



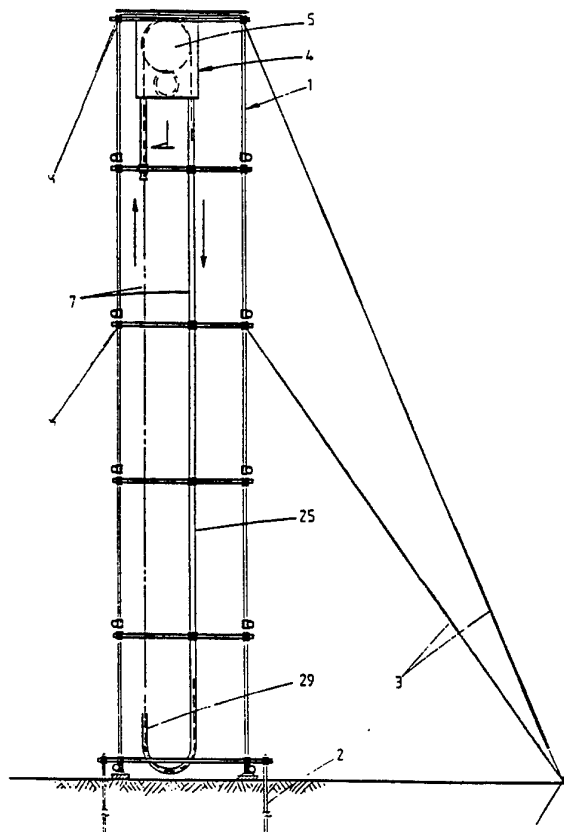
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(54) Title: EMERGENCY ESCAPE DEVICE

(57) Abstract

An emergency escape device for a structure comprising a continuous cable in the form of a ladder (37) comprising two separate side supports pinned by rungs (20), said cable being accessible from a sidewall of a structure and being supported by a pulley (5), rungs (20) of the ladder including laterally extending arms (21) having locating members (22) on the free ends thereof, guide rails (25) fixed from a structure beneath the pulley, the guide rails being arranged to accommodate the locating members of the laterally extending arms to prevent deflection of the ladder and operating means (18) for the cable which enables a user requiring access to or descent to stop or restrict movement of the cable as required. The winding speed of the ladder can be controlled by a closed circuit hydraulic system (6).



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EMERGENCY ESCAPE DEVICE

This invention relates to emergency escape devices for buildings.

The vulnerability of human occupants of high rise buildings is occasionally highlighted by news reports of disastrous fires or earthquakes with many deaths or injuries when the occupants are trapped in a building. In situations where lifts are shut down and stairwells blocked other forms of escape for human occupants are desirable, however modern construction techniques or requirements make it impractical to build stairway escapes on larger buildings.

In my New Zealand Patent Application No. 230847 I have described an emergency escape device for a building which provides a cable accessible from the side of the building, the cable being supported by a suspended pulley.

I now believe that this concept may be more acceptable if the system were "self contained" and incorporated in an enclosed chute on the inside or outside of a building and further that the system should cater for disabled as well as able bodied persons.

It is an object of the present invention to improve upon the concept described in New Zealand Patent Specification No. 230847, particularly having regard to the above-mentioned desiderata.

According to the present invention there is provided an emergency escape device for a building comprising a continuous cable in the form of a ladder comprising two separate side supports pinned by rungs, said cable being accessible from a side wall of a structure and being supported by a pulley, rungs of the ladder including laterally extending arms having locating members on the free ends thereof, guide rails fixed from a structure beneath the pulley, the guide rails being arranged to accommodate the locating members of the laterally extending arms to prevent deflection of the ladder and

operating means for the cable which enables a user requiring access to or descent to stop or restrict movement of the cable as required.

The guide rails can be continuous throughout the length of the ladder, at least on the side adjacent a ladder mounting position.

The escape device can include a speed control device comprising a hydraulic motor connected to said pulley by transmission means in a circuit with a liquid flow controller device and valving means connected to said operating means for enabling a user requiring access to or descent to stop or restrict movement of the cable as required.

The rungs of the ladder can mount access platforms to coincide with floor levels of the structure which the ladder serves.

The access platforms can be pivotably mounted to the ladder so as to be able to pivot in an upward direction on the access side of the ladder.

The speed control device can be controlled by a cord or cable which descends from the pulley alongside the cable.

According to a further aspect of the present invention there is provided an emergency escape device for a structure comprising a continuous cable in the form of a ladder comprising two separate side supports pinned by rungs, said cable being accessible from a side wall of the structure and being supported by a pulley, a speed control device comprising a hydraulic motor connected to said pulley by transmission means in a closed circuit with a liquid flow controller device and valving means connected to operating means for the cable which enables a user requiring access to or descent to stop or restrict movement of the cable as required.

The function of the hydraulic motor is to govern the winding speed of the pulley and cable.

