on the side of the vehicle itself and on each side of the support plane seen in the longitudinal direction of the vehicle.

[0006] Other safety solutions for the aforementioned type of vehicles are based on including in the rear part where the worker is gripped a connecting element to a safety harness of the worker himself, as is provided for in the present invention, but this connecting element is not actuated by a valve system or pneumatic cylinder as in this case, but rather, it is either a structure for manually mechanically anchoring the harness, such as, for example, that disclosed in utility mold ES1065013-U, consisting of a height-adjustable handle on a truck lashing column by means of an adjustment handle, to which the harness is attached by means of a connecting strap topped by a carabiner; or it is an element in which the attachment to the harness strap is controlled by an electronic device, as in the utility molding ES1158086-U, which has as its object an anti-fall system for operators of waste collection vehicles comprising a device for attachment to the vehicle and a strap attached at one end to a safety harness and with a ring at the other end, characterized in that the vehicle attachment device comprises an electronic device with a pin configured to move through a slit and immobilize the ring inside it.

[0007] However, it is a fact that within the field of vehicle-integrated safety elements various pneumatic control systems have been developed, particularly seat belts and safety seats actuated by valves or cylinders that take advantage of a source of pressure or vacuum generated by the vehicle engine, which has given rise to several published patent documents.

[0008] The oldest is UK patent GB1059162 of 1963, on a device for retracting, cushioning and locking a safety harness on a car seat by means of a pneumatic cylinder, consisting of a harness strap connected to an eye at the end of a piston rod sliding inside the cylinder attached to the back of the seat. Subsequently, in 1979, French patent FR2414752 presented an automatic cut-off mechanism of a pneumatic control system of a vehicle seat belt on acceleration or deceleration, consisting of a hermetic chamber connected by a tube to a source of pressure or vacuum, and with another tube closed at the end by a control member sliding against the action of a spring, inside which a spherical body closes an opening from the chamber to the atmosphere, so that when tilt or inertia causes the body to uncover the exit to the atmosphere, the vacuum or pressure in the chamber collapses and allows the spring to move the control member. More recently, international application WO2009025594 (2007) discloses a mechanism for adjusting the height of a seat belt loop on a pillar in a vehicle by a movable member that moves vertically along the pillar by pneumatic cylinder and piston means, or Chinese patent CN103832400

(2014), for a pneumatically controlled safety seat, with a seat frame connected to a compressed air cylinder controlled by an electromagnetic valve.

[0009] However, this technology of pneumatically-controlled safety elements for vehicle occupants has not been implemented so far as a fall arrest system for operators who travel in the back of garbage and waste collection trucks in general, on a platform or step from where they have to jump onto the road at each stop to place the waste containers on the automatic tipping shovel, or to be themselves the ones who introduce them into the truck's transport cavity. For this purpose, it has been necessary to configure a module in the form of a box that can be easily attached mechanically to the rear of the truck, on the side profile where the handles to which the operator holds on with his hands are located, which integrates a pneumatic assembly that enables the automatic interlocking of a fastening provided for this purpose at the end of the worker's harness tie-down at the moment of being introduced into the box, and which is then immediately released when desired, by simply pressing a button.

ABSTRACT OF THE INVENTION. -

[0010] The fall prevention module for this type of trucks and waste collection vehicles, in which the operators traveling in the back of the truck must be equipped with a safety harness, is configured from a metal-sheet box, as a straight parallelepiped-shaped shell, with rectangular or quadrangular sides, with an opening in its front cover for access to the interior and a hole in one of its sides for the exit of a mushroom or pushbutton, designed in a suitable size and shape to be mechanically fixed to the chassis in the area where the worker's gripping handles are located, by means of two L-shaped metal profiles fixed in turn to any of the sides of the box, either the upper or lower sides, or to its sides, depending on the truck's possibilities, which integrates, as an element of connection to the safety harness, a pneumatically operated anchoring system of the ball-shaped head of the lanyard cable to the harness, which is made up of the following elements:

- a ball socket, as a guide piece that externally surrounds the opening of the front cover, to facilitate the positioning of the ball inside the box;
- a ball support located behind the front cover, in the form of a plate with a die-cut circle at its end, surrounding the cover opening, which projects a cylindrical body or "ladle" perpendicularly inwards, provided at its rear mouth with a circular closing plate with a U-shaped slot coinciding with a perimeter groove on the tubular edge of its surface, intended to collect the ball from the harness fastening;
- a pneumatic-cylinder connected to the truck's com-

pressed air circuit by means of two air intake and flow regulation fittings, one on each side of the piston, next to the upper and lower bases, which, in connection with the cylindrical body of the ball support through the piston rod, raises the ball of the anchorage device when the piston is actuated and moves forward, causing it to latch, or lowers the ball when the piston is deactivated and moves backward, causing it to disengage and allowing it to be released;

- a distribution valve integrated in the compressed air circuit, to regulate the flow through the two fittings of the pneumatic cylinder, making the circuit work in one or the other direction;
- a retractable micro switch, installed on a micro support at the base of the case, for detecting the entry of the ball into the cylinder of the ball support, through the grooves of the rear plate and perimeter edge, and actuating the distribution valve and the pneumatic cylinder; and
- a manual stop or emergency mushroom, which protrudes from the box through a hole in one of its sides, usually one of the sides, but also on the front, upper or lower side, according to different design variants, and which, when pressed, produces the inaction of the distribution valve and of the pressurized air cylinder, with the consequent release of the ball.

[0011] The pneumatic cylinder can be a single-acting cylinder, provided with a spring or reset spring around the inner piston rod, in which case the air intake takes place through the lower fitting, using the upper fitting to regulate its speed; or, alternatively, it can be a double-acting cylinder, without inner spring, with air intake synchronized through the upper and lower fittings.

[0012] In order to ensure the locking of the ball at the top when the system is activated, the compressed air circuit of the module has an integrated non-return device downstream of the distribution valve.

[0013] It is also recommended that the module is provided with an internal protection plate for the area around the ball support, consisting of a double L-shaped profile with a rectangular lower opening cut out on its front side, in order to have access to the microphone from the outside.

[0014] In an optional realization, in order to be able to use a cylinder of smaller diameter in the sizing of the equipment without reducing the locking force of the ball holder, a self-locking pneumatic cylinder can be used, of the type that integrates a locking system in the limit switches, specifically next to its upper base, in the position of the module with the piston rod retracted and the ball holder locked in place.

[0015] The locking system of this type of cylinder prevents the piston rod from moving from the position in which it has been secured, which, when applied to this

equipment, eliminates any possibility of the ball disengaging from the clamping device in the event of the user falling.

[0016] Alternatively, another solution that has been foreseen to avoid this undesirable possibility without having to resort to a conventional cylinder of large diameter, maintaining an equipment of adequate size for the purpose for which it is intended, is to use a secondary pneumatic cylinder to actuate the locking pins of the interlocked ball support. In this case, it is a small cylindrical cylinder with a guided axis integrated in the assembly behind the travel area of the ball support, perpendicular in its axial axis to the main cylinder, connected to the same compressed air distributor as the main cylinder by means of two air intake and flow regulation fittings, whose guides end in a support plate (32) of two locking pins (31) of the ball support body which are actuated simultaneously with the main piston rod when the ball is raised by the latter, acting as stops or latches to secure the locking position of the clamping device. This secondary cylinder is provided with two lateral stabilizing spring springs, connected between the pins support plate and a spring support plate fixed to its base.

[0017] These locking pins in the module variant with secondary cylinder pass through the internal protection plate of the ball bearing body and pre-tensioning space by means of the main rod, if provided, through two longitudinal and parallel grooves on each side of the die-cut rectangle of access to the retractable micro.

[0018] On the other hand, since the installation height of the equipment on the truck is important with respect to the skid on which the user climbs, since there is no standard height that satisfies both short and tall workers, the system can be complemented, if necessary, with a support structure that, once fixed to the truck, can be used as a support structure, with a support structure that, once fixed to the truck, allows to regulate the position-height of the pneumatic control module box, such as a double vertical profile structure with through conduits of toggle clamps or insertion screws on the side edges of the box, which is positioned between the two profiles at the appropriate height.

