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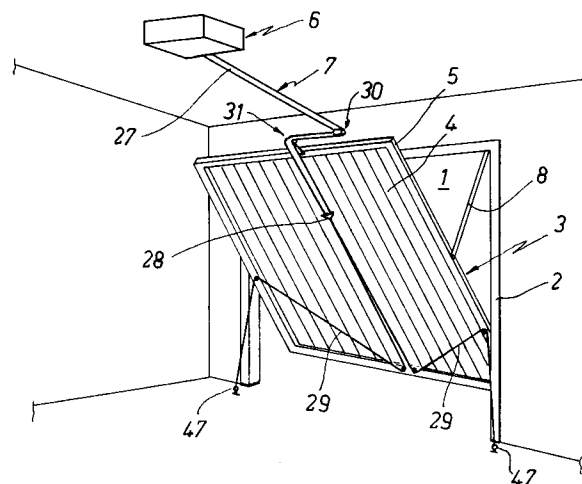
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I-42100 Reggio Emilia (IT)(54) **Operating unit for up-and-over doors.**

(57) An operating unit for up-and-over doors comprising a portal-shaped frame (2) for receiving a door (3) connected to the frame by two upper lateral connecting rods (8) and two lower lateral wheels (9) guided to slide within rails (10) provided on the frame uprights, comprises a motorized drum (22) for winding and unwinding a flexible element (7) deviated by a roller (30) located at the centre of the

frame lintel and by a roller (31) fixed to the centre of the upper edge of the door in a position projecting from the inside of the door, said flexible element dividing into two ropes (29) extending symmetrically between two pairs of deviation members (45,46) positioned in the lower region of the door, and a pair of eyelets (47) fixed to the sides of the door sill.

**FIG.1****EP 0 632 182 A1**

This invention relates to doors of up-and-over type, and in particular concerns a unit for operating such doors.

For closing non-habitational rooms such as garages, it has been known for some time to generally use up-and-over doors.

These basically comprise a flat element forming the actual door and a respective portal-shaped receiving frame to be fixed to the room access aperture.

In addition the door lateral edges are provided at a certain distance from the bottom with two opposing coaxial wheels of horizontal axis which are received in longitudinal guides provided on the frame uprights, these lateral edges being connected, at a certain distance from the upper edge, to said uprights by means of connecting rods.

Said uprights are usually in the form of box members provided upperly with pulleys for deviating two cables which at one end are connected to a counterweight and at their other end are connected to the door lateral edge in proximity to or in correspondence with said wheel.

In some cases the counterweight is replaced by a spring, said counterweight or spring tending to force the lower part of the door upwards into its open position.

Finally, such up-and-over doors can be of manual closing/opening type or of automatic operation, to which latter the invention relates in particular.

Automatically operating up-and-over doors are known, operated by a geared motor unit with two directions of rotation, which in some cases is fixed onto the inner face of the door whereas in other cases it is fixed to the ceiling of the room (such as a garage).

Between said geared motor unit and door there are interposed rigid connection means which have to be fixed onto the door and/or ceiling as necessary.

At this point it should be noted that the installation of manually operated up-and-over doors is long-standing whereas the installation of automatically operated up-and-over doors is relatively recent.

Consequently a large number of already mounted up-and-over doors exists which could potentially be converted from manual to automatic.

However, known operating devices are little suitable for said potential conversion because in addition to being relatively complicated and costly, they are relatively complex to mount and once installed cannot be recovered.

Specifically, said mounting complexity is due to the means which have to be interposed between the geared motor unit and the door, requiring substantial structural modification of the door (such as in the devices the geared motor unit of which is

fixed to this latter), and a relatively lengthy installation time, and can result in imprecise mounting and hence maloperation, particularly if mounted by non-specialized personnel.

The main object of the present invention is to provide an operating unit for up-and-over doors which is of simple construction and easy operation, does not require door adaptation work, and can be easily recovered after installation and easily installed in a different location.

Said object is attained according to the invention in that the means to be interposed between the up-and-over door and a geared motor unit fixed to the top of the interior of the room provided with said door consist of a flexible element extending between said geared motor unit and the sill of the room access aperture, and deviated on the inner face of the door such that pulling said flexible element results in the door rotating towards its closed position whereas releasing the flexible element results in the door automatically rotating towards its open position by the effect of the counterweights, with a movement which is braked by the flexible element undergoing release.

Specifically, said flexible element comprises a band or web wound on a drum keyed onto the exit shaft of the geared motor unit and deviated at least at the centre of the upper edge of the door, said band forking into a pair of ropes to be fixed, after deviation towards the lower lateral regions of the door, to the sides of the sill of said aperture.

The band is preferably deviated by at least one idle roller with its axis horizontal and parallel to the door, said ropes being deviated by small pulleys with their axis perpendicular to the door, or by equivalent means.

All the objects of the invention are attained by the aforesaid means.