Aspects of the present invention will now be described with reference to the accompanying drawings in which:

Figure 1: is a side elevation of a prototype emergency escape device in accordance with one possible embodiment of the present invention, and

Figure 2: is an end elevation of the device of Figure 1, and

Figure 3: is an enlarged cross-section taken at axis B of Figure 1, and

Figure 4: is an enlarged cross-section taken at axis B of Figure 3, and

Figures 5 and 5a: are detailed drawings of the rungs of a cable ladder for the device of Figure 1, and

Figures 6 and 7: are further detailed drawings of a ladder guide for the apparatus of Figure 1.

Figure 8: is a sectional view from above of an emergency escape device installed the wall of a multi-storey building, and

Figure 9: is a side sectional view of the emergency escape device of Figure 8, and

Figure 10: is a sectional view from above of an emergency escape device in accordance with a further embodiment of the present invention.

As discussed, the apparatus of the present invention can be free standing as illustrated by Figures 1 and 2 but is more likely to be embodied within a vertical service duct on the inside or outside of a building. The duct may be conventionally constructed or constructed from tubular sections manufactured off the site.

In a free standing version of the device illustrated by the drawings a scaffold-like structure generally indicated by arrow 1 is secured with respect to a ground surface by ground spikes 2 and guy ropes 3. The structure supports a module generally indicated by arrow 4 incorporating a cable pulley 5, and a governing mechanism generally indicated by arrow 6.

In the example illustrated the cable pulley 5 supports a continuous cable ladder 7.

In my New Zealand Patent No. 230847 I have described in some detail various aspects of the drum and ladder configuration and the description in that specification is incorporated herein by way of reference.

The cable pulley 5 of the present invention has two ends 8 supported from a hub 9 and the hub is mounted for rotation with respect to the supporting structure. Gear wheels 10 and 11 and an appropriate transmission belt or chain 12 are connected to an hydraulic motor 13 via a gear box 14 and control means generally indicated by arrow 15 determine the winding speed of the motor 13. The control means may comprise a flow control valve 16 and a ball valve 17 to which a control cord 18, which can be used to start and stop rotation of the pulley via the transmission devices, is attached.

It is believed that the transmission device illustrated has several advantages over that previously described in my Patent No. 230847, in particular the compactness of the system and the accuracy of the speed control which is obtained using a hydraulic motor. The gear box 14 may be a Fairfield Differential Planetary gear box and a suitable motor is supplied by Sperry Vickers under the code 25V00A-1020-28. The control valve may be a snap-tite adjustable in-line flow control valve supplied by Keystone identified as a F383-MP32 diameter ball valve.

Further significant improvements to my earlier design are illustrated by Figures 4 through 7 of the drawings.

The present invention provides a modification to the ladder rungs generally indicated by arrow 20 in the drawings. Each alternative ladder rung has extending end portions 21 which mount rubber rollers 22. All rungs have a similar central portion 23 and Figures 5 and 5a indicate the comparison in detail between a rung without rollers and one with rollers. The ladder cables pass through apertures 24 in the free ends of the standard rungs and the rungs are secured with respect thereto by an internal ferrele 25 which is pressed onto the sides of the cable under pressure so that rungs cannot slip under normal loading.

The present invention includes the provision of guides generally indicated by arrow 25. The guides 25 receive the wheeled ends of the rungs with rollers and extend for substantially all of the length of the escape device and prevent lateral deflection of the ladder due to loading.

Each guide can comprise an inner channel member 26 supported by an outer channel 27, which is in turn secured to a supporting structure by brackets 28.

The guide rail 25 may have a tail portion 29 which ensures stability for the ladder near the base of the device.

As with the previously described embodiment the present invention can include a stop/go control in the form of a cord which is suspended over the restrained side of the ladder. Restraining movement of the ladder also will enable objects such as stretchers, wheelchairs and the like to be safely lowered without tilting which would otherwise occur.

With respect to Figures 8 to 10 of the drawings the emergency escape device can be readily incorporated in new buildings or as an addition to existing buildings, subject to provision being made for an access lobby.

With respect to Figures 8 and 9 of the drawings the emergency escape device can be embodied in pre-made modules generally indicated by arrow 30. Each module 30 can be moulded in an appropriate fire and weatherproof material with one module being provided for each storey. In plan each module is substantially U-shaped having a lobby 31 which is housed in an opening 32 with air space in between perhaps being filled with fire retardant materials. Each module has an outer section 36 which houses and supports the cable ladder 37 and guide rails 38. Each module can have male and female top and bottom joints 39, 40 respectively so that they are stackable one upon the other with the top or a specially built module (not shown) housing the control devices.

Each module has a floor 41 and incorporates a smoke stop chamber 42 defined by fire doors 43, 44. The fire door 44 can be remotely or otherwise controlled for security purposes.

The ladder 37 has an access platform 45 which when it is moving passes through a complimentary recess 46 in floor 41. The access platforms coincide with floor levels of the structure and is mounted to the ladder so as to be able to pivot in an upward direction on the access side of the ladder.

