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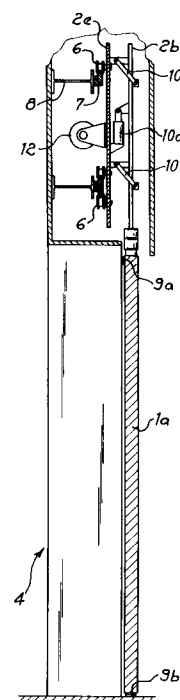
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I-20123 Milano (IT)(54) **Safety door with guided movement and free rotation.**

(57) An automatic safety door comprising at least one leaf (1a) which is integral with supporting means (2a, 2b, 2e) which can be caused to move relative to fixed supporting means in linear motion by drive means (12), this attachment between the leaf (1a) and the supporting means (2a, 2b, 2e) being achieved through means (1b, 2c) which allow the leaf to rotate with respect to the supporting means in any position which it may reach during its linear lateral motion, and in which means are provided for moving the leaf (1a) so as to raise/lower it upwards/downwards and outwards/inwards to engage/disengage members (9a, 9b) providing a seal against the corresponding contact surfaces.

Fig. 6**EP 0 556 882 A1**

This invention relates to a safety door which can be moved in a straight line by automatic means and is caused to rotate by a force exerted against the door in order to open it in emergency conditions.

It is known that in all spaces to which the public has access, such as exhibition halls, shops and even hospitals and operating theatres, it is necessary to have automatically operated doors so as not to obstruct the persons passing across the threshold, but which at the same time can be caused to open by a mere push when emergency conditions arise within the space which make it necessary to vacate the premises quickly.

Some embodiments of safety doors which however require manual or similar operations before they will open under emergency conditions are also known.

There therefore arises the technical problem of constructing a safety door for closed premises which is capable of being operated both manually and automatically under conditions of normal use and which at the same time is capable of being operated so that it will open from the interior by means of mere pressure upon it so as not to constitute an impediment to vacation of the premises under emergency conditions.

Within the scope of the aforementioned technical problem a further scope of this invention is to provide in automatic door which once it is closed will provide a seal in order to maintain particular conditions within the space, such as for example in the case of operating theatres in hospitals in which isolating conditions must be maintained in order to safeguard the theatre from possible bacteriological contamination, and for the proper functioning of the conditioned air circulation. These problems are resolved according to this invention by an automatic safety door which comprises at least one leaf which is integral with supporting means which are capable of being moved relative to fixed supporting means in a straight line through the action of drive means, this coupling between the leaf and the supporting means being provided by means which allow the leaf to rotate with respect to the supporting means in any position reached during the straight lateral movement, means being also provided to raise/lower the door upwards/downwards and inwards/outwards to engage/disengage the sealing members on the corresponding contact surfaces.

In accordance with the invention it is provided that the said means supporting the leaf are substantially constructed of a frame which can be coupled by means for fixing and adjustment of alignment to a front opposing frame which is in turn integral with a rear flange supporting rolling means which rolls on fixed rails and that the said coupling

means between the leaf and the frame substantially comprise a vertical pin having a lower part which is integral with the leaf and an upper part which is keyed onto a bush which is integral with the frame, thus permitting rotation of the leaf with respect to the frame.

More particularly the door according to the invention also provides that the said means for raising/lowering upwards/downwards substantially comprise a pair of levers whose ends are hinged on the front opposing frame and the rear flange respectively and a double acting piston capable of exerting a straight thrust in a vertical direction and in two directions thus forcing the front frame to rotate towards the exterior/interior and thus upwards/downward relative to the fixed part.

Means for engaging the leaf with the frame provided with elastic means for adjusting the thrust force which effects immobilisation and seals substantially comprising sections which are placed on the perimeter of the inner surface of the leaf and on the lower edge thereof opposite the floor are also provided.

Further details and features of the door according to this invention will be more apparent from the following description with reference to the appended drawing in which:

- Figure 1 shows a partial cross-section of the door according to the invention,
- Figure 2 shows a front view of the door in Figure 1,
- Figure 3 shows a cross-section along the plane of the line III-III in Figure 2,
- Figure 4 shows details of the device providing support and straight guidance for the door,
- Figure 5 shows a cross-section along the plane of the line V-V in Figure 1,
- Figure 6 shows a partial cross-section along the plane of the line VI-VI in Figure 1,
- Figure 7 shows a magnified detail of the moving device for releasing a door according to the invention in conditions where a seal is required.

As illustrated in the figures, a door 1 according to the invention substantially comprises at least one leaf 1a which below is substantially free with respect to the floor and above is integral with a supporting frame 2a which in turn can be attached to an opposing frame 2b by means of bolts 3a and dowels 3b which adjust the coupling so as to ensure that the door is correctly positioned and aligned with respect to the floor, with respect to which the door must be free to move.