In this respect, because of the simplicity of the means used, the unit of the invention:

- can be easily mounted within a short time even by persons of little expertise and without requiring the use of special tools (a common drill, some spanners and a few bolts are sufficient)
- does not require special work to be carried out on the door, in that only the holes for connecting said deviation means are required (in particular said holes are made along the reinforced edges of the door, and hence they are not through holes);
- operates correctly even in the case of mounting inaccuracies, because of the good adaptability of said belt and ropes;
- can be manufactured at low cost; and
- seeing that the cost of the deviation members required for its operation is low, these can be left in place if it is required to recover the unit

in order to reinstall it in another location.

The characteristics and constructional merits of the invention will be apparent from the detailed description given hereinafter with reference to the accompanying figures, in which:

Figure 1 is a schematic perspective view of the interior of a room (such as a garage) provided with a up-and-over door fitted with the invention; Figure 2 is a view similar to the preceding, showing a different arrangement of the geared motor unit;

Figure 3 is an inside view of the closed up-and-over door, with the invention mounted in accordance with the system of Figure 1;

Figure 4 is a right hand side view of Figure 4, the door being shown rotated into an intermediate position;

Figure 5 is a plan view of the drive unit;

Figure 6 is an enlarged frontal view of the releasable member in accordance with the mounting system shown in Figure 1;

Figure 7 is a frontal perspective view to an enlarged scale showing the deviation member to be fixed onto the upper edge of the door;

Figure 8 is an enlarged frontal view of the releasable member in accordance with the mounting system shown in Figure 2; and

Figure 9 is a view of Figure 8 from below.

Said figures, and in particular Figures 1 and 2, show a room (such as a garage) comprising an aperture 1 with which a up-and-over door 3 is associated by way of a portal-shaped frame 2.

Specifically, the door 3 consists of a substantially flat quadrangular or rectangular metal plate 4 reinforced by a perimetral rim 5.

Said door 3 is connected to the frame 2 as stated hereinafter, the door being caused to close/open by a drive unit 6 by way of a thin flexible element 7.

Said drive unit 6 can be fixed to the room ceiling (Figure 1) or to the lintel of the aperture 1 (Figure 2).

It should be noted that the second method (where possible) is certainly preferable as the unit 6 is completely hidden when the door 3 is open (raised).

As can be seen from Figures 3 and 4 the door 3 is connected to the frame 2 by two opposing lateral connecting rods 8 which at one end are hinged to the top of the frame uprights, whereas at their other end they are hinged to the lateral edges of the door 3 in a position spaced from the top by the length of the connecting rod 8.

In addition, in the lower part of the door there are provided two projecting lateral wheels 9 (only one of which is visible in Figure 4) which are received in respective longitudinal rails 10 of said uprights.

These latter are of box type, each of them slidably containing a counterweight 11 suspended by a cable 12.

The cable 12 is deviated by a pulley 13 positioned at the top of the respective upright, its opposite end being connected to a point 14 (Figure 4) of the door 3 close to the corresponding wheel 9.

The total weight of the counterweights 11 is such as to automatically raise the door 3.

As shown in Figure 5 the drive unit 6 for the flexible element 7 comprises a plate 15 provided with holes 16 for the passage of fixing plugs.

On the plate 15 there is fixed a geared motor unit, of which the motor 17, consisting for example of a direct current motor of 12 V feed voltage and 2 A maximum current absorption, is connected to a power device 19 to be connected to the mains.

With the power circuit of said motor 17 there is also associated a storage battery 20 for powering the motor 17 if mains voltage fails. Said storage battery 20, for example a 12 V, 6.5 Ah rechargeable dry battery, is controlled by a central control unit 21 provided with other circuits and devices for ensuring correct and reliable operation of the door 3.

Said central control unit 21 is provided inter alia with an adjustable safety device able to automatically reverse the direction of rotation of the geared motor unit when this is required to overcome an excessive resistance, for example due to an obstacle encountered by the door during its closure.

On the exit shaft of the reduction gear 18 there is keyed the hub of a drum 22 which extends into a threaded portion 23, said hub and portion being idly mounted on suitable supports 24.

Said portion 23 is engaged by two threaded bushes 25 which are retained so that they cannot rotate, and with which there cooperate respective microswitches 26 the purpose of which is to interrupt the power circuit to the motor 17 when the door 3 is completely closed or open respectively.

It should be noted that the geared motor unit can be operated (for opening or closure) by any known means, for example by a radio signal emitted by a portable unit.

A band 27 is fixed and spirally wound on said drum 22 and passes vertically to the central upper region of the frame 2, from which it follows the path described hereinafter.

Said band preferably consists of a woven web of the type used for safety belts, at a certain point it forking via an eyelet 28 into two ropes 29 consisting preferably of a nylon cord of nautical type having a diameter of 3-5 mm. Said ropes 29 preferably consist of the two branches of one and the same rope threaded through said eyelet, in order to

prevent any unbalance due to different tensioning.

As can be seen in Figures 1 to 4, said band 27 is deviated in one direction by a member 30 fixed to the lintel of the aperture 1, and in the opposite direction by a member 31 fixed to the inner upper edge of the rim 5. As shown in Figure 6, said member 30 consists of an idle roller of horizontal axis mounted on a fixing plate 310 by way of two supports 32 and 33.