In Figure 10 a L-section module 47 is provided. In this variation the lobby floor 41 extends outside the structure and the ladder is encased in a part of the module at right angles to the lobby floor.

The escape device can also be used during construction stages as a man or goods lift. Where a number of the devices are incorporated into a structure one or more can be dedicated to fire department access. In both cases a simple modification is required. This would involve replacing the hydraulic drive system with an electric or other drive system which rotated the ladder in reverse or disabling the hydraulic speed control device and driving the ladder in the same direction.

It can be seen that the emergency escape device provides a safe and effective means of escape for building occupants in the event of fire or in another emergency with descent speed control being provided by a non-electric hydraulic system. In the event of a fire, escaping occupants can be totally isolated from the fire or the effects of smoke.

The principles embodied in the present invention may apply in other ways and to other devices. For example, the escape device may be mounted on a vehicle in hinged sections which can be erected and secured at the site of an emergency. Two adjacent devices may be used to secure a work platform to assist with building or maintenance of structures.

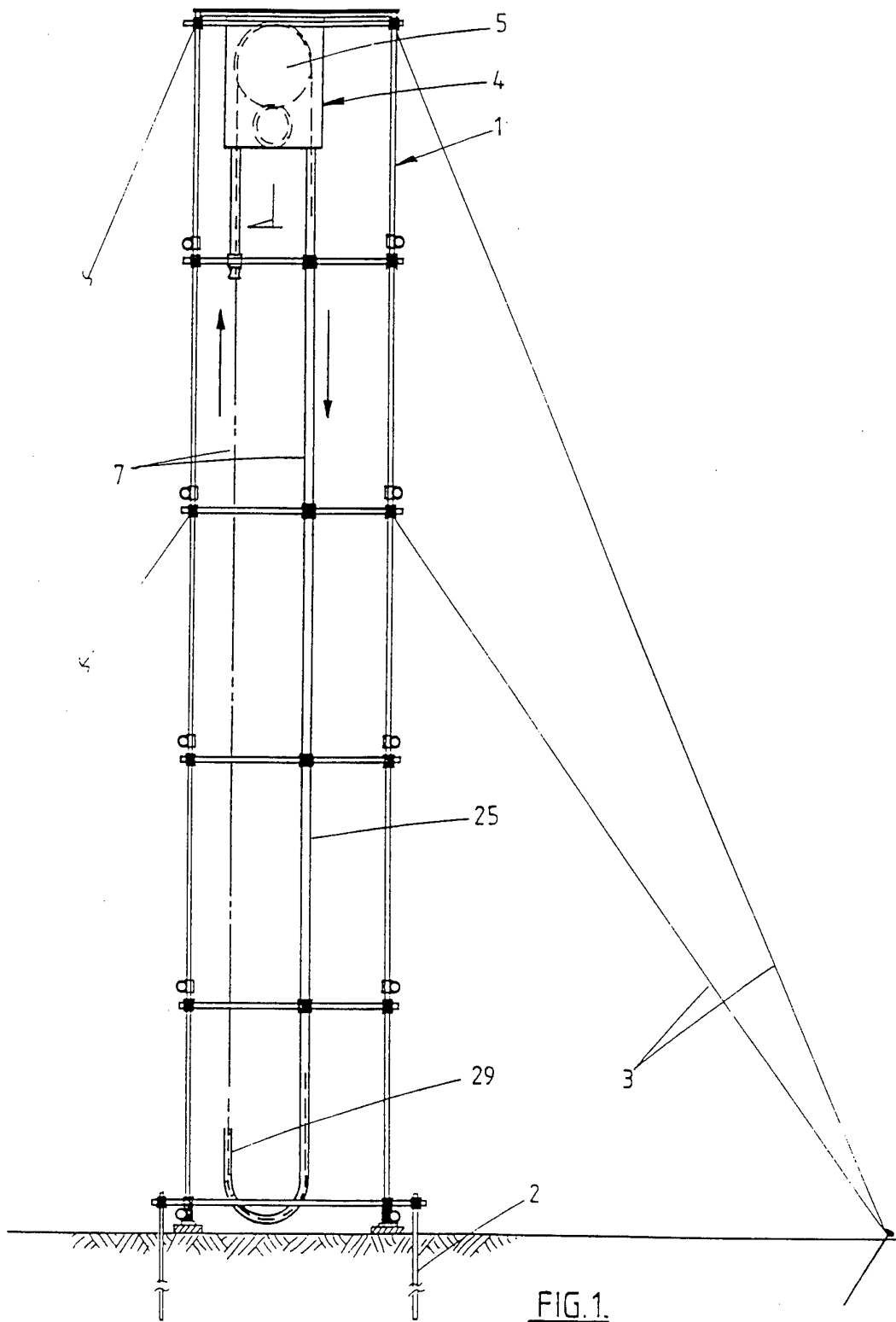
Aspects of the present invention have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope thereof as defined in the appended claims.