[0019] In addition, it is also worth mentioning as an essential part of the system, the solution of the anchorage device with ball head of the worker's harness to the described anchorage module, specifically designed for the same.

[0020] The aforementioned lanyard device or element, of the type consisting of a lanyard, rope or extension cable, one end of which is attached by means of a carabiner to the worker's fall arrest harness and the other end of which is secured by means of a connector to a structure or fastening element, which in this case is the pneumatic control module, is made up of a braided steel extension cable, with the end destined to be hooked to the closed harness in the form of a loop or sling by means of a U-shaped thimble that guides it to rotate and at the same time reinforce the resistance, and a steel bushing that

fixes the two sections of cable joined inside by pressure on at least two points of the bushing, acting as a connector at the other end of the braided cable the ball that is locked by the socket inside the module, which is a steel sphere with a threaded hole in its surface that is screwed to a piece composed of the screw itself finished in a steel jacket, through whose interior the cable is introduced, where it is fixed by pressing.

[0021] With this new safety system for garbage and waste collection trucks, consisting of the pneumatic control module installed as an auxiliary box next to the handles at the rear of the truck and the ball-shaped connector tie-down device, when the operator who is on the top step takes the tie-down device from his harness and pushes the ball at the end of the harness towards the cylindrical support inside the box, through the mouth of the front cover, the distribution valve of the truck's compressed air circuit is actuated by means of the micro retractable, taking air from the pneumatic cylinder through its lower base and causing the piston in its advance stroke to drag the support upwards, thus producing the ball interlocking. This way, the harness tie is pre-tensioned upwards from the box, and the operator is held in such a way that if he were to lose his balance during the trip and get out of the skid, he would remain hanging from the harness, without hitting the ground with his feet.

[0022] In an equally simple way, when the operator has to get off the truck or in case of any eventuality, by simply pressing the manual button, the distribution valve is deactivated, with the consequent recoil of the piston of the pneumatic cylinder that produces the descent and release of the ball, which can be extracted from the box without any problem.

[0023] It should be emphasized that such deactivation of the system can only happen intentionally by the user, because the integrated non-return device in the circuit ensures that even if the air supply is interrupted, the clamping ball cannot be disengaged.

FIGURES and DIAGRAMS. -

[0024] At the end of this descriptive report there are a series of figures with plans and drawings showing the recommended truck fall arrest module, with its component parts, and the operator harness tie-off device designed for this module.

Figure 1 shows two perspective views of the box of which the module consists, with the harness lanyard device interlocked upwards through the ball-shaped end, and with the attachment profiles to the chassis at the rear of the truck, one view from above and one view from below.

Figure 2 is a front elevation view of the box in said position of the anchoring device, and figure 3 shows the side elevation of the side opposite the deactivation mushroom.

The drawing of **figure 4** is a longitudinal section of the same box in side elevation, which leaves visible the various components of the pneumatic anchoring system.

Figure 5 is a side elevation view of the internal elements of the box on the side of the activation mushroom, in the module variant with secondary pneumatic safety cylinder.

Figures 6 and 8 show two perspective views of the housing of the box divided into two parts, one consisting of the front cover with punched opening and lateral side with hole for the mushroom, and the other consisting of the two lateral sides opposite to the previous ones and the upper and lower sides of the housing, while the drawings of **figures 7 and 9** show the machining details of the metal-sheet components of this structure, in elevation and plan.

Figure 10 shows a perspective view of the ball valve, while the drawings of **figure 11** show the machining details of this part, in front and side elevation.

Figure 12 is a drawing of the same type of the ball holder, seen in perspective from the side of the cylindrical body housing the ball, and **figure 13** are machining drawings of this part in front, side and plan elevation, being represented in the front elevation the circular cylinder closure plate with U-shaped groove and the groove of the perimeter edge.

Figures 14 and 15 show perspective views of the micro support and the internal protection plate.

Figure 16 is a perspective view of the set of component elements of a box with two pneumatic cylinders, main and secondary, in which the details of assembly and integration of the same can be seen.

Figure 17 shows another perspective view of the previous assembly, from another angle.

Figure 18 is a perspective view of an equipment support structure of double vertical profile, intended to be fixed to the rear of the truck, which allows its height adjustment.

Finally, **figure 19** shows a perspective view of the ball-connector tie-down device to which the operator is attached.

MANNER OF EXECUTION.-

[0025] As can be observed in the figures shown above, the module referred consists on a metal-sheet box (1), provided with an opening (2) punched in its front cover, as an entrance and exit hole for the anchoring ball (5) at

the end of the cable (6) to which the worker is attached by means of a carabiner to his safety harness, according to the lanyard device specifically designed for this system, this opening being surrounded by a collar-shaped ball socket (7) to make it clearly visible and facilitate the ball insertion operation, and by a circular hole (3) on one of its lateral sides.

[0026] In order to avoid a risk of trapping the user's hands, specifically when the ball is up, as the hole into which it was inserted is free and the user may have a finger stuck in this hole while he/she is operating the ball to lower it, the hole remaining in the lower part of the box must have a sufficient opening so that, in the undesired situation, the finger, instead of being trapped, is ejected out of the box. This also implies a suitable opening of the lower part of the ball socket.

[0027] This box is mechanically fixed to the handles at the rear of the truck by means of two L-shaped metal profiles (4) screwed on either side depending on the circumstances of the truck, for example on the upper and lower sides, as shown in the figures, but optionally a support structure for the box can be provided, like the double profile vertical rail, as shown in **figure 18**, which, once fixed to the rear part of the truck, allows to adjust its position in height by means of, for example, threaded levers to be inserted in the holes provided on the edges of the lateral sides, passing through different channels in the profiles of the rail (28), a structure that can also incorporate its own handles for gripping the worker, to avoid the frequent interferences of the equipment with the handles already existing on the trucks to which it is destined.

[0028] Inside the case are the components of the pneumatic anchoring system itself, visible for example in **figure 4**, whose main elements are the ball support (8), with the cylindrical body or bucket (9) for housing the ball located behind the opening of the cover, closed at its rear mouth by the circular plate (15) with U-shaped groove extended by the perimeter groove (16) of the tubular edge, the pneumatic cylinder (10) with the piston rod (35) attached to the ball support bucket, above it, cylinder that can be of the self-locking type, with a locking system incorporated in its upper end of stroke, connected in any way to the compressed air circuit of the truck through the two air inlet fittings (11), one on each side of the piston, the distribution valve (12), to regulate the air flow through the two fittings, the retractable micro (13), installed on the micro support (14) at the base of the case, whose function is to activate the distribution valve when the platen detects the entry of the ball, and the manual mushroom (17) to deactivate the system, which protrudes from the case through the hole on the side.

[0029] In addition, the system has the pneumatic cylinder non-return device (18), located after the distribution valve, and the internal protection plate (19) of the connection of the microphone and the bucket of the ball holder, consisting of a double L profile with a rectangle (20) punched on its front side at the height of the microphone.

[0030] The case can also integrate as a component of

the system, if used, the secondary pneumatic cylinder (29) with guided shaft shown in **figures 5, 16 and 17**, connected to the compressed air distributor by means of the air intake and flow regulation fittings (30). In these figures it can be seen that the guides (36) of this additional cylinder are fixed through the support plate (32) to the two locking pins (31) of the ball support body when it is pretensioned upwards, and the two lateral spring springs (33) of securing its position perpendicular to the axis of the main cylinder, connected between the support plate of the pins and a support plate (34) of the springs fixed to its base.

[0031] In this variant of module with secondary cylinder, the protection plate of the ball bearing bucket travel zone must have two longitudinal grooves (37) on each side of the die-cut rectangle (20), through which the locking pins driven by the additional cylinder pass.

[0032] In the construction of the metal case which serves as the housing of the system elements, 3mm thick steel sheets have been used, laser cut, drilled, counter-sunk (if necessary) and folded, according to the design drawings shown in **figures 9 and 7**. The micro support piece and the lower protection piece shown in **figures 14 and 15** are manufactured with the same characteristics.