The rotation shaft 35 of the roller 30 is pivoted to the first support 32 on a transverse axis 34, a locking pin 36 being slidably inserted into the second support 33.

The free end of this pin is received in a coaxial seat provided in the end of said shaft 35, the pin being maintained in its locking position by a spring 37 positioned on the other side of the support 33.

Finally, the opposite end of the pin 36 is connected to a sheathed cable 38 terminating (Figure 3) in a release handle 39 positioned at the centre of the door 3.

Said handle, which comprises an external handgrip and an internal handgrip, is provided with a lock and releases the roller 30 and hence the band 29 in case of emergency (such as breakage of the drive unit).

Basically, if such breakage occurs, the release of the roller 30 enables a band portion to be released sufficient to allow the door to be opened by an amount allowing access to the room.

This is apparent from an examination of Figures 1 and 4.

If however the drive unit 6 is fixed to the lintel of the aperture 1 (see Figure 2), which would not allow a sufficient length of the flexible element 7 to be released, this latter is released as stated hereinafter with reference to Figures 8 and 9.

As shown in Figure 7, said member 31 consists of an idle roller of horizontal axis positioned at the end of a small bracket 40 branching from a fixing plate 41.

Specifically, the roller 31 projects above the inner face of the door 3 (see Figure 4) and its upper edge sufficiently to allow correct door closure and its proper retention in the closed position by virtue of the tension of the band 27.

The plate 41 carries hinged thereto an arm 42 of adjustable length elastically urged towards the outer face of the door 3 by a torsion spring 43, and carrying a terminal wheel 44.

This latter is intended to rest against the cross-member of the frame 2 when the door is closed, and aids the counterweights 11 at the commencement of the opening stage.

From Figure 3 it can be seen that each rope 29 is deviated by a small pulley 45 fixed to the lower central region of the door 3 and having its axis perpendicular to this latter, and then by an identical

pulley 46 fixed above the corresponding lower edge of the door, and is finally fixed to a floor plug 47 facing the inner face of the corresponding upright of the frame 2.

It should be noted that equivalent means can be used instead of the pulleys 45, 46.

With reference to the type of mounting shown in Figure 2, the release of the flexible element 7 in case of emergency is effected by the pair of pulleys 45.

Specifically, with reference to Figures 8 and 9 said two pulleys 45 are mounted on a plate 60 coupled to an element 61 to be fixed to the centre of the lower edge of the door 4 (Figure 2).

This coupling is achieved by two opposing coaxial seats provided in said plate 60, of which one is arranged to receive a peg 62 rigid with said connection element 61, and with the other there engages a slidable pin 360 connected to said release cable 38.

Said pin 360 is constantly urged into the locking position by a compressed spring 370.

Consequently when said pin 360 is disengaged (in case of emergency), the plate 60 is released to enable the up-and-over door 4 to be (partly) opened.

Finally it should be noted that the pulleys 46 can be arranged differently from that shown.

For example said pulleys 46 can be fixed on the lower edges of the door 4, especially if this latter is provided with a side service door. This is for obvious reasons.

In Figure 8 the rope portions 29 leading to pulleys 46 positioned on the lower edges of the door are indicated by dashed and dotted lines.

The invention operates as follows.

Assuming that the door is open, when the geared motor unit receives the closure signal it pulls the band 27, with the result that two forces act in opposite directions on the upper and lower regions of the door, to cause the door to rotate by urging said regions towards the lintel and sill of the aperture 1.

When the door is closed the respective micro-switch 26 halts the geared motor unit, the flexible element 7 being perfectly taut.

The door is opened by the counterweights 11 aided at the beginning by the wheel 44, the geared motor unit unwinding the band 7 at a speed (preferably equal to the winding speed) such as to maintain the rising of the door constantly braked, so that the flexible element 7 is always taut.

The merits and advantages of the invention are apparent from the foregoing and from an examination of the accompanying figures.

Claims

1. An operating unit for up-and-over doors comprising a portal-shaped frame (2) for receiving a door (3) connected to the frame by two upper lateral connecting rods (8) and two lower lateral wheels (9) guided to slide within rails (10) provided on the frame uprights, characterised by comprising a motorized drum (22) for winding and unwinding a flexible element deviated by a roller (30) located at the centre of the frame lintel and by a roller (31) fixed to the centre of the upper edge of the door in a position projecting from the inside of the door, said flexible element dividing into two ropes (29) extending symmetrically between two pairs of deviation members positioned in the lower region of the door, and a pair of eyelets (47) fixed to the sides of the door sill.

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2. A unit as claimed in claim 1, characterised in that said flexible element consists of a band of woven material, said two ropes (29) consisting of the two branches of a cord of synthetic material freely threaded through a connection element (28) provided at the free end of said band.

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3. A unit as claimed in claim 1, characterised in that said roller (31) positioned at the centre of the upper edge of the door projects above said upper edge.

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4. A unit as claimed in claim 1, characterised by comprising an elastically deformable member (42) to be fixed to the centre of the upper edge of the door, and which when in the rest position extends above the outer face of the door to rest against the frame (2) on termination of closure.

