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I-10121 Torino(IT)(54) **Mechanised system for the storage and transfer of safety-deposit boxes, for example for banks.**

(57) The system includes at least one rack (24) provided with a plurality of seats (26) each adapted to house a box (10), and transfer members elements (28, 44, 52) for the boxes (10) for withdrawing the boxes (10) from the rack (24) and inserting them therein. These transfer members include a carriage (28) which accommodates one box (10) at a time temporarily and which is movable to select the seat (26) and to displace the box (10) relative to the rack (24), and a transfer and/or lift mechanism (44, 52) which transfers the box into a transfer space (39) adjacent the consultation station (37). A security door (38) is provided between the station (37) and the space (39) while an armoured door (41) is provided between the space (39) and the room (22) housing the racks (24). The two doors (38,41) are opened automatically and only one at a time.

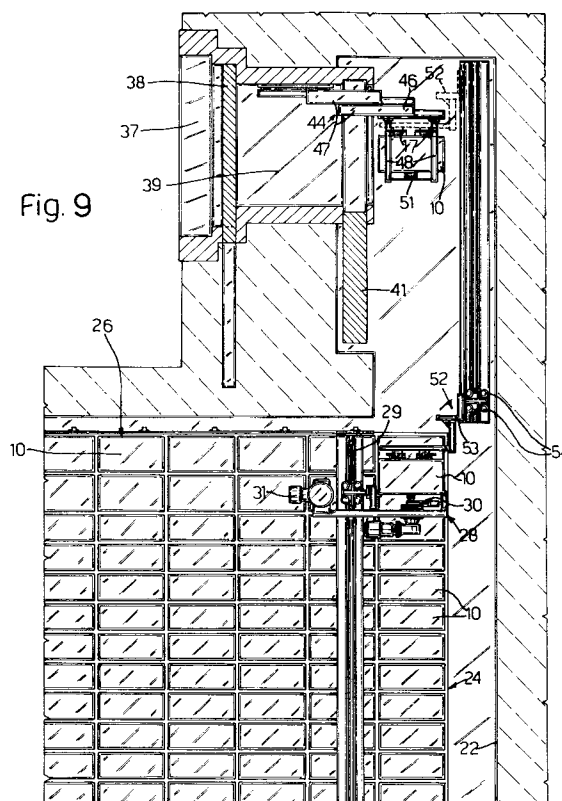


Fig. 9

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The present invention relates to a mechanised system for the storage and transfer of safety-deposit boxes, for example for banks.

In known systems of the said type, the means for moving the boxes include a carriage which can accommodate one box at a time. The carriage is also arranged to be moved vertically relative to the racks for the selection of the seat of the box to be removed or inserted and to carry the box to a consultation station.

In the case of the transfer of safety-deposit boxes in banks, which contain securities and valuables, these known systems do not provide for a complete separation between the consultation rooms and the rooms in which the boxes are deposited (vaults) and hence, in addition to providing poor protection, present the risk of unauthorised persons gaining entry and, for the reasons explained above, do not allow the option of access to the consultation rooms without access to the rooms in the bank.

The result is that it is impossible to use the consultation rooms outside the normal bank opening hours.

The object of the invention is to provide a mechanised system for the storage and movement of safety-deposit boxes which is extremely simple and secure in operation and eliminates the disadvantages of the known systems listed above.

This object is achieved by the system according to the invention, in which the transfer means include a carriage arranged to accommodate one box at a time temporarily and which is movable to select the seat and to displace the box thus accommodated relative to the rack, and which is characterised in that the transfer means are also arranged to hold the box in a transfer space, barrier means being provided between a consultation station and the rack.

In order to provide a better understanding of the invention, several preferred embodiments of the system now be described by way of example with the aid of the appended drawings, in which:

Figure 1 is a side view of a safety-deposit box used in the system of the invention;

Figure 2 is a front view of the box of Figure 1;

Figure 3 is a plan view of the box of Figure 1;

Figure 4 is a median section through a room for the safety-deposit boxes for a bank, incorporating the mechanised and automated system for the storage and transfer of the boxes according to a first embodiment of the invention;

Figure 5 is a section taken on the line V-V of Figure 4 on an enlarged scale;

Figure 6 is a partial vertical section of the detail of Figure 5 in a first phase of its operation;

Figure 7 is the section of Figure 5 in another operating phase;

Figure 8 is a section in plan of a mechanised system according to another embodiment of the invention;

Figure 9 is a partial median section of the system of Figure 8 in one of its operating phases;

Figure 10 is an elevational view of part of Figure 9 on an enlarged scale;

Figure 11 is a section taken on the line XI-XI of Figure 10;

Figure 12 is a partial view of a detail taken on the arrow A of Figure 10;

Figure 13 is a section in plan of a variant of the embodiment of Figure 8;

Figure 14 is a section in plan of another embodiment of the invention;

Figure 15 is a schematic drawing of another embodiment of part of the invention shown in Figure 5;

Figure 16 is a schematic drawing of another embodiment of the part of the invention shown in Figure 15.

With reference to Figures 1 to 3, a safety-deposit box of the type used in banks for the deposit of securities and valuables is generally indicated 10. The box 10 is generally rectangular or square in shape and may have different heights, for example, in accordance with a predetermined module. The box 10 has a base wall 11, a top 12 and four sides 13, 14, 19, 21.

The box 10 houses a casing, termed the "case" in which the securities and valuables are arranged.

Two inverted U-shaped handgrips 16 are fixed to the base 11 at the two opposite sides 13 and 14 while two profiled members 17 of inverted-L section are fixed to the top 12. The two profiled members 17 are of C-shape and are disposed symmetrically relative to each other. Each profiled member 17 has a longer side 18 parallel to one of the other two sides 19 and 21 of the box 10 with the flange of the profiled member facing towards this side. Three sides of the box 10 are fixed to the base 11 and to the top 12 while the fourth side (any one of the sides 13, 14, 19, 21) is normally locked shut, with a key, and can be opened to allow the case to be removed by the user.

The boxes 10 are normally stored in a room 22 (Figure 4) in the bank, generally below ground and fitted with an armoured door 23. The room 22 may house at least one rack 24 with a series of seats 26 for the boxes 10 disposed in a matrix of horizontal rows and vertical columns. In Figure 4, the rows of seats 26 are of three different heights to house boxes 10 of corresponding heights. Generally, there are two racks 24 in the room 22 facing each other and separated by a corridor 27 (see also Figure 5).

A carriage 28 is located in the corridor 27 and

is arranged to receive one box 10 at a time, the carriage being movable in front of the racks 24 to select the seat 26 at which to work. More particularly, the carriage 28 is movable vertically on a column 29 under the action of a geared motor 31 which drives a pinion engaged with a rack. The column 29 is in turn carried by a structure 32 which can run on a rail 33 along which it is moved by a second geared motor 34 by means of another pinion and associated rack. The carriage 28 carries a device 36 for engaging one of the two hand grips 16 to withdraw a box 10 from the seat 26 and to place it on two guides on the carriage 28 parallel to the corridor 27.

The system of the invention includes a consultation station 37 accessible to the user and separated from the room 22 by barrier means including a security door 38, disposed between the consultation station 37 and a transfer space 39, and an armoured door 41 disposed between the space 39 and the room 22. In general, the consultation station 37 is located at the end of the corridor 27 at a higher level than the floor of the room 22, for example as shown in Figure 4. The two doors 38 and 41 are slidable on corresponding vertical guides 42 and 43 and may be opened automatically and in alternation by associated servo-motors not shown in the drawings.

A transfer mechanism, generally indicated 44, is located in the space 39 and includes a support constituted by a slide 46 carried by a telescopic guide device 47. This can be actuated to move the slide 46 between a retracted position within the space 39, shown in Figures 5 and 7, and an extended position shown in Figure 6.

The slide 46 has two pairs of columns 48 which extend downwardly and are spaced apart by the length of the box 10. Each pair of columns 48 carries a cross-member 49 at their lower ends, the cross-member having an appendage 51 adapted to engage the corresponding grip 16 of the box 10. The mechanized system described above functions as follows.