[0033] The ball support piece is composed of three pieces of 2 and 4 mm thick laser cut independently, one of them forming a cylinder from a standard tube, and all of them welded together according to the images in **figures 12 and 13**.

[0034] The ball flare is manufactured by polymer cast in a mold, made from a sculpted surface machining of a metal part according to the design of the 3D model shown in **figure 10**, or alternatively it can be a piece of polymeric material manufactured by plastic injection molding. In any case, in its rear part are drilled the holes that will join the part to the outer casing by means of screws as shown in **figure 6**.

[0035] The assembly of the set is inside the box formed by the two housings, as shown in **figures 6 and 8**, except for the ball valve, which is attached later, once the box is installed at the rear of the vehicle. The union of the parts is made by means of specific screws for each case, so that the mechanism formed by the machined parts and the pneumatic system that moves the protection ball, is assembled as shown in **figure 4**.

[0036] As for the mooring device between the operator's harness and the described anchorage module, it is essentially constituted by an aluminium sphere at the end of a braided steel cable (21), closed at the other end in the form of a loop (22) for attachment to the harness by means of a carabiner, said sphere being the ball (5) which is inserted through the socket of the case for its pneumatic interlocking. Figure 19 shows that the union between the ball and the cable is achieved with a threaded hole (25) on its surface, which is screwed to a piece consisting of the screw (26) at one end and a steel sleeve (27) at the other, through the interior of which the cable

is inserted, which is immobilized and fixed by pressing. This figure also shows the way to achieve the loop of the cable hooking with the carabiner, passing its other end through a steel sleeve (24) to then surround a thimble (23), which is a closed U-shaped piece that serves as a guide to rotate forming a sling and at the same time reinforcing the resistance and protecting the cable, and re-inserting it through the sleeve to close the mooring. These two sections of the cable inside the sleeve are fixed by means of pressure on at least two points of the jacket.

Claims

1. **A pneumatically-controlled fall prevention module for the rear of a truck**, such as refuse collection trucks or waste collection trucks, in which workers or operatives travel on a platform at the back of the truck, of the intended protection type for these vehicles, including a connecting element to a operative's safety harness, **characterised by** a metal-sheet box as a straight parallelepiped-shaped shell (1), with rectangular or quadrangular sides, with an opening (2) made in its front cover for access to the interior and at least one hole (3) in one of its lateral sides as an outlet for a manual mushroom-head or pusher button, of proper size and shape to be mechanically attached to the chassis of the area of the truck where the operative's gripping handles are located, by means of two L-shaped metal profiles (4) fixed in turn on any of the upper, lower or lateral sides of the box, or by means of a support structure with a double vertical profile (28) with through channels of thumb-screws or insertion screws in the lateral edges of the box for positioning at different heights, integrating as a joining element to the safety harness an anchoring system pneumatically activated by the ball-shaped head (5) of the fastening cable (6) to the personal harness, consisting this system of the following elements: a ball opening (7), as a guide piece that externally surrounds the opening of the front cover; a ball support (8) located behind the cover of the box, formed by a plate with a die-cut circle at its end, around the opening of the cover, projecting a cylindrical body (9) perpendicular to the inside, provided in its rear mouth of a circular closing plate (15) with a U-shaped groove coinciding with a perimeter groove (16) made in the tubular edge of its surface; a pneumatic cylinder (10), connected to the truck's compressed air circuit by means of two air intake and flow regulation fittings (11), one on each side of the piston, next to the upper and lower bases, which in connection with the cylindrical body of the ball support through the stem (35) makes the ball of the anchoring device rise when the piston is activated and advances, thus engaging it, or it lowers the ball when the piston is deactivated and backs down, disengaging it and enabling its release; a distribution valve

- (12) integrated in the compressed air circuit, for distributing the air flow through the two fittings of the pneumatic cylinder, making the circuit operate in one direction or the other; a retractable microswitch (13), installed on a microswitch support (14) at the base of the box, to detect the entry of the ball into the cylinder of the ball support, through the grooves in the back plate and perimeter edge, and to activate the distribution valve and the pneumatic cylinder; and a manual stop or emergency mushroom-head button (17), which protrudes from the box through the hole made in one of its lateral sides, and which when pressed produces the inaction of the distribution valve and the pneumatic cylinder, with the consequent release of the ball.
2. A pneumatically-controlled fall prevention module for the rear of a truck, according to claim 1, **characterised in that** the pneumatic cylinder is a single-acting cylinder, provided with a spring or return spring around the inner stem, with air intake through the lower fitting, and use of the upper fitting for speed regulation;
 3. A pneumatically-controlled fall prevention module for the rear of a truck, according to claim 1, **characterised in that** the pneumatic cylinder is a double-acting cylinder, with air intake synchronized by the upper and lower fittings.
 4. A pneumatically-controlled fall prevention module for the rear of a truck, according to claims 1 to 3, **characterised in that** the compressed air circuit has an integrated non-return device (18) downstream of the distribution valve.
 5. A pneumatically-controlled fall prevention module for the rear of a truck, according to claims 1 to 3, **characterised in that** it is provided with an internal protection plate (19) of the ball support body and its area of travel of engagement by action of the pneumatic cylinder, consisting of a double L profile with a die-cut lower rectangle (20) on its front side for access to the microswitch.
 6. A pneumatically-controlled fall prevention module for the rear of a truck, according to claims 1 to 3, **characterised in that** the pneumatic cylinder (10) is a cylinder with a locking system incorporated in its upper limit switch, in the module position with retracted stem (35) and engaged ball support, preventing the stem from moving from the position in which it has been secured.
 7. A pneumatically-controlled fall prevention module for the rear of a truck, according to claims 1 to 3, **characterised by** the incorporation of a secondary pneumatic cylinder (29) with a guided axis (36) behind the travel area of the ball support, in a perpendicular position along its axial axis to the main cylinder, connected to the same compressed air distributor as the main cylinder by means of two air intake and flow regulation fittings (30), the guides of which end in a support plate (32) of two locking pins (31) of the ball support body when it is engaged upwards by action of the stem of the main cylinder, which are activated simultaneously as position assurance latches, this secondary cylinder provided with two stabilizing lateral spring holders (33), connected between the support plate of the pins and a support plate (34) of the springs fixed to its base.
 8. A pneumatically-controlled fall prevention module for the rear of a truck, according to claims 5 and 7, **characterised in that** the locking pins (31) activated by the secondary pneumatic cylinder (29) pass through the inner protection plate (19) of the ball support body through two longitudinal grooves (37) made on each side of the die-cut rectangle (20) of access to the retractable microswitch.
 9. A pneumatically-controlled fall prevention module for the rear of a truck, according to claim 1, **characterised in that** the ball-headed fastening cable device to the operative's safety harness, or the "ball-fastening" device, consists of a braided steel extension cable (21), with the end intended to be hooked to the harness closed in the form of a loop (22) by means of a U-shaped thimble (23) that guides it to rotate and at the same time reinforces the resistance, and a steel bushing (24) fixing the two sections of cable connected inside by pressing on at least two points of the bushing, and by a connector at the other end of the braided cable formed by a steel sphere or ball (5) with a threaded hole (25) on its surface, which is screwed to a piece composed of the screw (26) itself ended in a steel sleeve (27), through which the cable is inserted, where it is fastened by pressing.