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5. A unit as claimed in claim 1, characterised in that each of said pairs of deviation members consists of two small pulleys (45) and (46) having their axes perpendicular to the door (3), and of which the first (45) is fixed to the centre of the door lower edge, whereas the second (46) is fixed to the lower part of the corresponding lateral edge of said door.

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6. A unit as claimed in claims 1 and 5, characterised in that said roller (30) located at the centre of the lintel, or said pair of pulleys (45), is located on a fixing element by way of means enabling the flexible element (7) to be released by remote control.

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7. A unit as claimed in claim 6, characterised in that said release means consist of an elastically opposed pull-release cable (38).

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8. A unit as claimed in claim 1, characterised in that the electrical power circuit (19) for the unit (17, 18) operating said drum (22) is provided with a rechargeable storage battery (20) able to power said unit in case of temporary lack of mains voltage.

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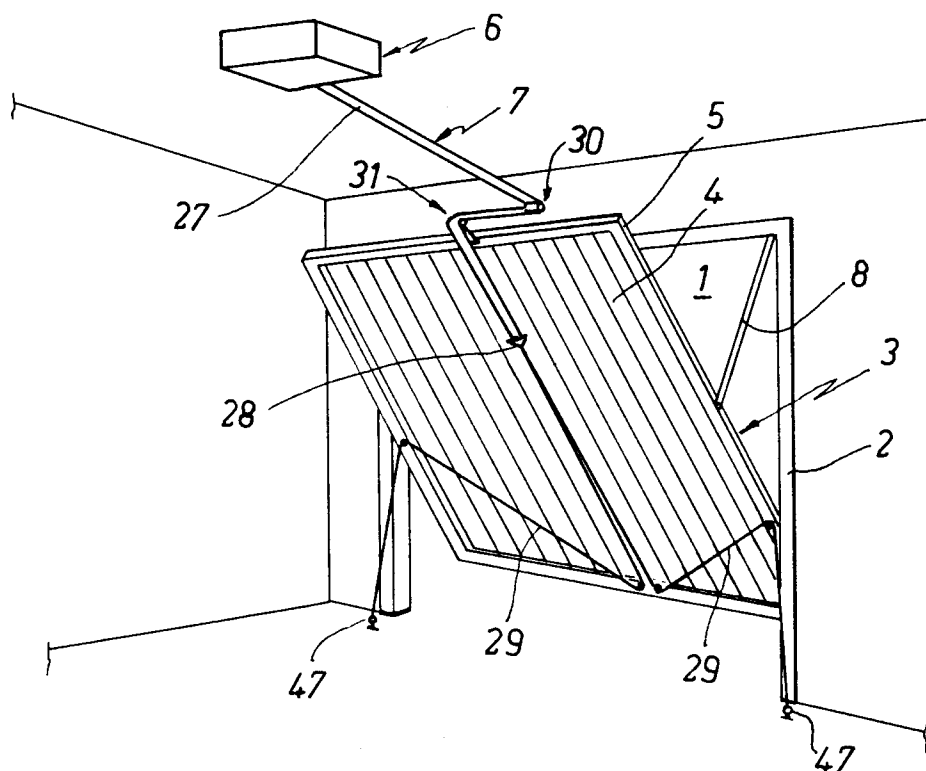