Normally both doors 38 and 41 are closed as shown in Figure 5. The operation may be initiated by suitable commands from the user or from the bank employee. Initially the carriage 28 (Figure 4) is driven to take one of the boxes 10 from its seat 26 and to bring it in front of the door 41. This is now opened, after which the telescopic guides 47 are actuated and carry the slide 46 into the extended position of Figure 6. The appendages 51 of the two cross-members 49 are thus brought into correspondence with the two grips 16.

The carriage 28 now being lowered, the box 10 remains housed with the grips 16 on the two appendages 51. The telescopic guides 47 are then actuated to bring the slide 46 to the retracted

position of Figure 7. Next the door 41 is closed and then the door 38 is opened as shown in Figure 7. The user may now open the locked side of the box 10, take out the case and consult it at the station 37.

After consultation, the user replaces the case in the box 10 still seated on the appendages 51, locks the open side of the box 10 and gives the appropriate command which first causes the door 38 to close and then the door 41 to open. The telescopic guides 47 are then actuated to return the box to the position of Figure 6 from which it is then taken by the carriage 28. While the carriage 28 returns the box 10 to its seat 26, the telescopic guides 47 are retracted and the door 41 is reclosed.

According to the embodiment of the Figures 8 and 9, the consultation station 37, and hence also the transfer space 39, are located on a floor of the building above the floor with the space 22. In this case the box 10 taken up by the carriage 28 is brought in front of the door 41 of the space 39 by a lift 52. This includes a support 53 having two groups of rollers 54 by means of which it can run on two vertical bars 56 (Figure 11) attached to a fixed tubular column 57 of rectangular section.

The support 53 carries a geared motor 58 arranged to rotate a pinion 59 engaged with a rack 60 fixed to the column 57 in order to reciprocate the lift 52 between the position shown in continuous outline in Figure 9 and the position shown in broken outline. Two arms 61 are also cantilevered on the support 53 and each has two L-shaped appendages 62 adapted to engage the horizontal flanges of the profiled members 17 of the box 10.

By way of example, in Figures 8 and 9 the consultation station 37 is above the room 22. The lift 52, and hence the transfer space as well, are disposed at one of the two ends of the corridor 27. In order to transport a box 10 from its seat 26 to the consultation station 37, the lift 52 is located in the lower position of Figure 9 while the carriage 28 is moved to take up the desired box 10 and carry it to the position shown in Figure 9. The latter portion of this movement occurs in a horizontal direction so that the two profiled members 17 are inserted into the appendages 62 of the two arms 61 of the lift 52.

Immediately afterwards, the lift 52 is raised so as to carry the box 10 in front of the door 41. Here the box 10 is transferred to the slide 46 in a manner similar to the transfer between the carriage 28 and the slide 46 described above in relation to Figure 4. The reverse movement of the slide 46 and the lift 52 serves to return a box 10 from the space 39 to the carriage 28.

In the variant of Figure 13, the column 57 of the lift 52, instead of being at the end of the corridor 27, is located in a recess 63 between two

parts of one of the racks 24, in correspondence with the overlying consultation station, not shown. The lift 52 may then be designed so that the two arms 61 project towards the corridor 27. The transfer of a box 10 from the carriage 28 to the two arms 61 of the lift 52 is here effected by the withdrawal device 36 of the carriage 28 in a manner similar to the movement for inserting the box 10 in a seat 26 in the same rack 24.

In both cases of Figures 8 and 13, the racks 24 may be located in pairs in rooms 22 on different floors of the building, each pair having a corresponding carriage 28 for transferring the boxes 10. The various carriages 28 may be served by a single lift 52 (or, alternatively, by several lifts) arranged to move along different paths between the door 41 of the transfer space 39 and the various carriages 28.

In the embodiment of Figure 14, in addition to the pair of racks 24 with their carriage 28, there is another pair of racks 24' in the room 22, forming a second corridor 27'. The pair of racks 24' is parallel to the pair of racks 24 and is served by a corresponding carriage 28'. The lift 52 is located in a recess 63 in one of the racks 24, as in the embodiment of Figure 13, but with the two arms 61 disposed in the corridor 27.

A shuttle mechanism 66 is arranged in a passage 64 in the upper part of the room 22 between the two adjacent racks 24 and 24'. This mechanism is actuated to move a box 10 from that zone of the passage 64 in the rack 24 to the zone of the passage 64 in the rack 24' and vice versa.

A box 10 taken by the carriage 28' from its racks 24' may thus be brought into correspondence with the passage 64. The box 10 is then inserted in the shuttle mechanism 66 by means of the withdrawal device 36 of the carriage 28'. The shuttle transfers it to the zone of the passage 64 in the rack 24 from which it is transferred to the lift 52 by means of the carriage 28.

In the embodiment of Figure 13, the consultation rooms are rotated through 90° with respect to the orientation of the consultation rooms in the embodiments of Figures 4, 8 and 9. Given the specific characteristics of the box 10 which allow any one of its four sides to be opened, the consultation rooms may be oriented on an arc of 360° according to the design requirements of any individual system for any particular bank.

In the embodiment of Figure 15, three different consultation stations 32 for three different users may be provided in correspondence with a single lift 52. Each of these stations 32 is accessible from a separate entrance 67 and may communicate with a space 68 for the lift 52 through a corresponding security door 38.

Here, the arms 61 of the lift 52 are mounted on

a rotatable structure so that they can be oriented towards the desired stations 32 each time. In this case each consultation station 32 has a corresponding transfer space 39 complete with transfer mechanism 44 with telescopic guides 47 and armoured door 41 disposed between the space 68 for the lift 52 and the underlying room 22.

When a box 10 is brought by the lift 52 into correspondence with the stations 32, the door 38 only of the corresponding user is opened automatically and he may thus take up the case from the corresponding box 10 as explained previously. During the consultation, the armoured door 41 is re-closed so that, in this case, the lift 52 may serve another user by taking a box 10 from its respective seat 26 or returning it thereto.

In the embodiment of the Figure 16, a space 71 for the lift 52 connects the room 22 for the racks 24 with an extensive consultation room. The space 71 is closed by an armoured door 41 which is operated automatically. A plurality of consultation stations 32 is arranged in the room along a closed path served, for example, by a conveyor belt 73. After the automatic opening of the armoured door 41 a transfer mechanism 44 mounted, in this case, directly on the lift 52 actuates the telescopic guides 47 to deposit the box 10, by operations similar to those described above, at a station 78 on the conveyor 73 which transfers it to the particular station 32 determined.

Each consultation station 32 is also accessible from a separate entrance 74 and may have access to the belt 73 through a corresponding aperture 75 in correspondence with a consultation table 76 of the respective station 32. Each station 32 is served by a shuttle mechanism 77 with a lifting movement (indicated in broken outline in Figure 16) which takes the box 10 from the conveyor 73, transferring it through the aperture 75 to the consultation station 32. Here a suitable lift raises the box 10 to the consultation table 76 so that the user may take the case from the box 10 as described previously.

After consultation, the user replaces the case in the box 10 and provides a command which starts the reverse operations to return the box 10 to the conveyor 73. The box 10 then reaches the station 78 of the conveyor 73 where the armoured door 41 opens automatically. After this the operations which return the box 10 to the lift 52 and then to the seat 26 in the rack 24 are started.

From the above, the advantages of the system of the invention over known systems will be clear. In fact, the barrier means 38, 41 ensure the maximum security against any attempt by unauthorised person to remove boxes 10 or the entry of unauthorised persons into the storage room 32.

Moreover the complete separation and segregation of the consultation rooms from the box

deposit room in ensured thus completely eliminating any risk of unauthorised persons gaining entry.

The system enables consultation rooms to be used without the need for access to rooms in the bank, thus allowing "full-time" (that is 24 hours a day) consultation and, in particular, at times outside normal bank opening hours.

It is understood that the system described may be varied and improved without thereby departing from the scope of the claims. For example, multiple consultation stations 32 may also be applied to the embodiments of Figures 4, 8 and 13 while it is also possible to provide consultation rooms at different levels. Moreover, other automatic mechanisms and sensors may be added to ensure the correct operation of the system. Finally, a central electronic control unit with a keyboard for the input of commands may be provided for controlling the system and for checking the identity of the users.