WHAT WE CLAIM IS:

1. An emergency escape device for a structure comprising a continuous cable in the form of a ladder comprising two separate side supports pinned by rungs, said cable being accessible from a side wall of a structure and being supported by a pulley, rungs of the ladder including laterally extending arms having locating members on the free ends thereof, guide rails fixed from a structure beneath the pulley, the guide rails being arranged to accommodate the locating members of the laterally extending arms to prevent deflection of the ladder and operating means for the cable which enables a user requiring access to or descent to stop or restrict movement of the cable as required.
2. An emergency escape device as claimed in claim 1 wherein the guide rails are continuous throughout the length of the ladder, at least on the side adjacent a ladder mounting position.
3. An emergency escape device as claimed in claim 1 or claim 2 including a speed control device comprising a hydraulic motor connected to said pulley by transmission means in a closed circuit with a liquid flow controller device and valving means connected to said operating means for enabling a user requiring access to or descent to stop or restrict movement of the cable as required.
4. An emergency escape device as claimed in any one of claims 1 to 3 wherein rungs of the ladder mount access platforms to coincide with floor levels of the structure which the ladder serves.
5. An emergency escape device as claimed in claim 4 wherein the access platforms are pivotably mounted to the ladder so as to be able to pivot in an upward direction on the access side of the ladder.

6. An emergency escape device as claimed in any one of claims to to 5 wherein the braking means is controlled by a cord or cable which descends from the pulley alongside the cable.
7. An emergency escape device for a structure comprising a continuous cable in the form of a ladder comprising two separate side supports pinned by rungs, said cable being accessible from a side wall of the structure and being supported by a pulley, a speed control device comprising a hydraulic motor connected to said pulley by transmission means in a closed circuit with a liquid flow controller device and valving means connected to operating means for the cable which enables a user requiring access to or descent to stop or restrict movement of the cable as required.
8. An emergency escape device as claimed in claim 7 wherein the guide rails are continuous throughout the length of the ladder, at least on the side adjacent a ladder mounting position.
9. An emergency escape device as claimed claim 7 or claim 8 wherein rungs of the ladder mount access platforms to coincide with floor levels of the structure which the ladder serves.
10. An emergency escape device as claimed in claim 9 wherein the access platforms are pivotably mounted to the ladder so as to be able to pivot in an upward direction on the access side of the ladder.

11. An emergency escape device as claimed in any one of claims 7 to 10 wherein rungs of the ladder include laterally extending arms having locating members on the free ends thereof, guide rails fixed from beneath the pulley, said guide rails being arranged to accommodate the locating members to prevent deflection of the ladder.