FIG. 1

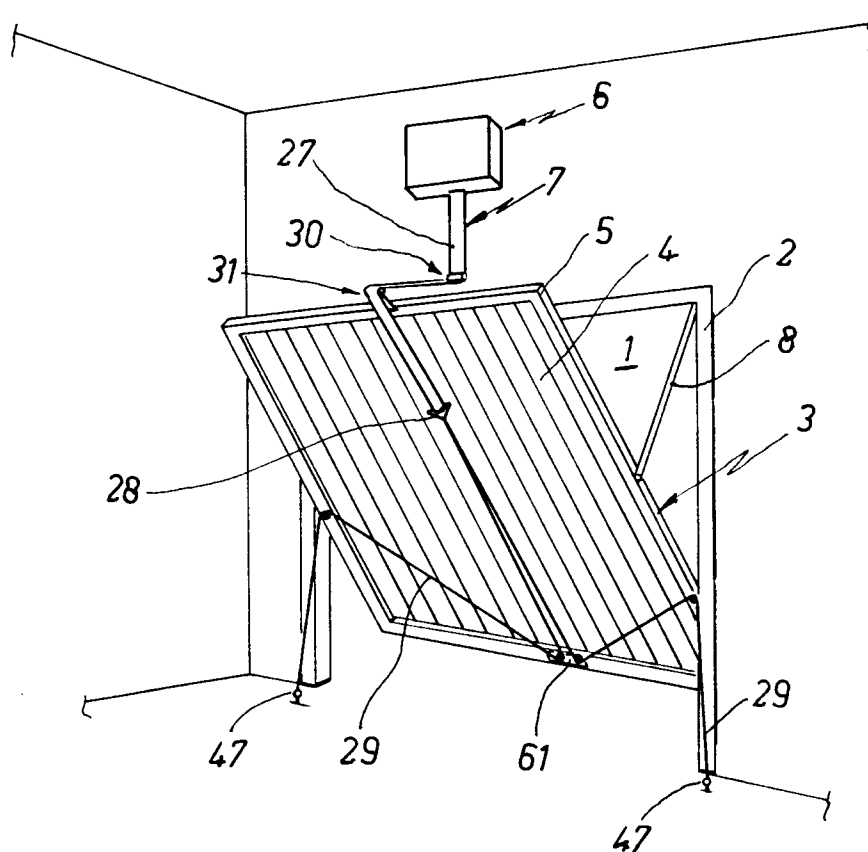
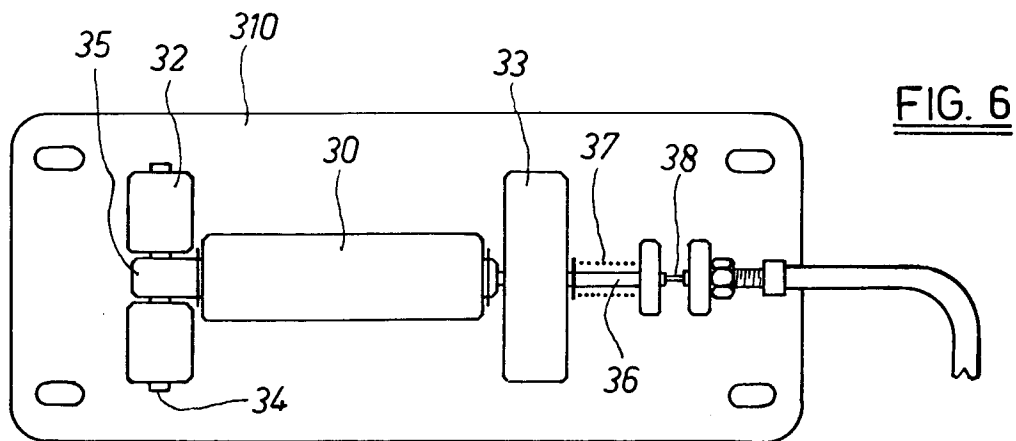