Claims

1. A mechanised system for the storage and transfer of safety-deposit boxes, for example for banks, including at least one rack (24) provided with a plurality of seats (26) each adapted to house one of the boxes (10), and transfer means (28, 44, 52) for the boxes (10) for removing a box (10) from the rack (24) and inserting it therein, the transfer means (28, 44, 52) including a carriage (28) adapted to accommodate one box (10) at a time temporarily and which is movable to select the seat (26) and to displace the box (10) thus accommodated relative to the rack (24), characterised in that the transfer means (28, 44, 52) are also arranged to hold the box (10) in a transfer space (39, 68, 71), barrier means (38, 41) being provided between a consultation station (37, 32) and the rack (24).
2. A system according to Claim 1, characterised in that the transfer means (28, 44, 52) include a support (46) adapted to transfer one of the boxes (10) at a time from the carriage (28) to the consultation station (37, 32).
3. A system according to Claim 2, characterised in that the barrier means (38, 41) include a first security door (38) disposed between the consultation station (37, 32) and the transfer space (39), and/or another security door (41) disposed between the transfer space (39) and the rack (24).
4. A system according to Claim 3, characterised in that the other door (41) is normally closed and is opened automatically during the transfer

of a box (10) between the support (46) and the carriage (28), the first door (38) being closed automatically at least during the said transfer.

5. A system according to one of Claims 2 to 4, characterised in that the support (46) is provided on a lift (52) whereby the rack (24) and the consultation station (37, 32) may be located in rooms on different floors in a building.
6. A system according to Claim 5, characterised in that the lift (52) is movable along a rigid vertical guide (57) between the transfer space (39) and a zone adjacent the said rack (24).
7. A system according to Claim 6, characterised in that each of the boxes (10) has a first pair of elements (16) for engagement by the carriage (28) and a second pair of elements (17) disposed in a different position from the first pair, the lift (52) including a pair of arms (61) for insertion in the second pair of elements (17) when the carriage (28) is moved horizontally.
8. A system according to Claim 7, characterised in that each of the boxes (10) has one side (13, 14, 19, 21) which can be opened and which can be locked with a key so as to allow the optimum positioning of the consultation rooms in various orientations with respect to the box deposit room.
9. A system according to one of Claims 6 to 8, in which the carriage (28) is located in a corridor (27) between at least one pair of facing racks (24), characterised in that the lift (52) is located in an end zone of the corridor (27) or in a recess (63) in one of the said racks (24).
10. A system according to Claim 9, characterised in that the lift (52) is movable between at least two floors of rooms (22) for the racks (24) and the transfer space (39), each room (22) having a corresponding associated carriage (28) whereby the rooms (22) may be located on different floors of a building.
11. A system according to Claim 9 or Claim 10, characterised in that at least two pairs of racks (24, 24') are provided, each pair forming a corresponding corridor (27, 27') containing a corresponding carriage (28, 28'), one (24) of the carriages being arranged to carry a box (10) to the lift (52), the other (24') of the carriages being brought to a translation station (60) and a shuttle device (64) being provided at the translation station (60) to move a box (10) between two corresponding positions in

the two corridors (27, 27').

12. A system according to one of the proceeding claims, characterised in that a plurality of consultation stations (32) are provided in communication with the transfer space (39, 68), each of the consultation stations (32) having a corresponding door (38) which can be opened selectively.

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13. A system according to Claim 12, characterised in that the consultation stations 32 of the said plurality are disposed along a closed path served by a conveyor belt (73), means being provided for stopping the conveyor belt (73) selectively with a box (10) in correspondence with a consultation station (32) selected from the said plurality and for actuating the corresponding mechanism (77).

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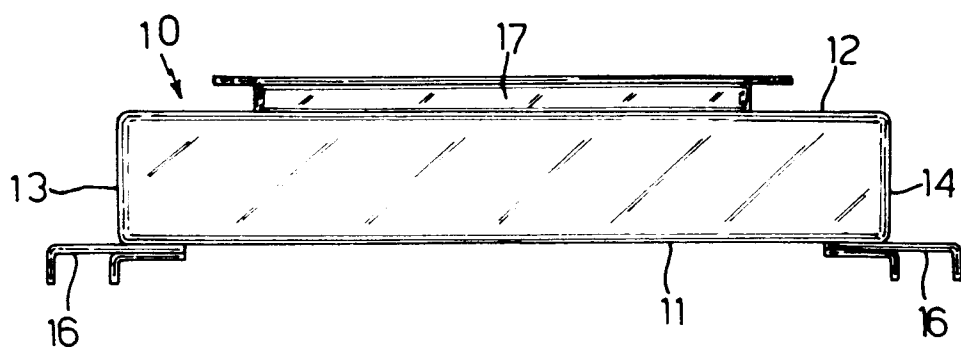