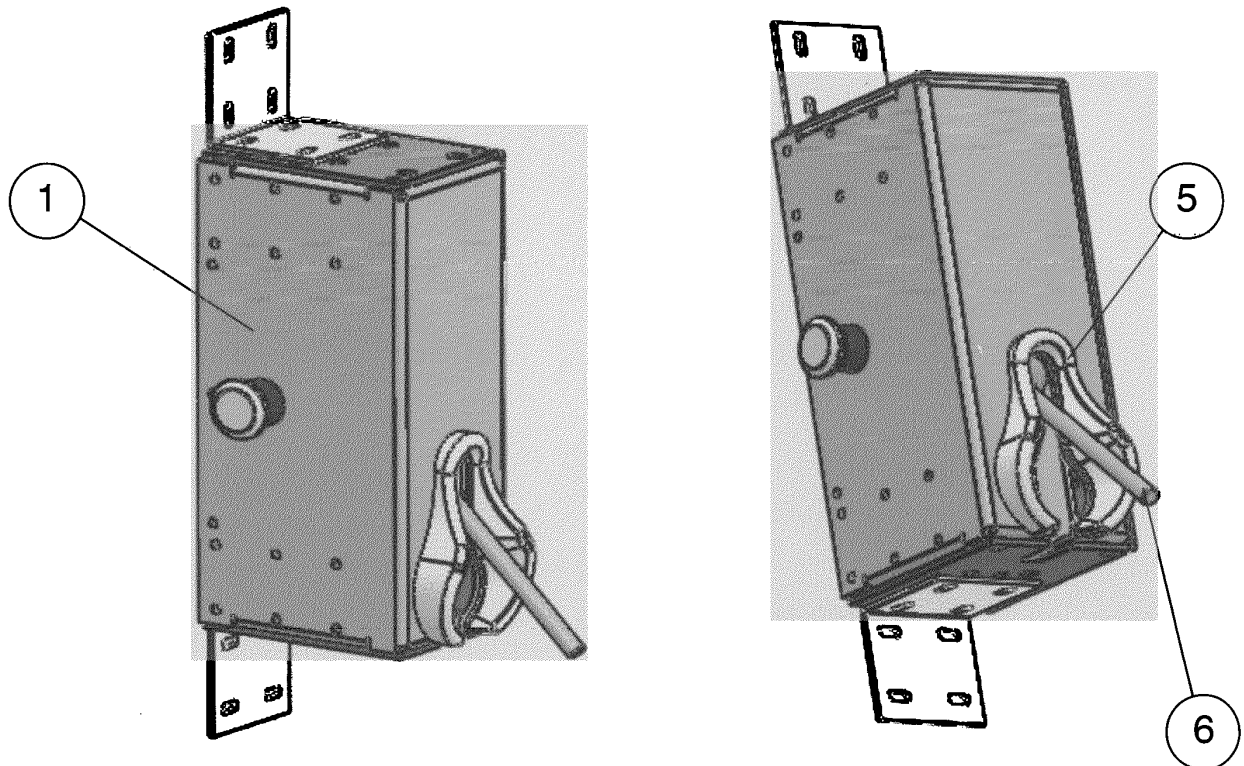


Fig. 1

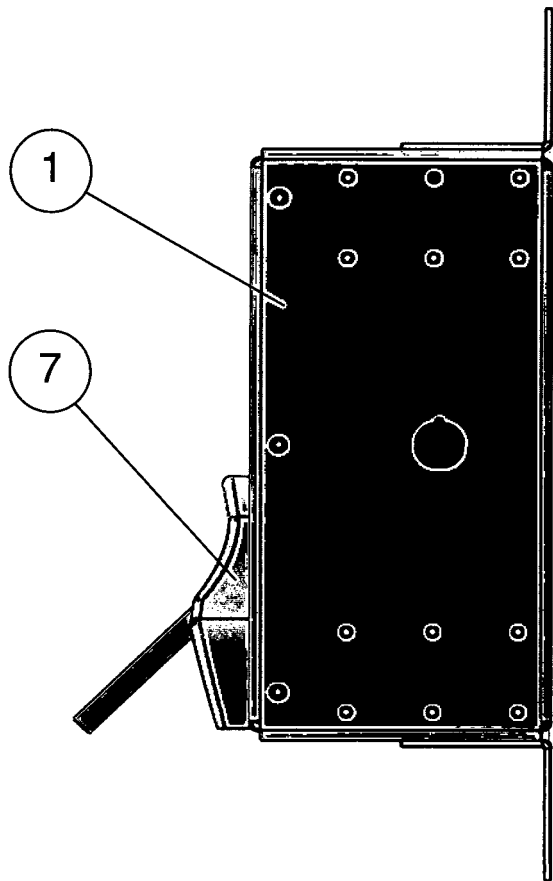


Fig. 2

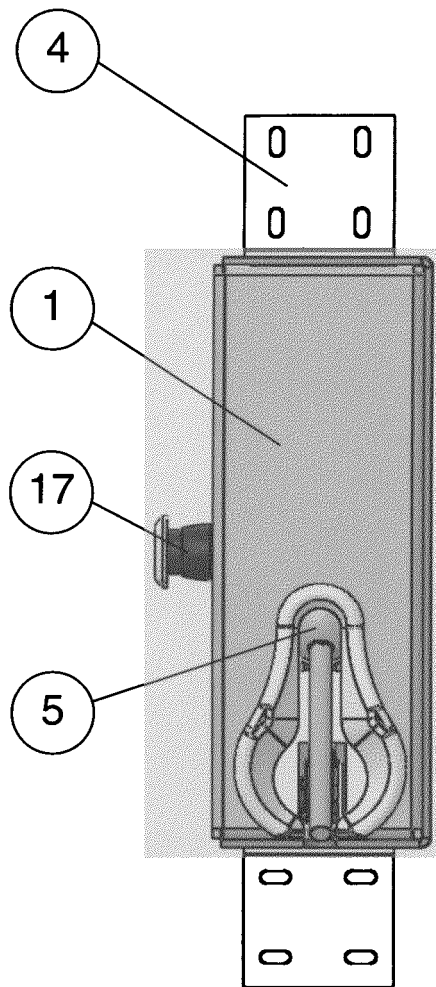


Fig.3

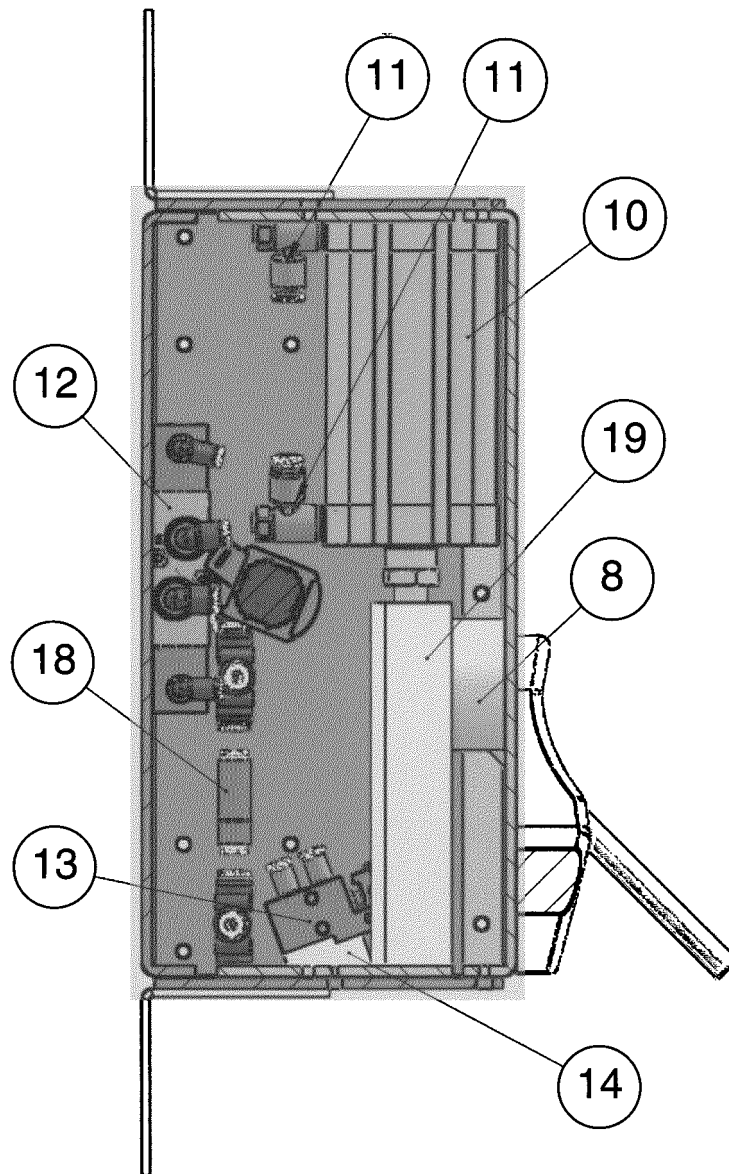


Fig. 4

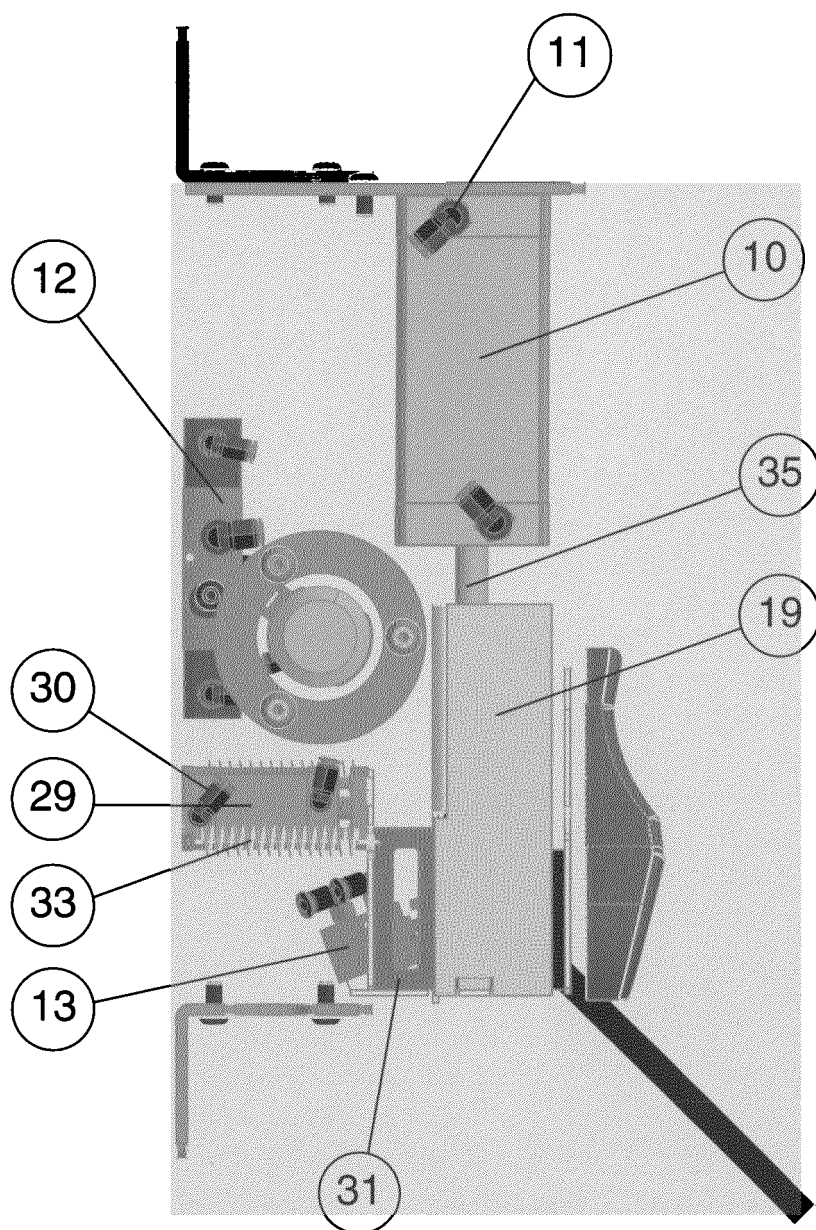


Fig. 5

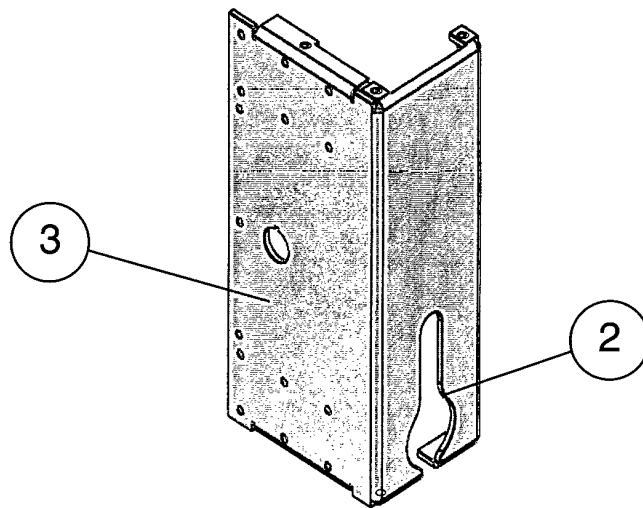


Fig. 6

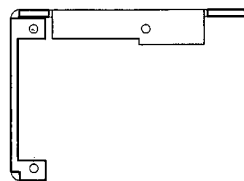
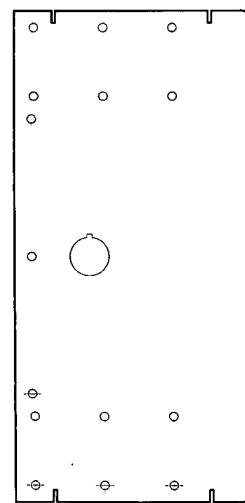