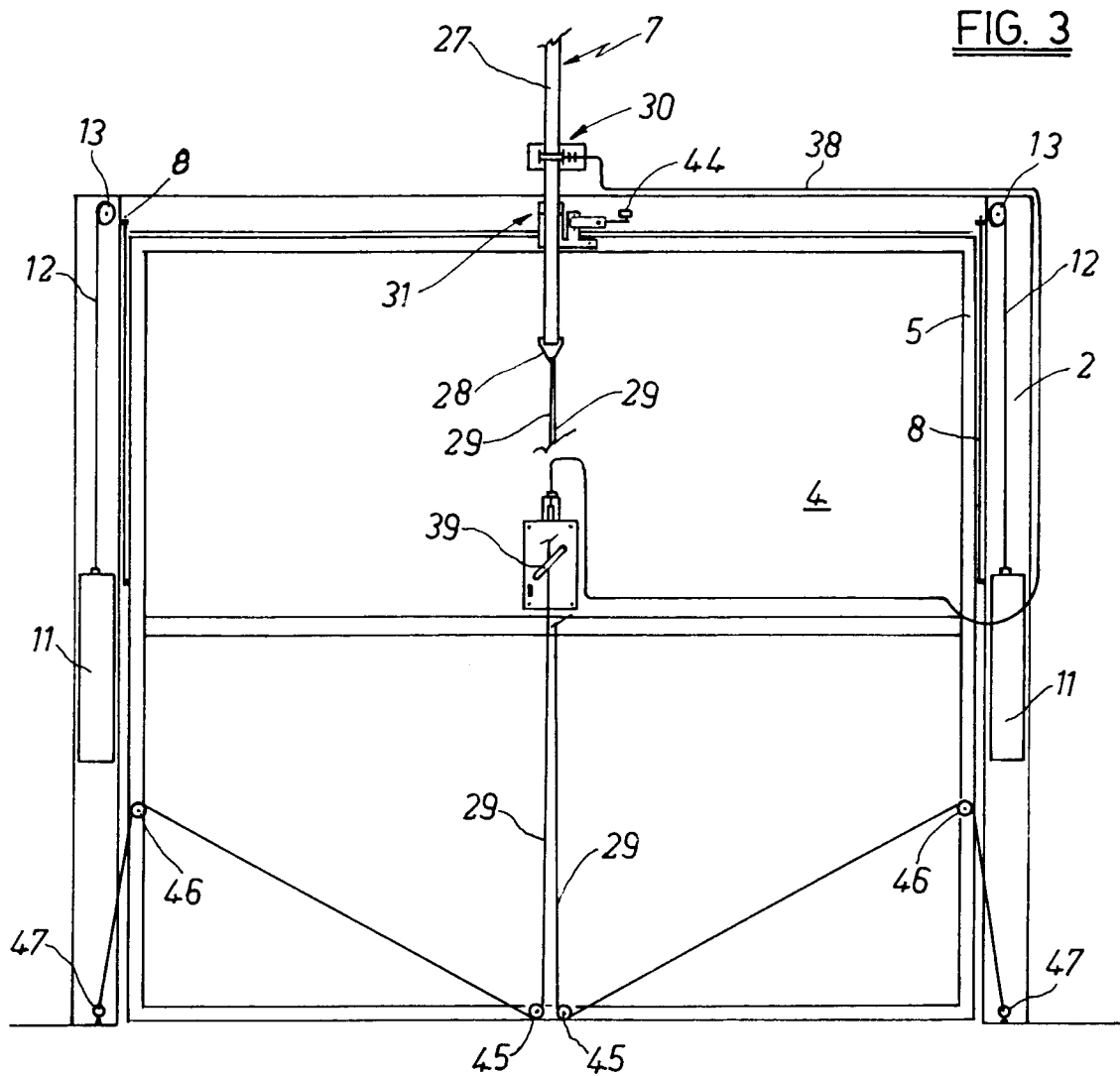
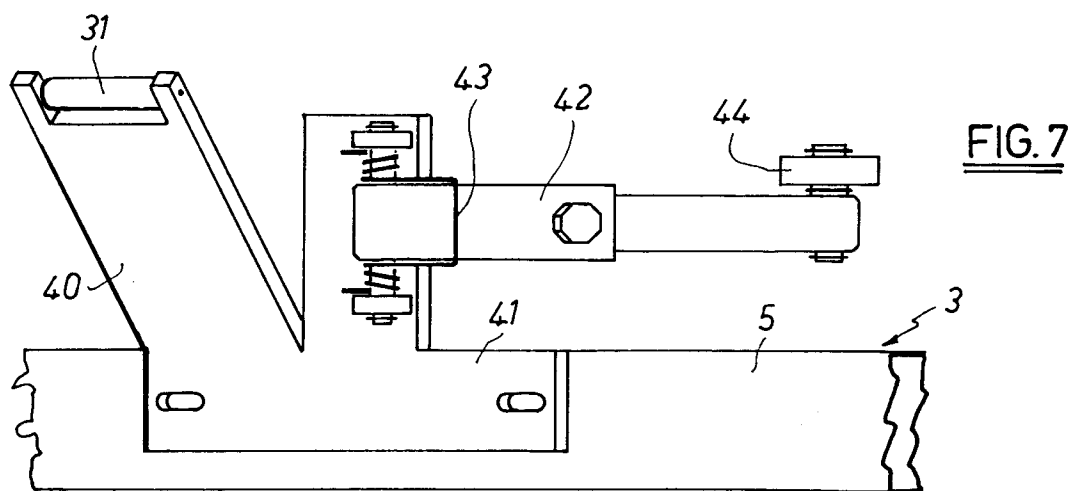
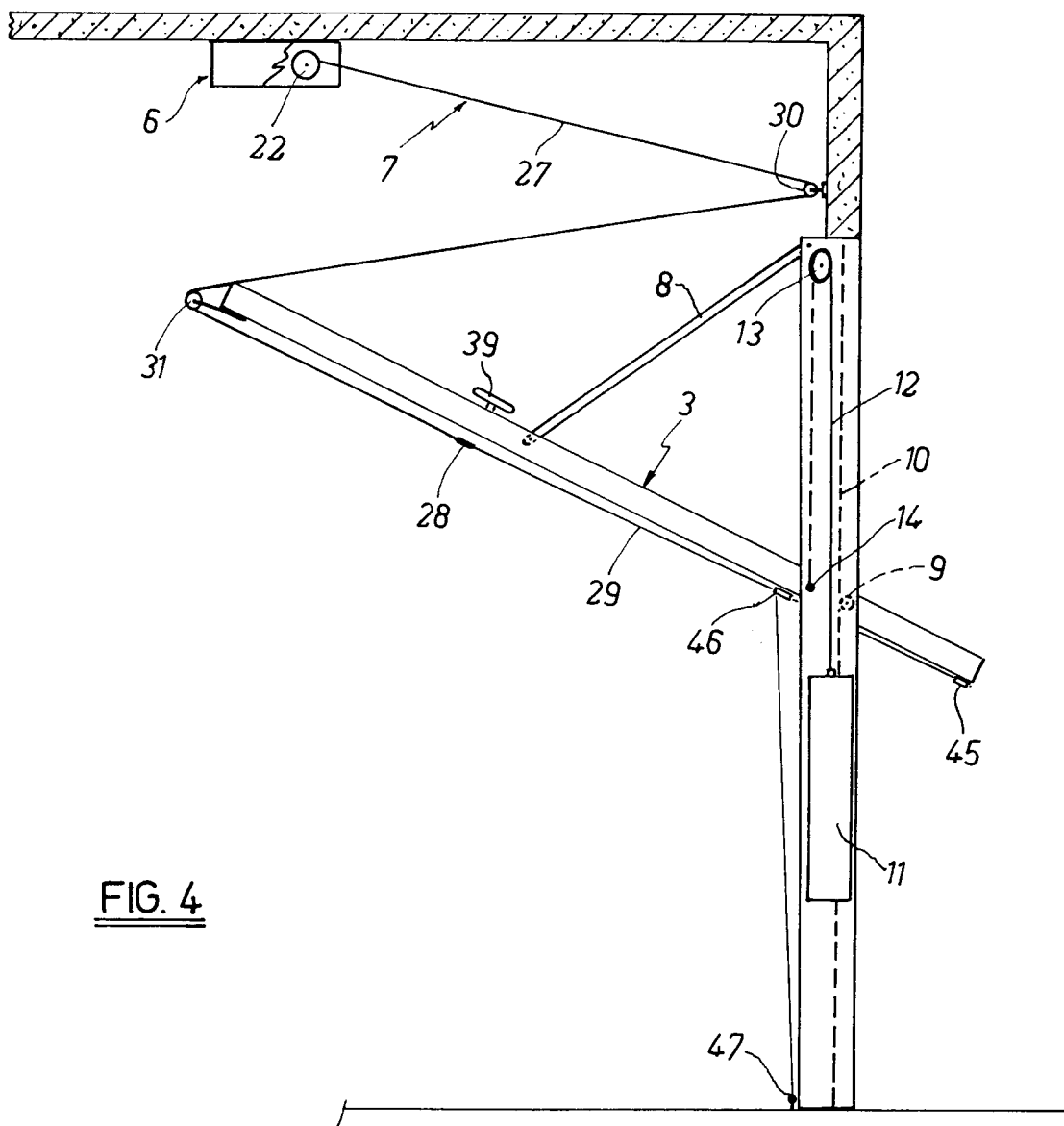