Fig. 1

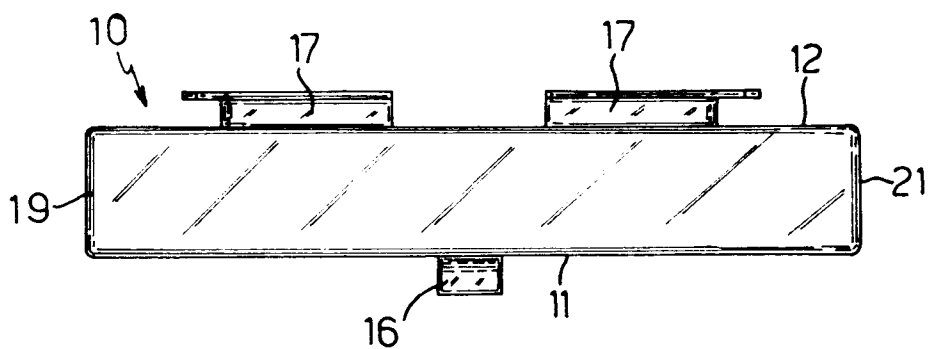


Fig. 2

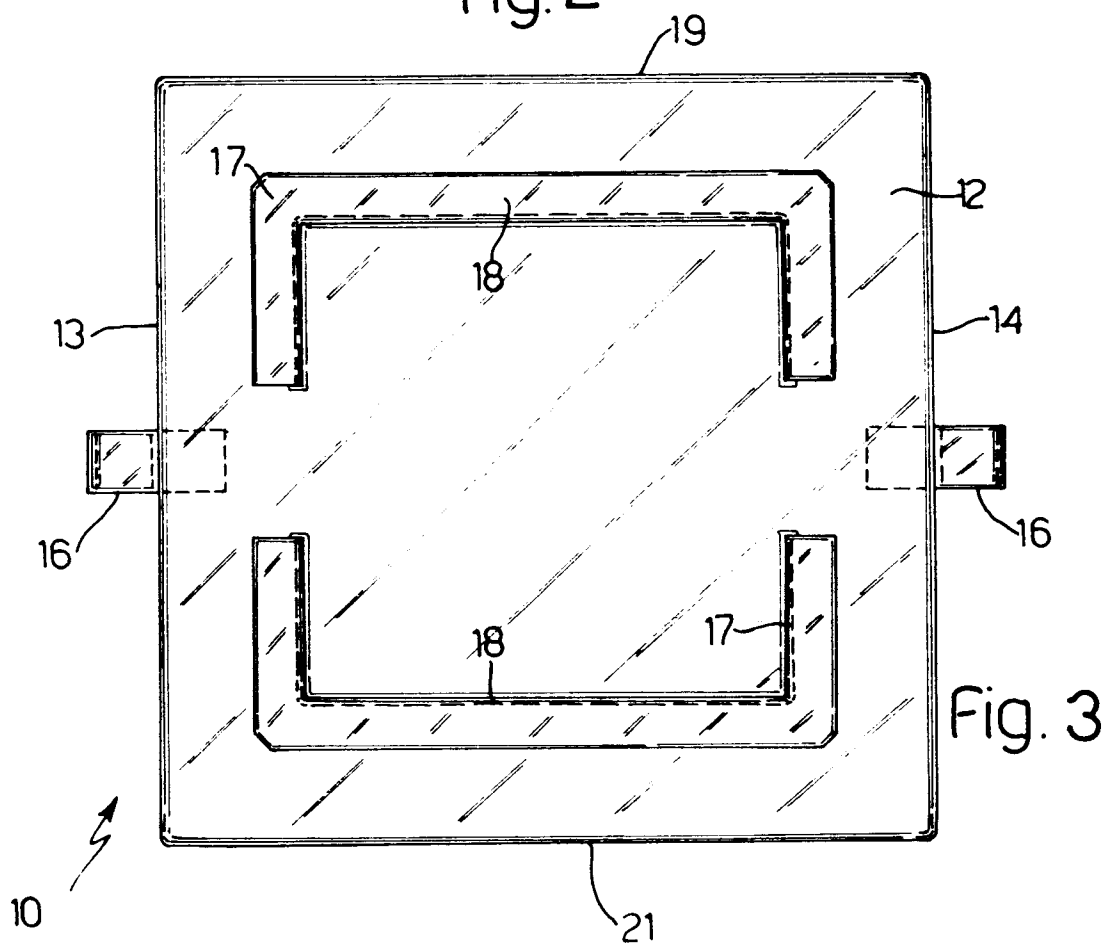


Fig. 3

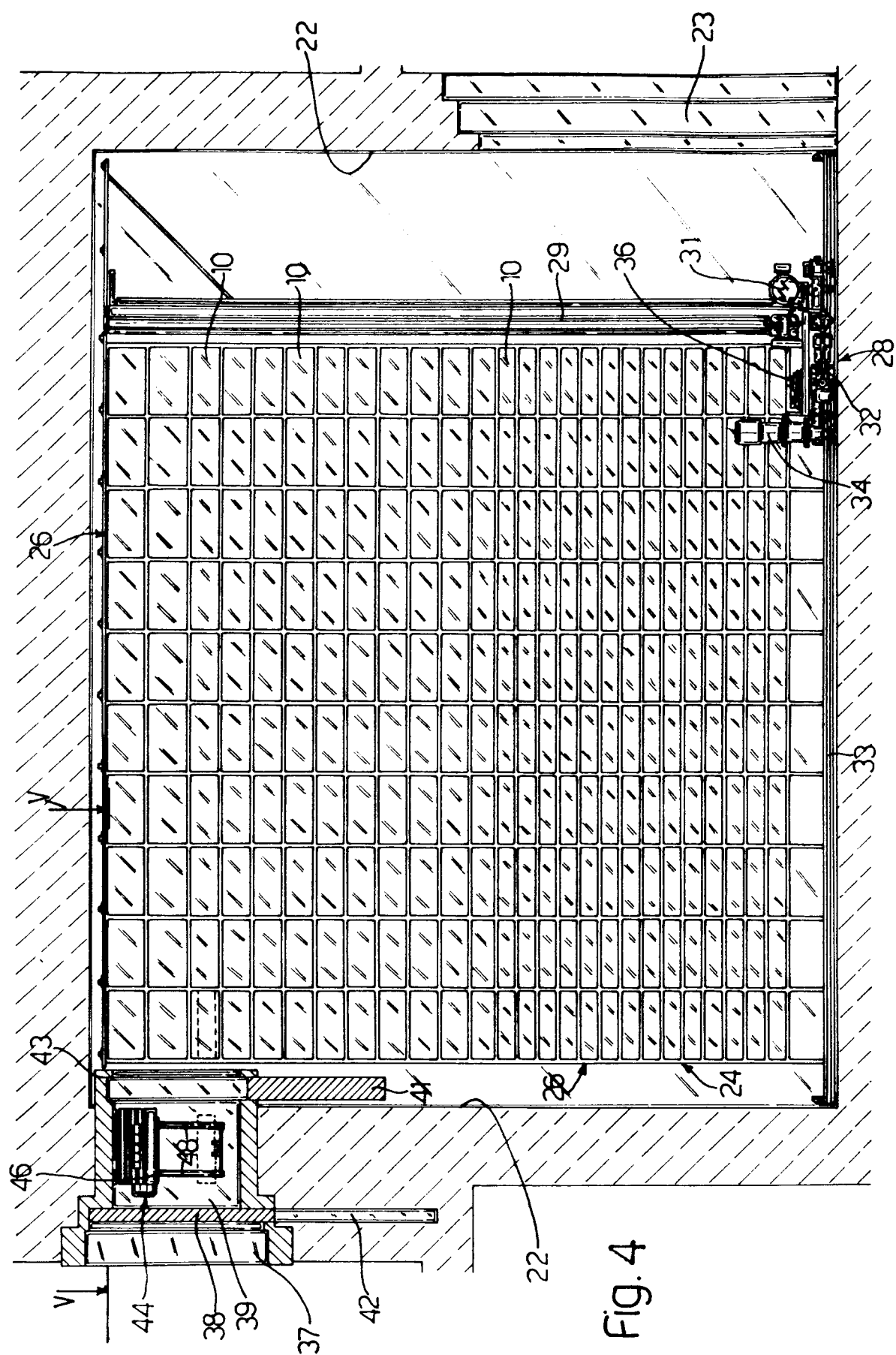