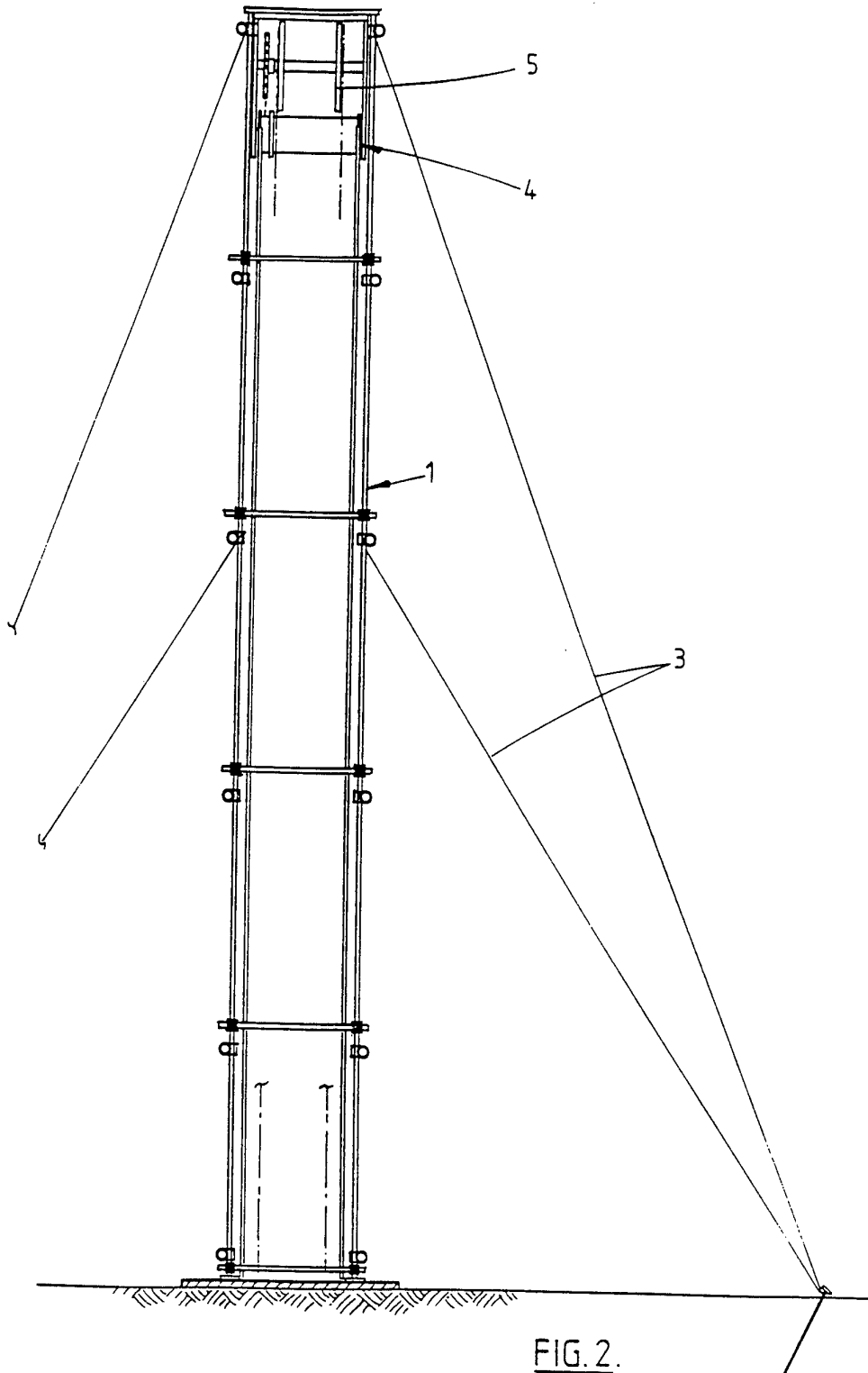


FIG. 2.

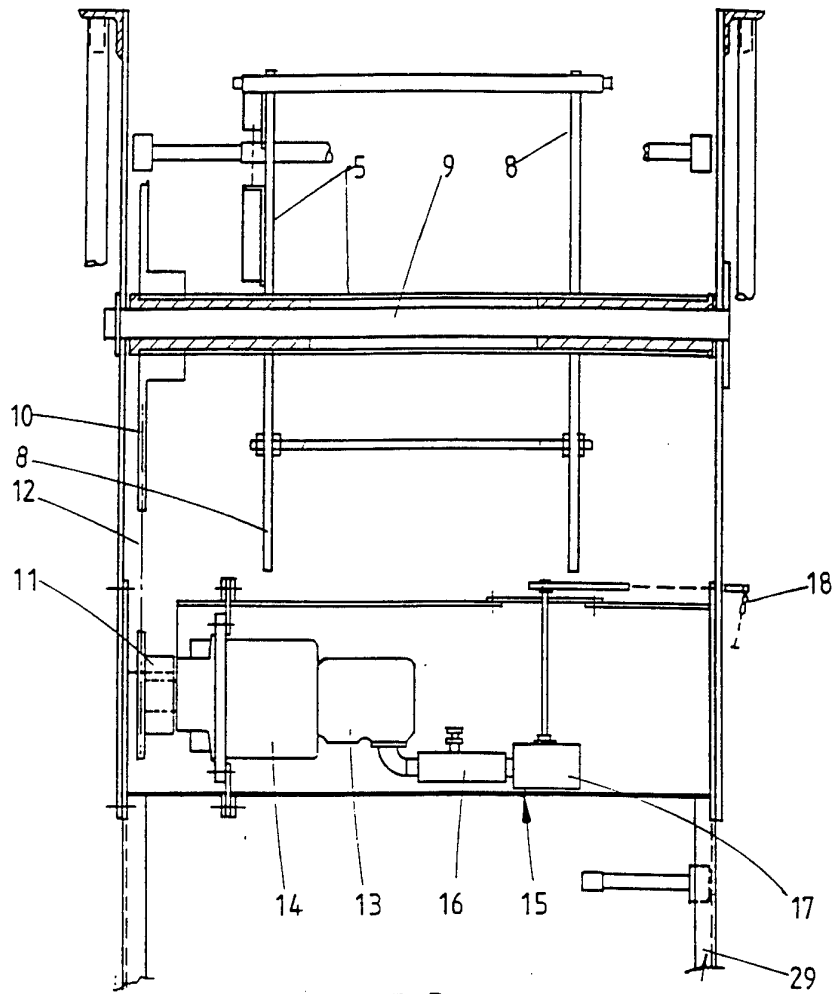


FIG. 3.