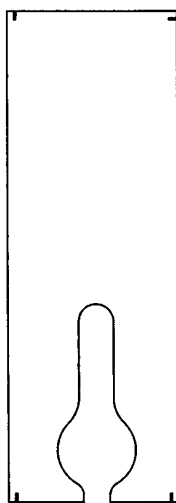
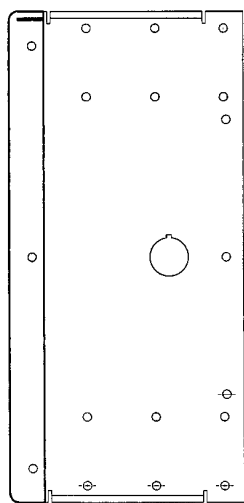
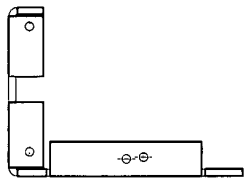


Fig. 7

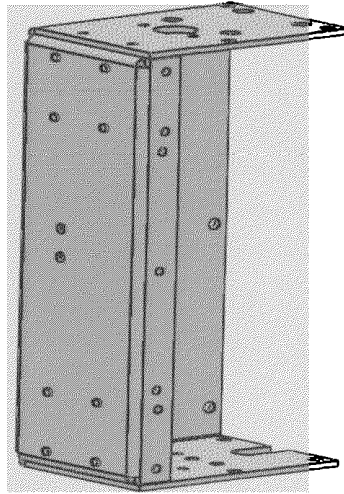


Fig. 8

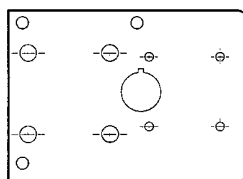
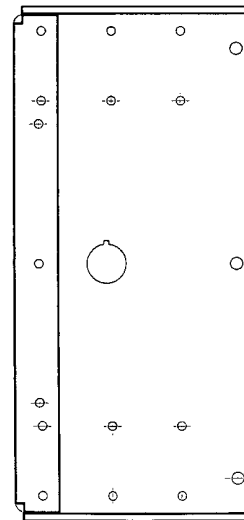
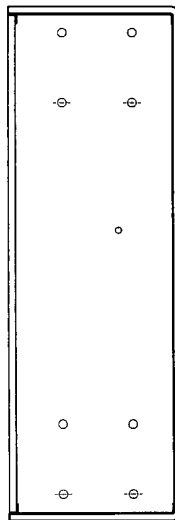
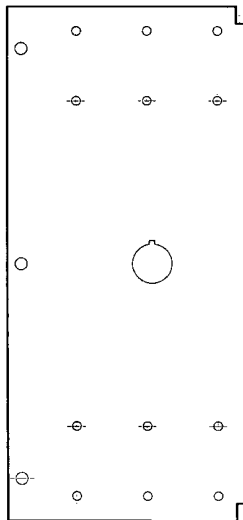
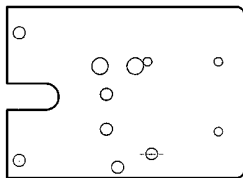