Fig. 4

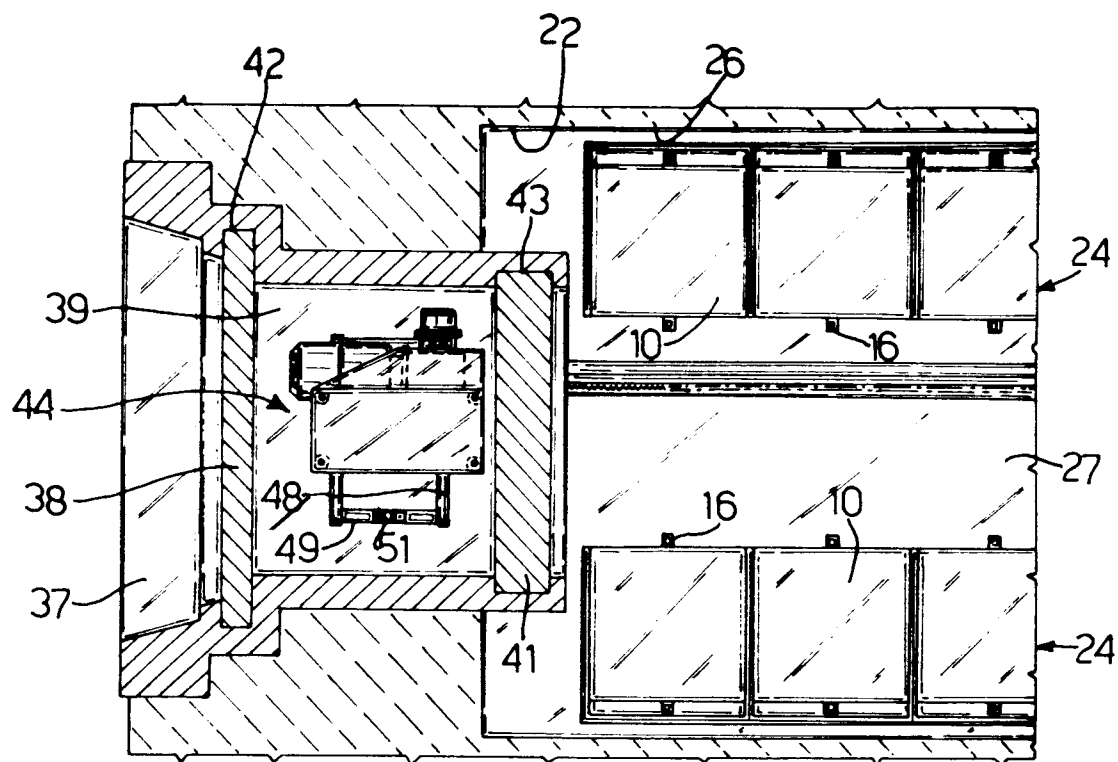


Fig. 5

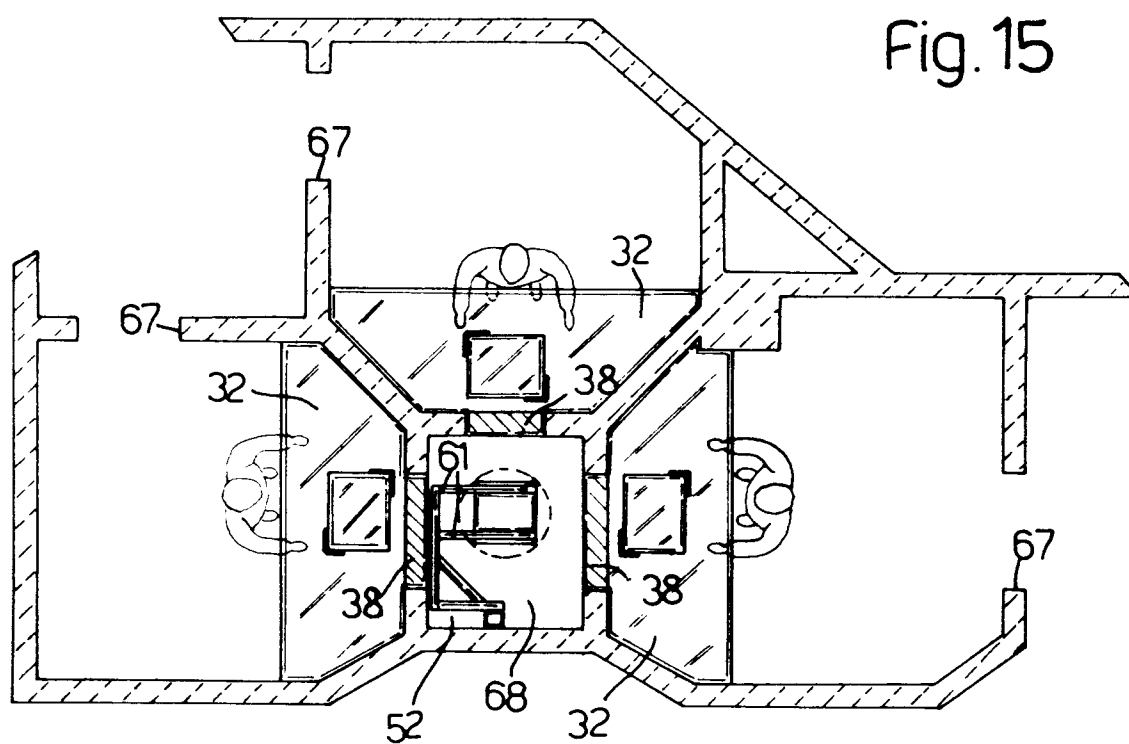


Fig. 15

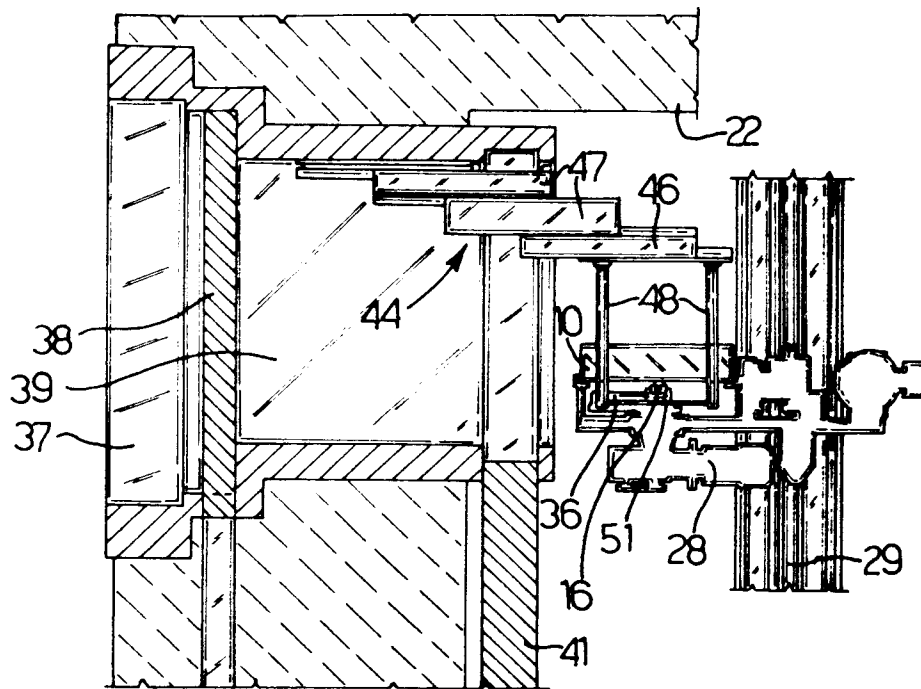