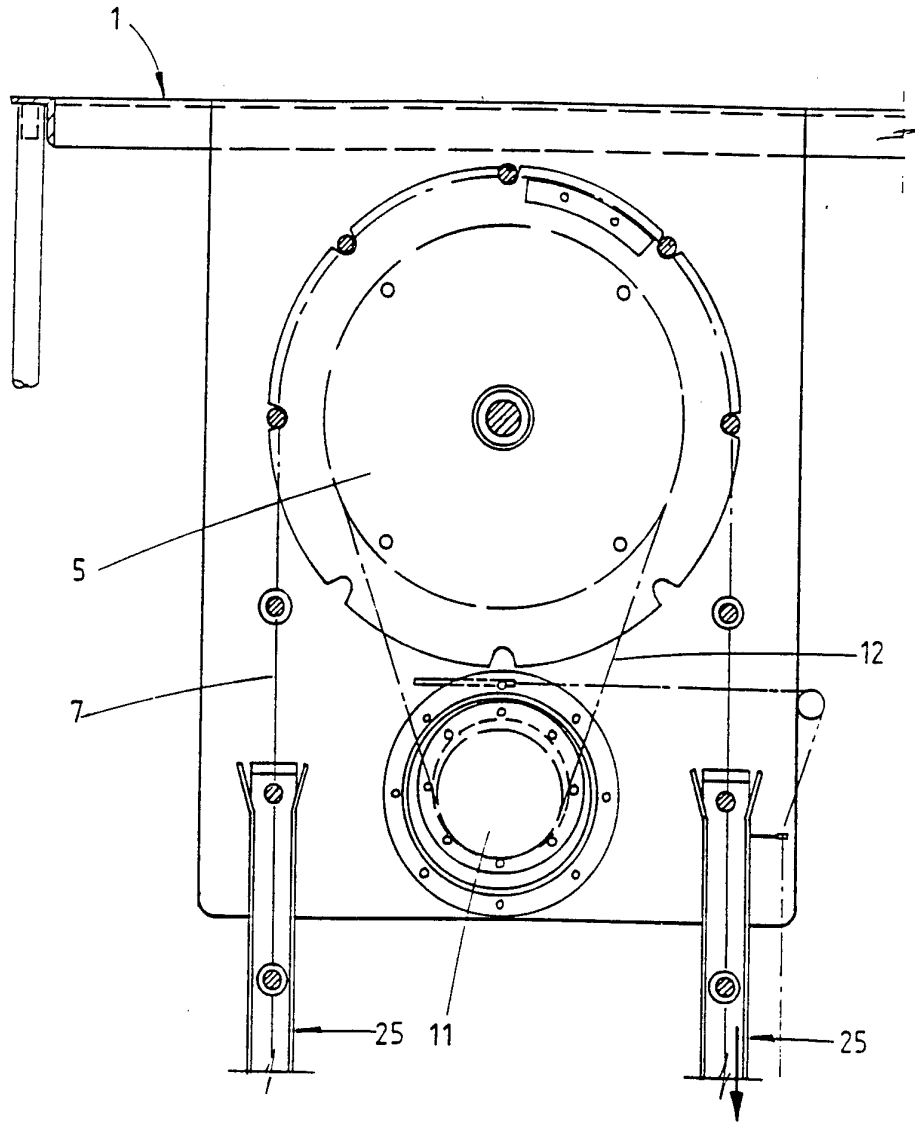


FIG. 4.

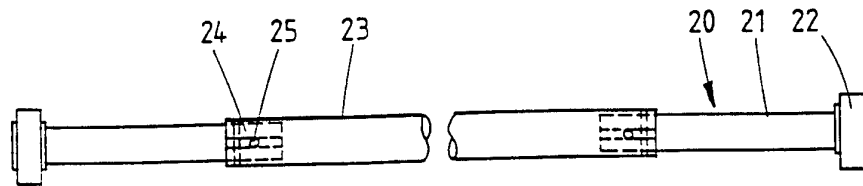


FIG. 5.

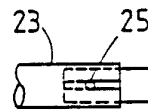


FIG. 5a.

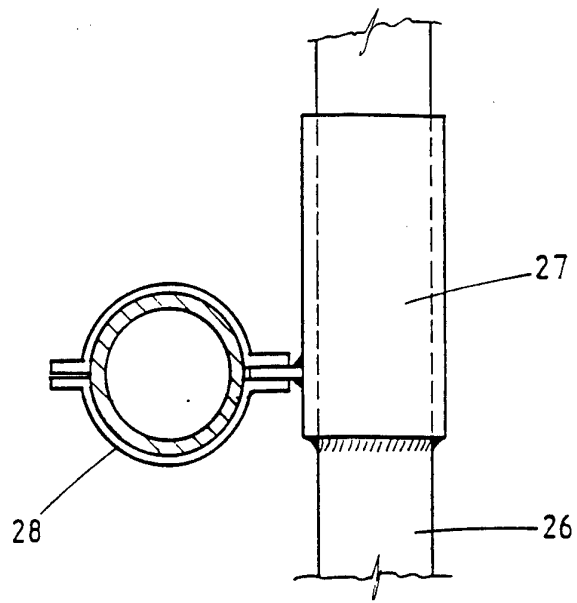


FIG. 6.