FIG. 2





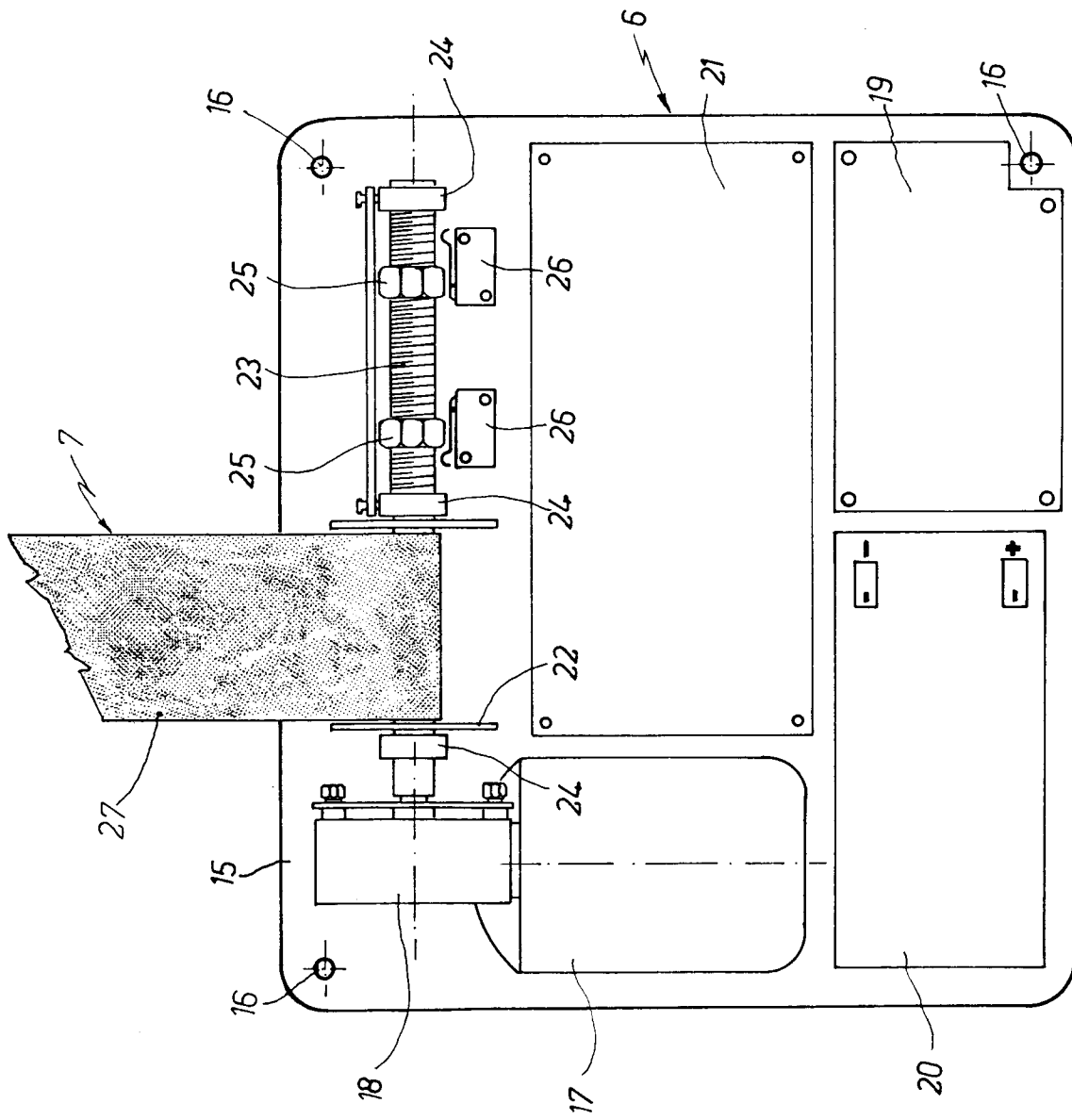


FIG. 5

FIG. 9

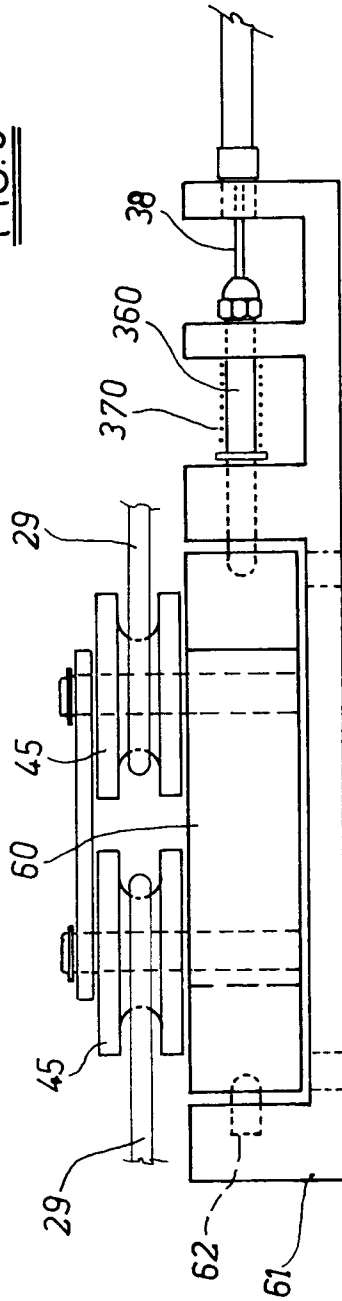
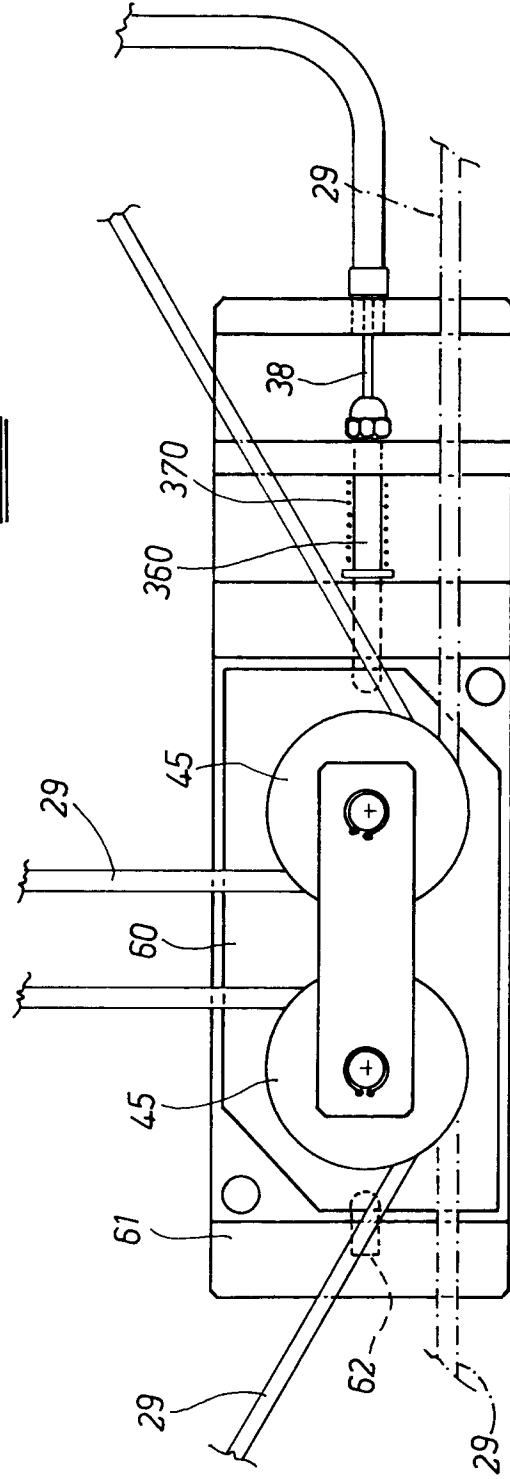


FIG. 8





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EUROPEAN SEARCH REPORT

Application Number
EP 94 20 1294

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	BE-A-501 867 (VAN BROEKHOVEN) * page 2, line 21 - line 33; figure 1 * -----	1	E05F15/16
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			E05F E05D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 5 August 1994	Examiner Van Kessel, J
CATEGORY OF CITED DOCUMENTS 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 L : document cited for other reasons & : member of the same patent family, corresponding document			