Fig. 9

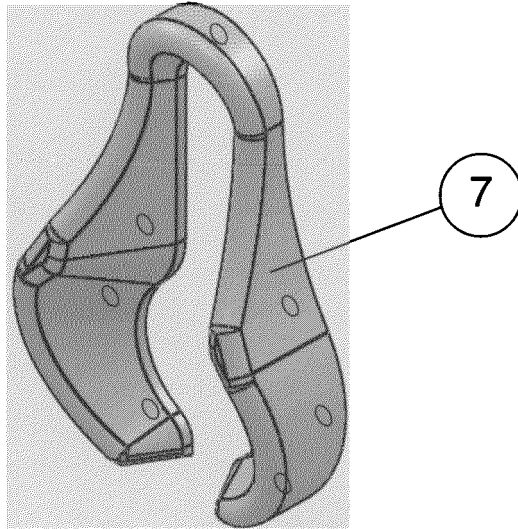


Fig. 10

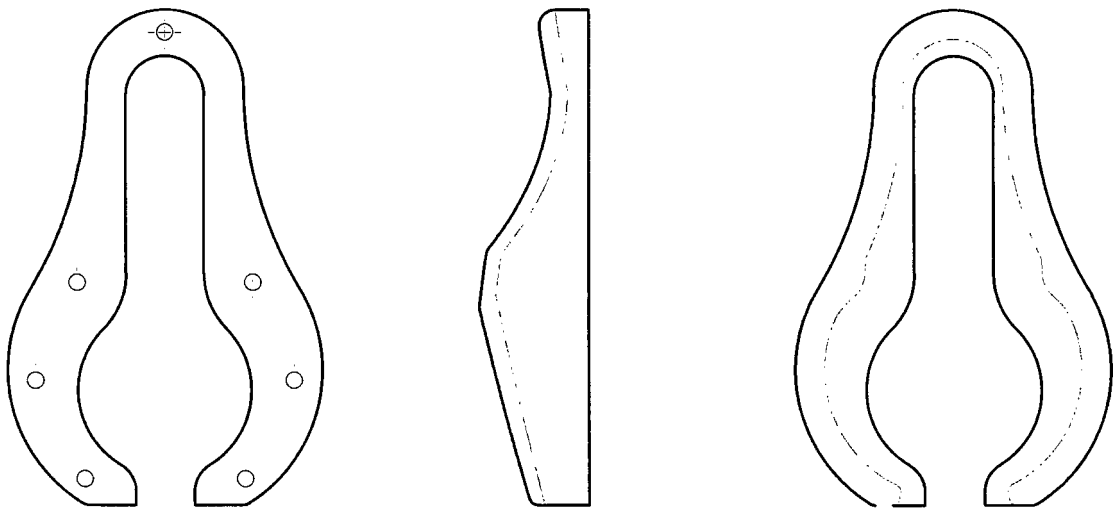


Fig. 11

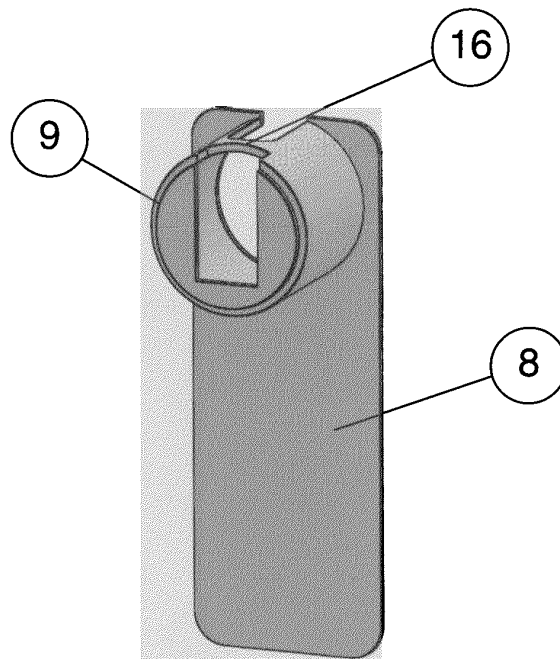


Fig. 12

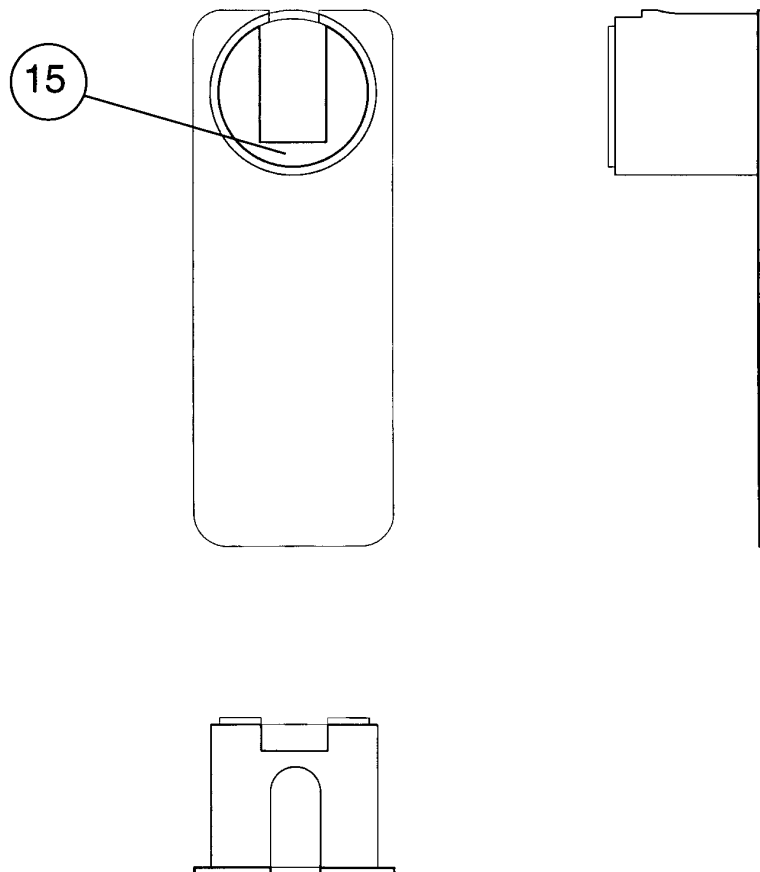


Fig. 13

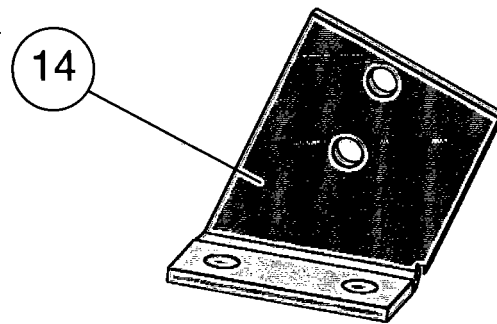


Fig. 14

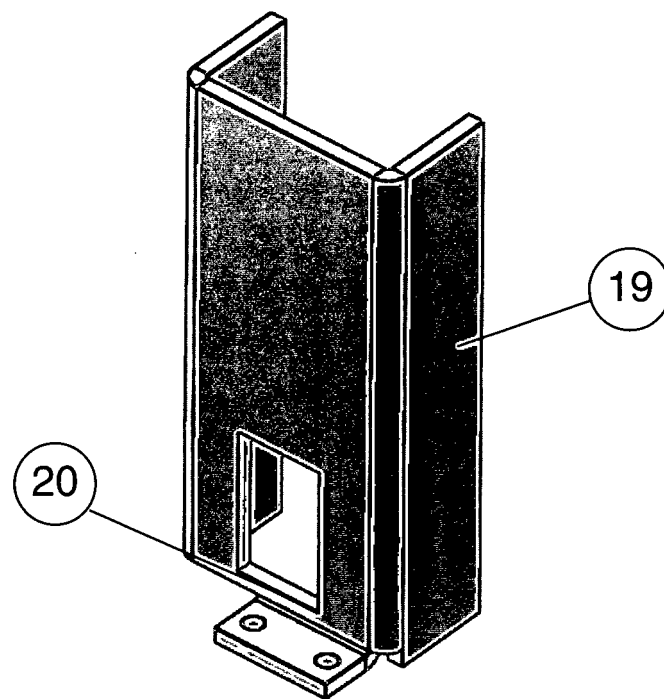


Fig.15

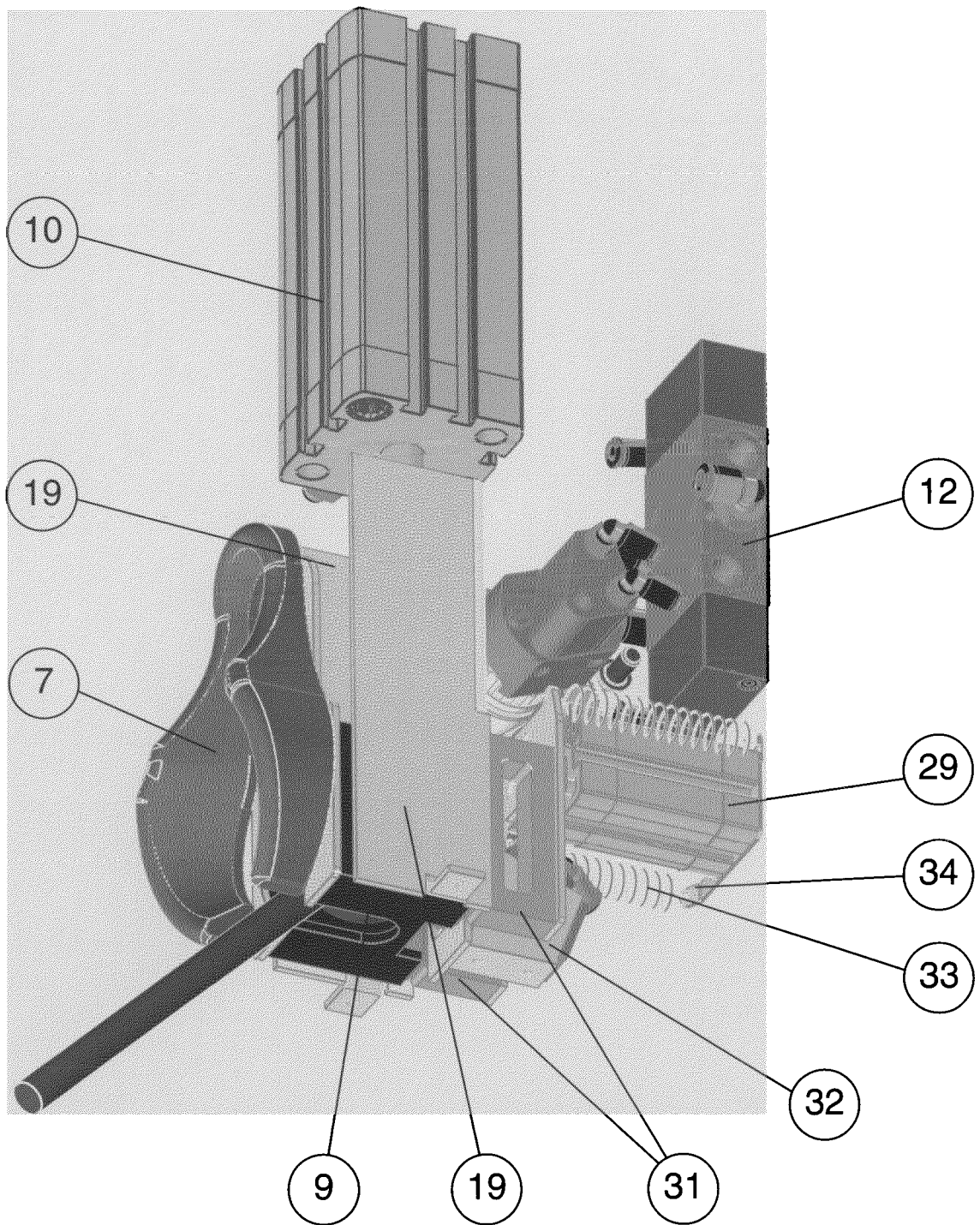


Fig.16

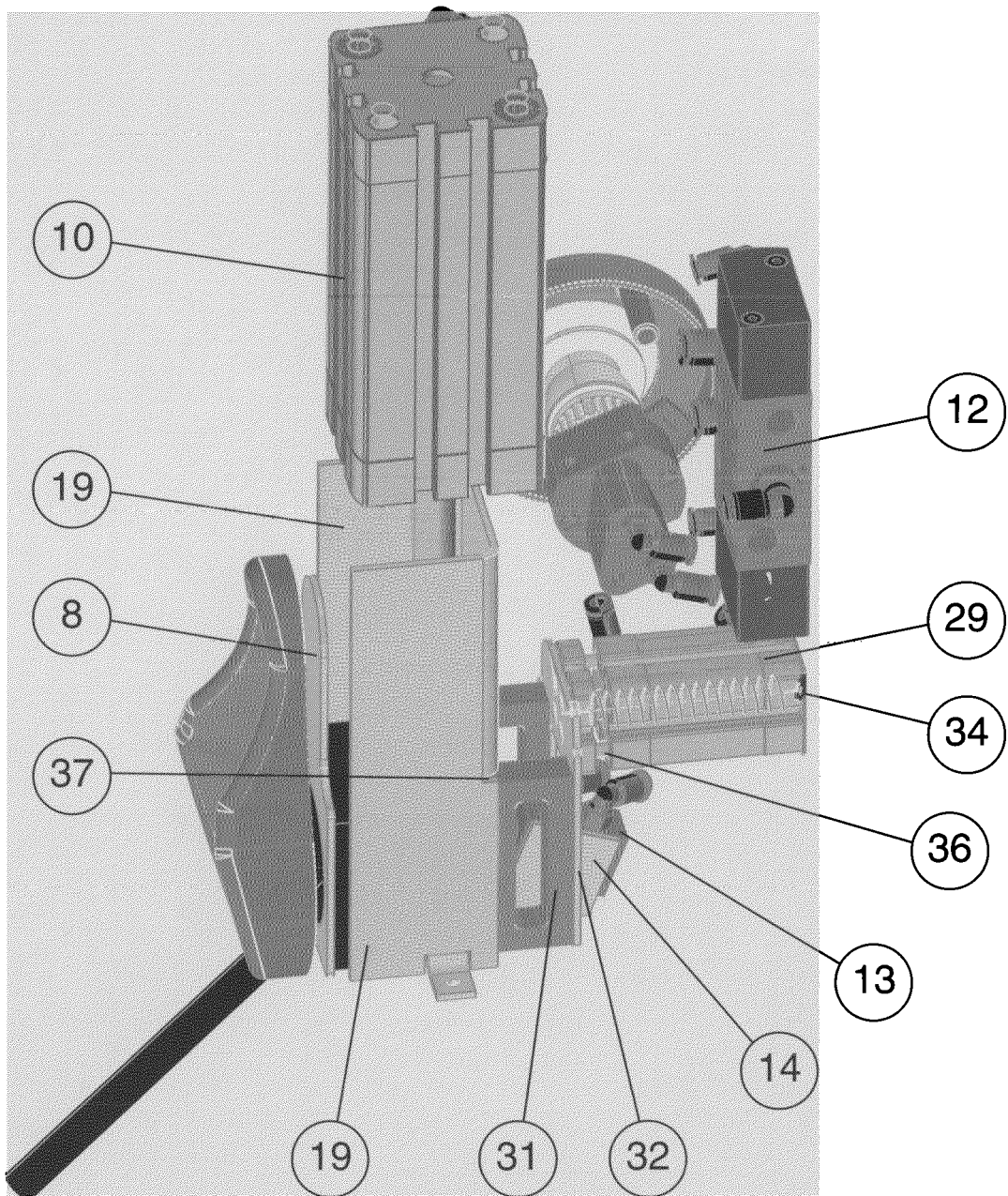


Fig.17

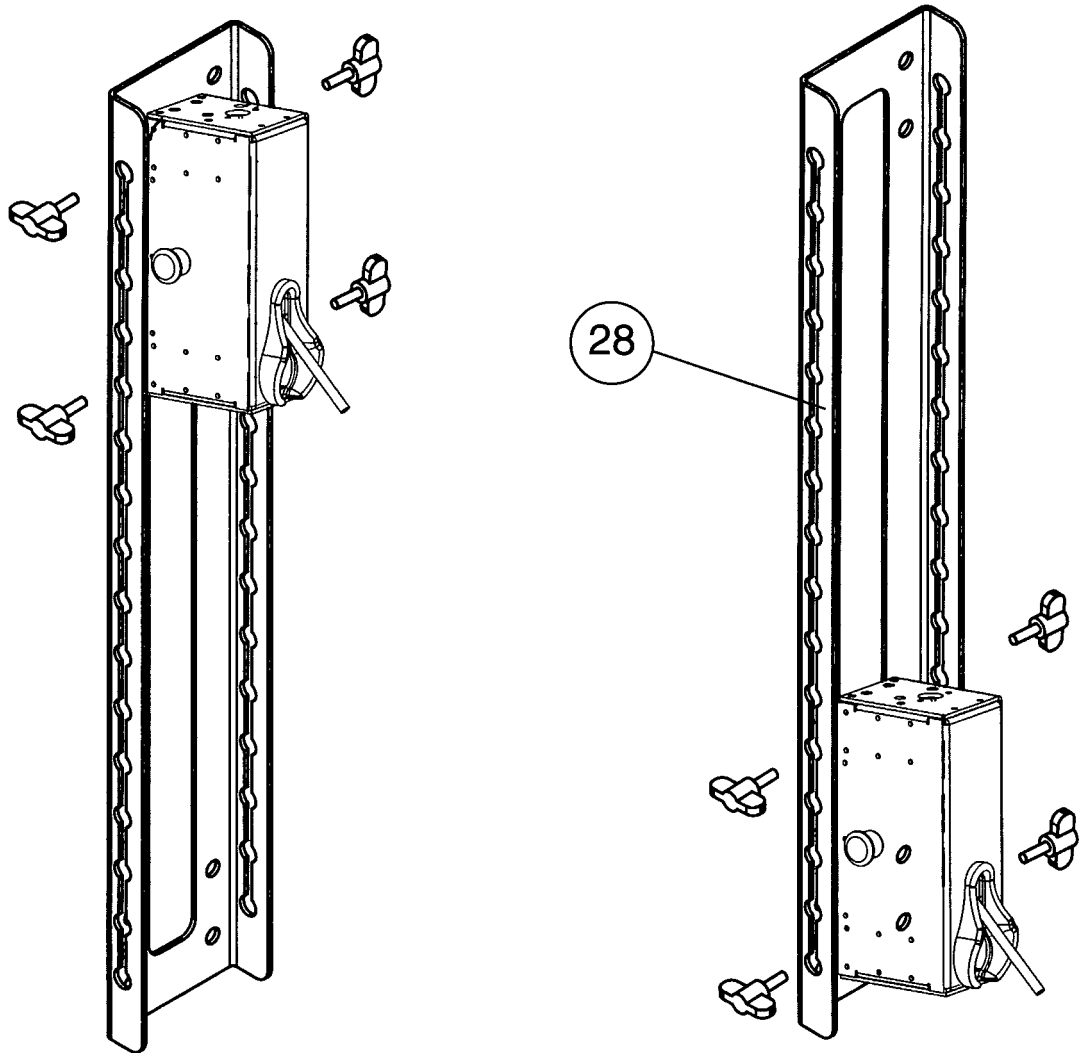


Fig.18

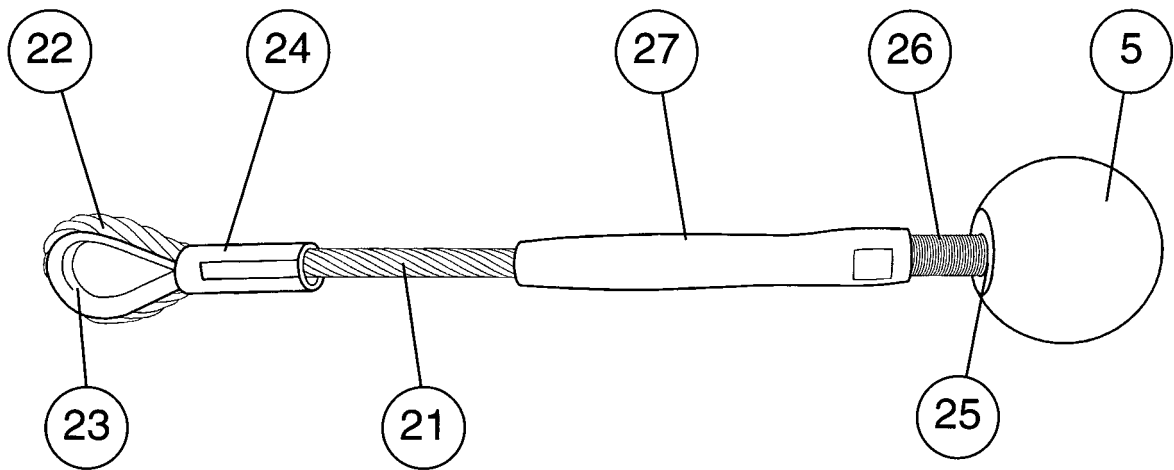


Fig.19

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2020/070280

5	A. CLASSIFICATION OF SUBJECT MATTER		
	B65F3/00 (2006.01)		
	According to International Patent Classification (IPC) or to both national classification and IPC		
10	B. FIELDS SEARCHED		
	Minimum documentation searched (classification system followed by classification symbols) B65F		
	Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