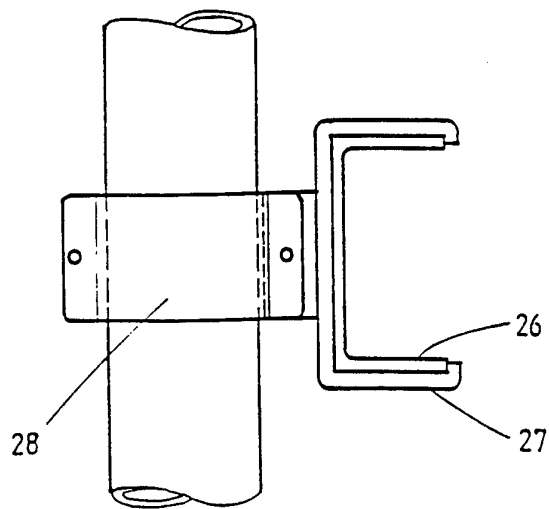


FIG. 7.

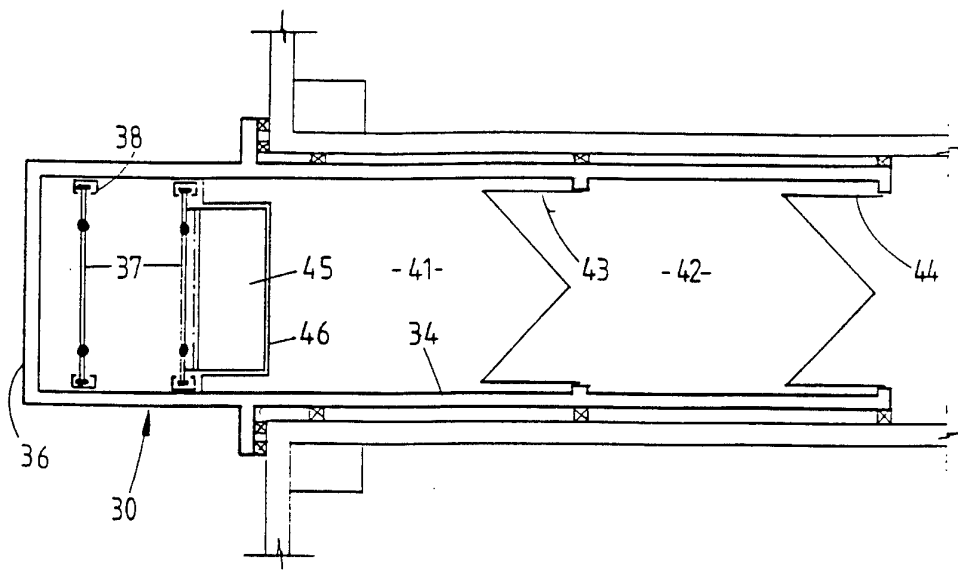


FIG. 8.

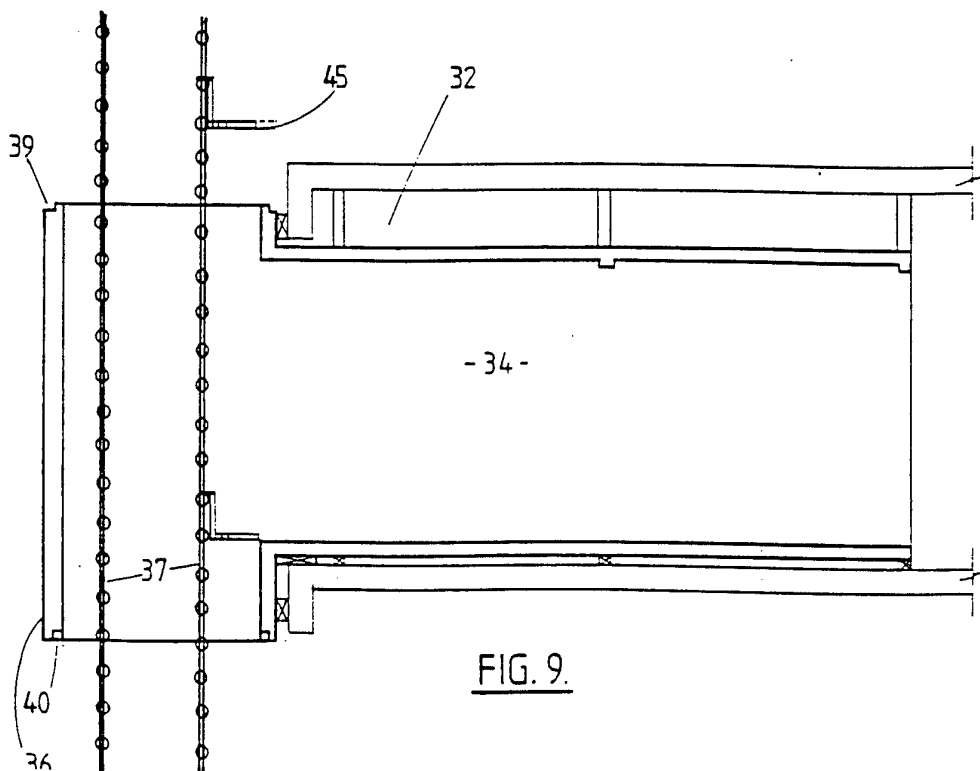


FIG. 9.