Fig. 6

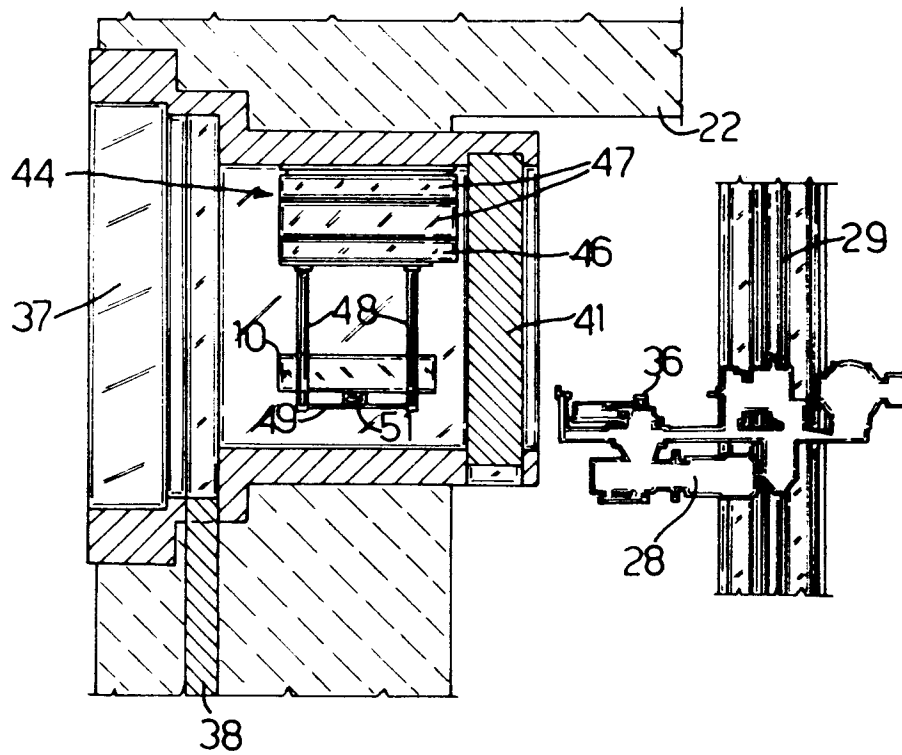


Fig. 7

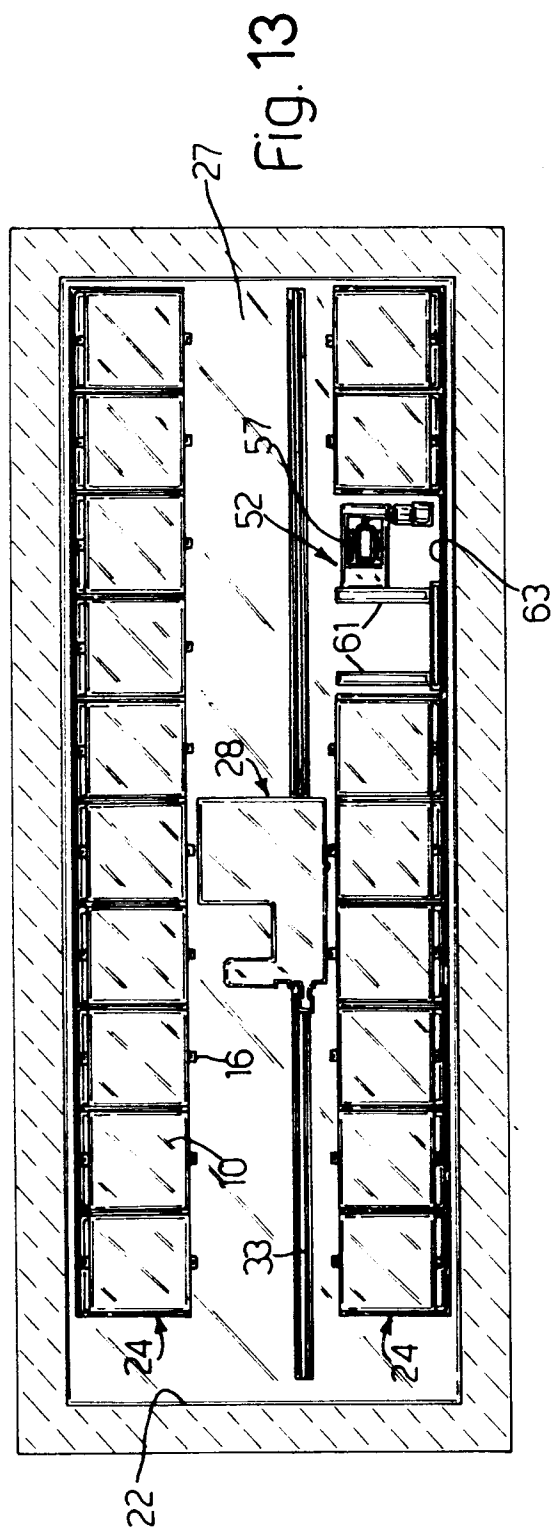
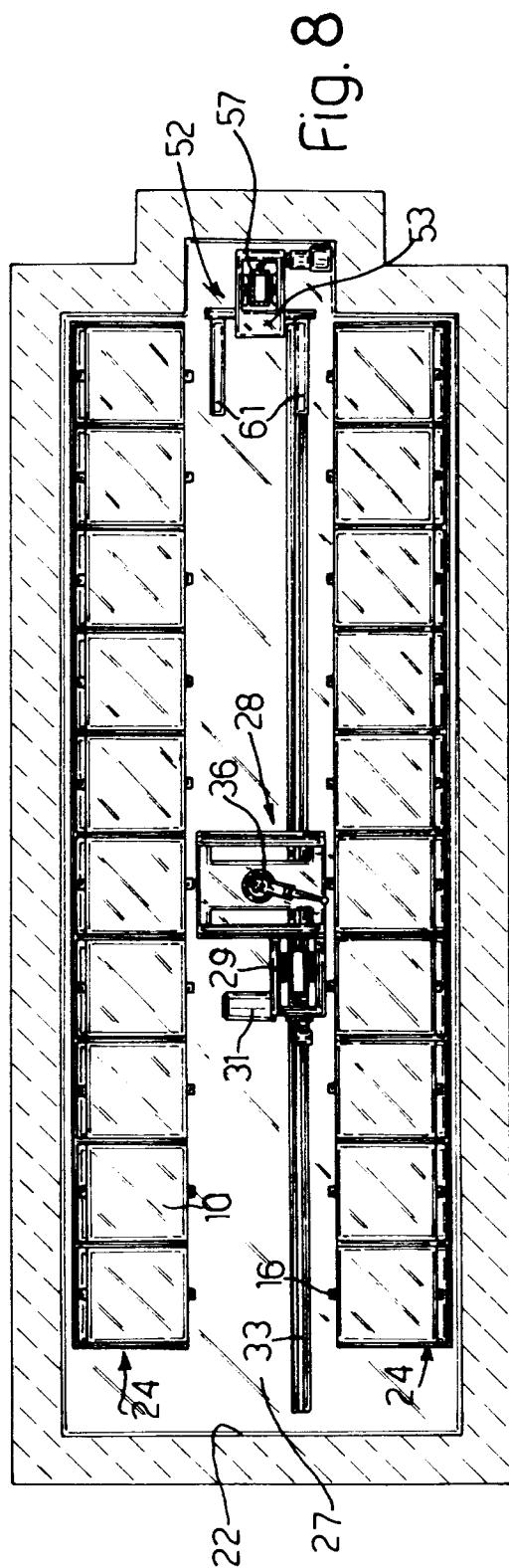