15	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPODOC, INVENES, WPI		
	C. DOCUMENTS CONSIDERED TO BE RELEVANT		
20	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	A	ES 1158086U U (MARTINEZ MARTINEZ JOSE ANTONIO et al.) 07/06/2016, the whole document.	1
25	A	ES 1065013U U (GARCIA ROBLEDO CARLOS JESUS) 01/06/2007, the whole document.	1
30	A	WO 2015162321 A1 (ENERAMUR) 29/10/2015, the whole document.	1
35	A	US 6109578 A (GUTHRIE KARL et al.) 29/08/2000, the whole document.	9
40	<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
45	* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance. "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure use, exhibition, or other means. "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "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 documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family	
50	Date of the actual completion of the international search 11/06/2020		Date of mailing of the international search report (12/06/2020)
55	Name and mailing address of the ISA/ OFICINA ESPAÑOLA DE PATENTES Y MARCAS Paseo de la Castellana, 75 - 28071 Madrid (España) Facsimile No.: 91 349 53 04		Authorized officer G. Barrera Bravo Telephone No. 91 3498447

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/ES2020/070280

Information on patent family members

Patent document cited in the search report	Publication date	Patent family member(s)	Publication date
ES1158086U U	07.06.2016	ES1158086Y Y	29.08.2016
ES1065013U U	01.06.2007	ES1065013Y Y	01.09.2007
WO2015162321 A1	29.10.2015	ES2551977 A1 ES2551977 B1	24.11.2015 08.09.2016
US6109578 A	29.08.2000	NONE	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- ES 2551977 A1 [0005]
- ES 2121287 T3 [0005]
- ES 1065013 U [0006]
- ES 1158086 U [0006]
- GB 1059162 A [0008]
- FR 2414752 [0008]
- WO 2009025594 A [0008]
- CN 103832400 [0008]