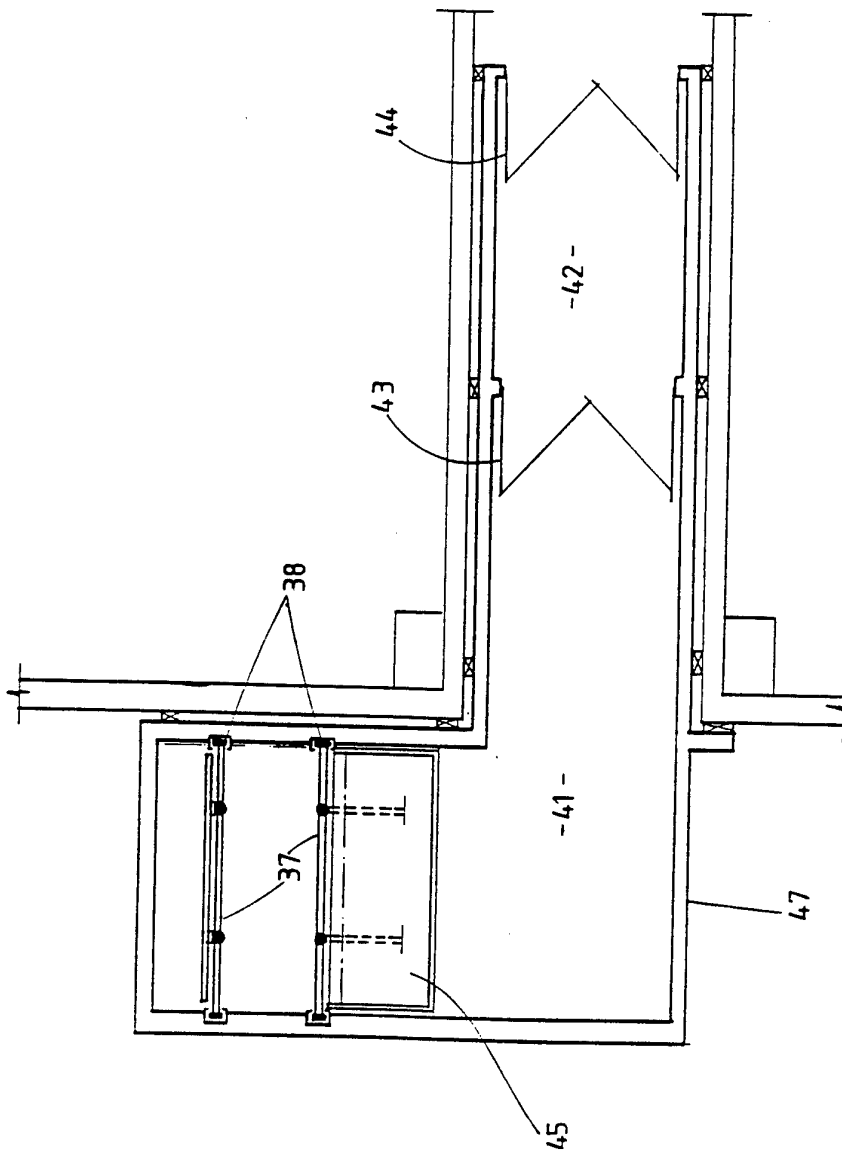


FIG. 10.

A. CLASSIFICATION OF SUBJECT MATTER Int. Cl. ⁵ A62B 1/12 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC A62B 1/12 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU : IPC as above Electronic data base consulted during the international search (name of data base, and where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
X	WO,A, 90/02700 (CLEVERLEY et al.) 22 March 1990 (22.03.90) See figures 1(a) and (b)	1-11
X	US,A, 4512438 (VILCHEK et al.) 23 April 1985 (23.04.85) See figures 1 and 5	1-11
A	US,A, 4653609 (DEVINE) 31 March 1987 (31.03.87)	
A	US,A, 4437546 (MARINOFF et al.) 20 March 1984 (20.03.84)	
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
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Date of the actual completion of the international search 17 November 1993 (17.11.93)		Date of mailing of the international search report 24 Nov 1993 (24.11.93)
Name and mailing address of the ISA/AU AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No. 06 2853929		Authorized officer P. WEST Telephone No. (06) 2832108

INTERNATIONAL SEARCH REPORT

Information on patent family memb.

International application No.

PCT/NZ 93/00056

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member			
WO	9002700	AU	42056/89	GB	2229692
US	4512438				
US	4653609	CA	1249554	JP	61135676
US	4437546				
					END OF ANNEX