Fig. 9

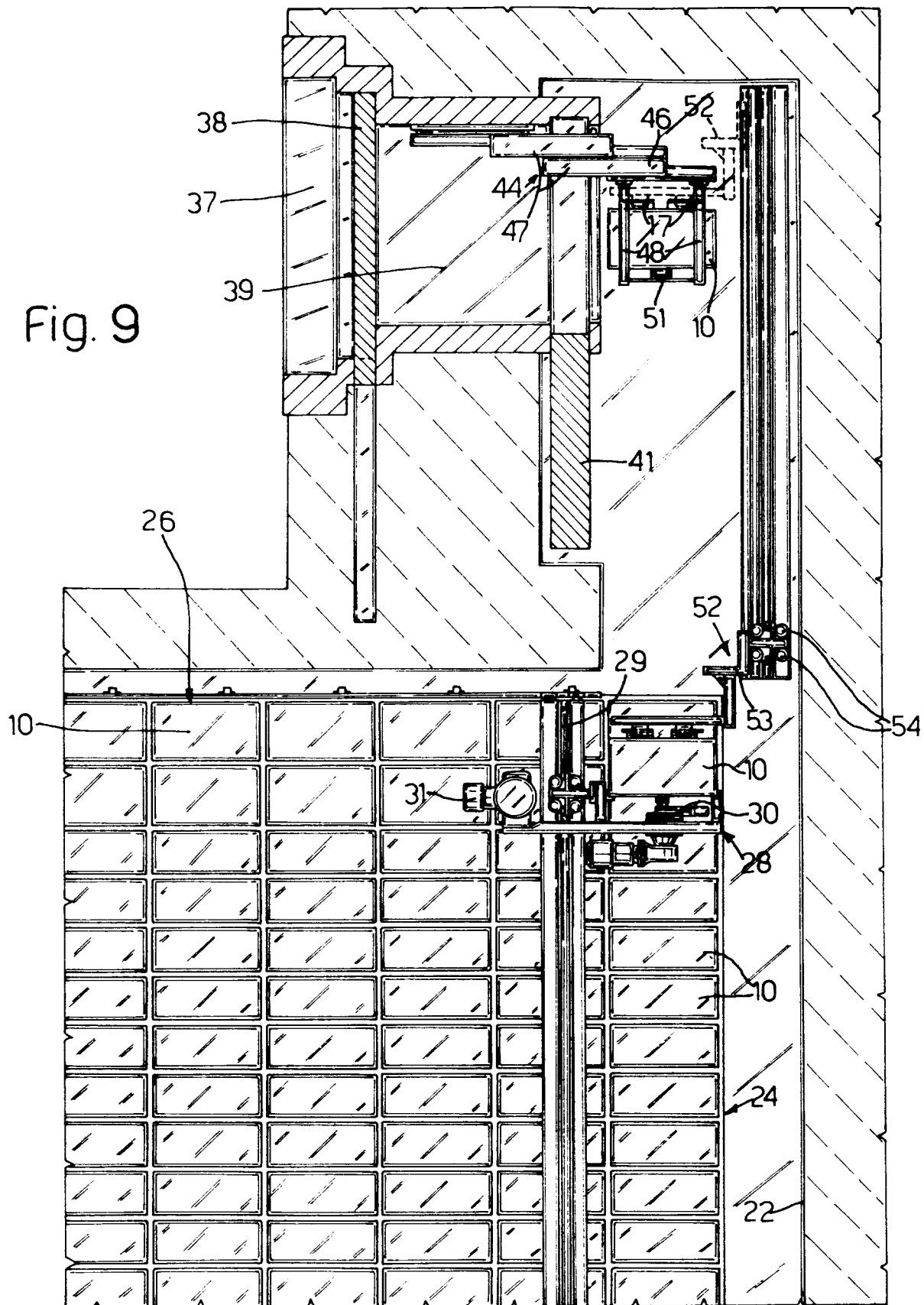
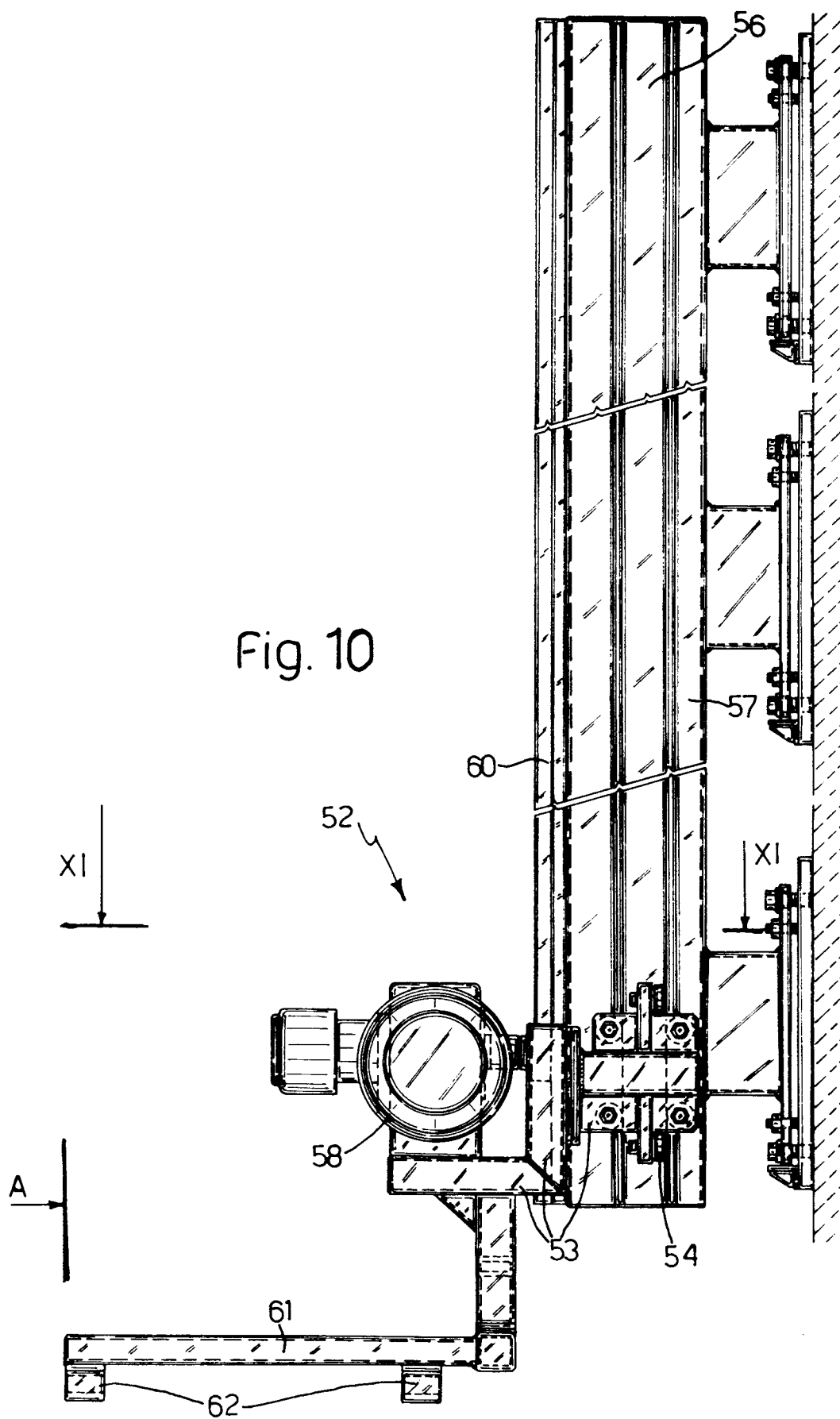
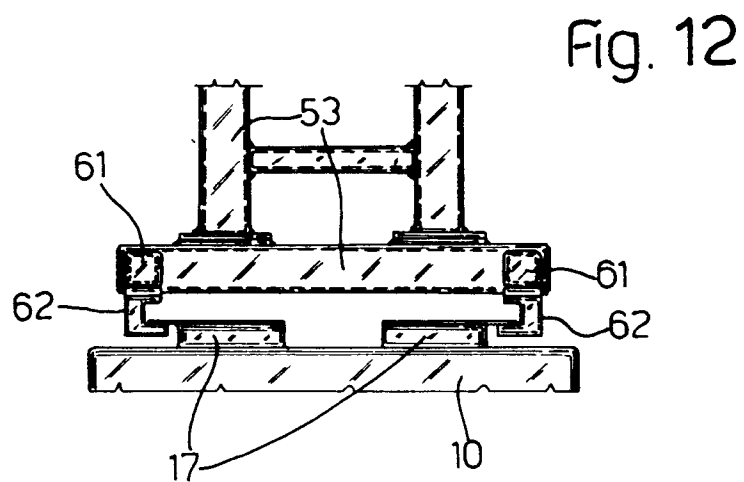
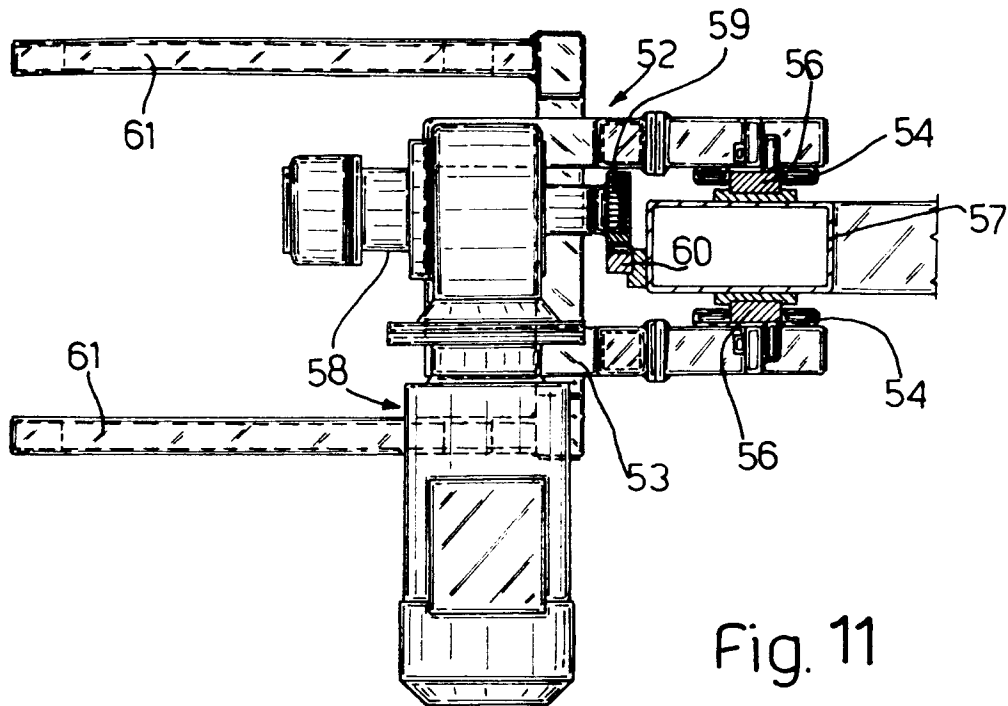


Fig. 10





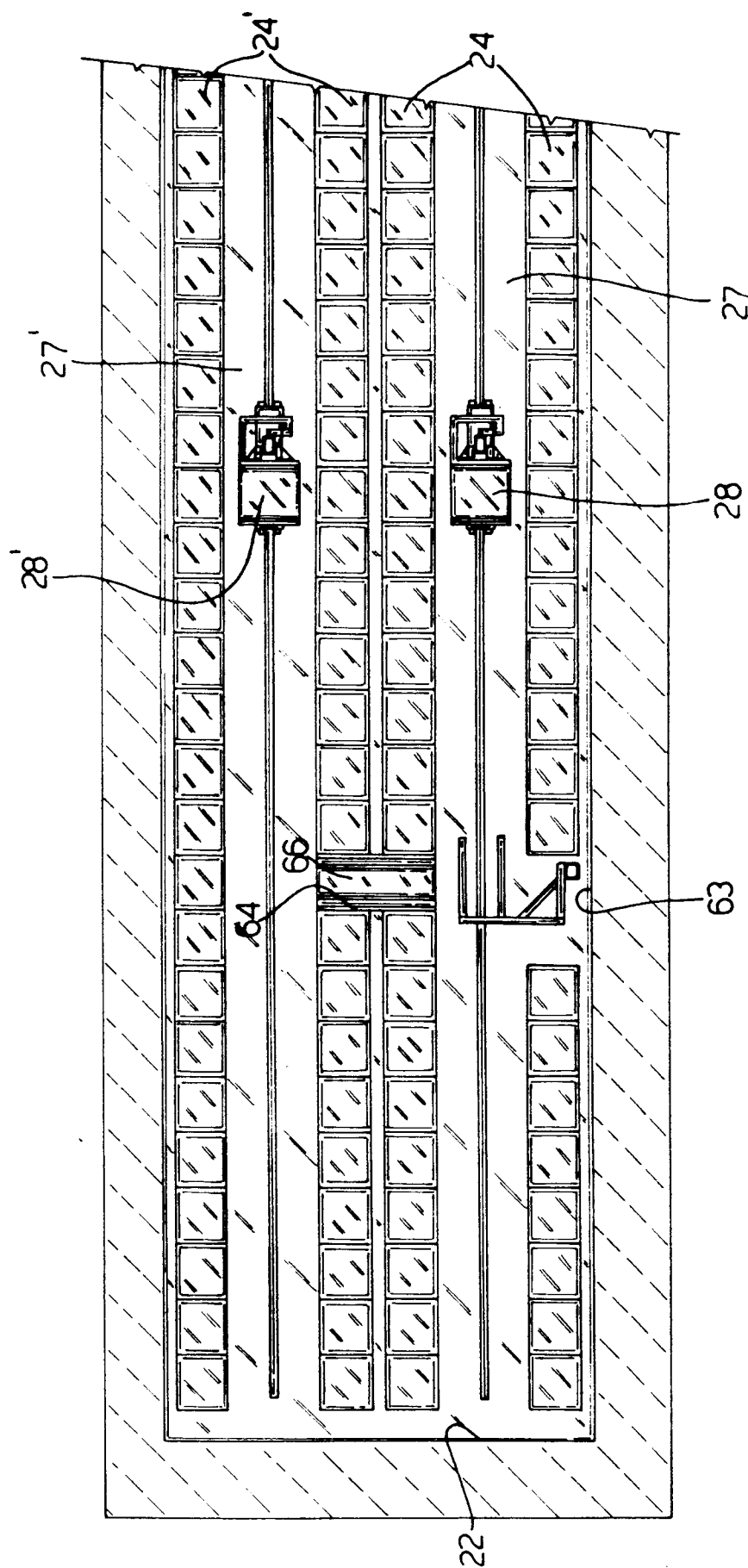
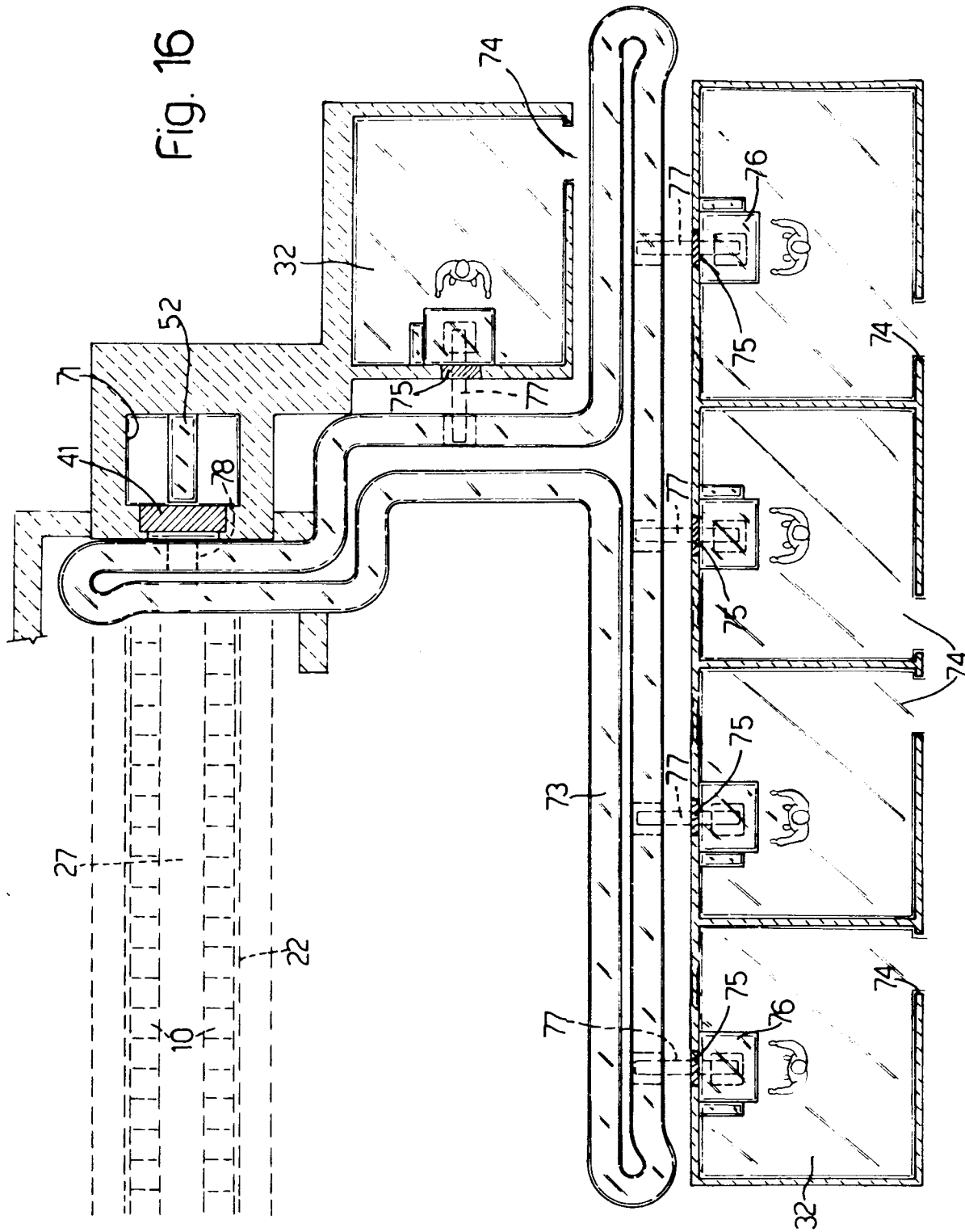


Fig. 14





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EUROPEAN SEARCH REPORT

Application Number

EP 91 12 1859

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)
X	US-A-4 789 293 (ITOKI)	1-3, 12	E05G1/08
Y	* column 1, line 46 - column 4, line 57 *	4-6, 9	E05G7/00
A	* column 8, line 3 - line 21 * * column 8, line 28 - line 39 * * column 8, line 50 - column 9, line 9; figures 1, 2, 4 *	13	

X	FR-A-2 245 546 (ROBUR KONSULT AB.)	1	
Y	* page 5, line 10 - line 39 *	4-6, 9	
A	* page 6, line 11 - line 37 * * page 7, line 25 - page 8, line 24; figures 1-6, 10, 11 *	2, 3, 7, 8	

A	EP-A-0 310 557 (VIDMAR) * column 2, line 20 - line 24 * * column 2, line 60 - column 3, line 27; figure 3 *	1, 5-10, 12	

A	US-A-3 620 389 (F. MUNCK) * abstract * * column 1, line 9 - line 11 * * column 1, line 63 - column 2, line 58; figures 1-3 *	11	TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A	US-A-4 692 876 (TENMA) * column 14, line 36 - line 42 * * column 16, line 63 - line 68; figure 24 *	13	E05G B65G

The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 19 MARCH 1992	Examiner GUILLAUME G. E. P.
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			