As illustrated in Figures 1 and 5, the door is supported by jambs 4 comprising panels 4a inserted into uprights 4b of a known type which is

not described in detail.

The leaf 1a is then made integral with frame 2a by means of a pin 1b whose upper end is keyed into a bush 2c housed in frame 2a in such a way that the leaf can rotate with respect to the frame as will be more particularly described below.

On the side opposite to the pin 1b the leaf 1a has a flange 1d provided with a seat 1f which can be connected to a corresponding securing member 5 mounted on an opposing flange 2d integral with frame 2a. This securing member is provided with elastic means 5a to adjust the thrust which is applied against flange 1d in order that the force necessary to release the leaf and allow it to rotate with respect to frame 2a about pin 1b can be adjusted.

As illustrated in Figures 2 and 4, opposing frame 2b supporting the door comprises a shaped member connected to a corresponding rear flange 2e bearing wheels 6 which can roll and be guided on rails 7 supported by long bolts 8 which are in turn secured into uprights 4b. As illustrated in Figures 5 and 7, where a seal is also required the leaf is provided with seals 9a and 9b which are located on the inner edge and the lower front edge of the floor respectively, and in this case the door support also provides means for relative movement of the door with respect to the uprights comprising a pair of levers 10 which are made integral to front supporting flange 2b and rear supporting flange 2e by means of pins 10a and 10b, between which flanges is also located a piston 10c whose shaft exerts a thrust and/or restoring force in frame 2b which is forced by means of said levers 10 to rotate upwards and therefore outwards.

The door according to the invention also makes provision for operation by means of a double acting pneumatic piston 12 supplied from an accumulator tank which is not illustrated.

The door operates as follows: under normal conditions, when the start of cycle control, which comprises e.g. any sensor of a known type to detect the presence of a person, is activated, piston 10c is activated and this forces the door to rotate outwards and upwards to release seal sections 9a, 9b from their corresponding contact surfaces and prevent friction against the latter; once it has reached the aligned position piston 12 is activated and this causes the door to move laterally in a straight line to open until an end-of-travel signal causes it to stop, after a predetermined waiting time piston 12 starts the return travel which returns the door to the closed position, in accordance with which piston 10c begins its return travel moving the leaf 1a downwards and inwards, bringing about contact between sections 9a and 9b against the corresponding striking surfaces thus ensuring the desired seal.

Because of the thrust force required for opening the leaf in lateral movement is taken from the said accumulation tank, the leaves may also be operated for a certain number of times even if there should be no electrical power.

When a hazardous situation therefore arises within the premises as a result of which the persons within have to abandon the premises, more pressure exerted on the leaves 1a will cause securing member 5 to disengage from flange 1d leaving leaf 1a to rotate freely around frame 2a by means of pin 1b thus permitting outwards rotation and therefore the unrestricted flow of persons. It will be seen that the absence of lower guide pins allows this rotation to take place when the leaves are in any even partly opened position, thus ensuring the safety of the persons within the premises.

Claims

1. An automatic safety door characterised in that it comprises at least one leaf (1a) which is integral with supporting means (2a, 2b, 2e) which can be moved relative to fixed supporting means (4) in linear motion by drive means (12), the said connection between leaf (1a) and supporting means (2a, 2b, 2e) being achieved by means (1b, 2c) which allow the leaf to rotate with respect to the supporting means in any position reached during its linear lateral motion, means also being provided for moving the leaf (1a) so as to raise/lower it upwards/downwards and outwards/inwards in order to engage/disengage the seal members (9a, 9b) from the corresponding contact surfaces.
2. A door according to claim 1, characterised in that the said supporting means of the leaf (1a) substantially comprise a frame (2a) which can be attached by means of attachment (3a) and adjustment of alignment (3b) to a front opposing frame (2b) which is in turn integral with a rear flange (2e) supporting rolling means (6) which can roll on fixed rails (8).
3. A door according to claim 1, characterised in that the said means of attachment between the leaf (1a) end frame (2a) substantially comprise a vertical pin (1b) which has a lower part integral with the leaf and an upper part keyed onto a bush (2c) which is integral with the frame (2a) thus permitting the leaf (1a) to rotate with respect to the frame (2a).
4. A door according to claim 1, characterised in that the said means for raising/lowering upwards/downwards substantially comprise a

pair of levers (10) whose ends are hinged on the opposing front frame (2b) and the rear frame (2e) respectively and a double acting piston (10c) which can apply a linear thrust in the vertical direction and in the two directions thus forcing the front frame (2b) to rotate outwards/inwards and therefore upwards/downwards.

5. A door according to claim 1, characterised in that means (5) are provided to attach the leaf to the frame (2a) equipped with elastic means (5a) for adjusting the thrust force which secures the doors.
6. A door according to claim 1, characterised in that the said sealing means (9a, 9b) substantially comprise sections placed on the perimeter of the inner surface of the leaf (1a) and the lower edge thereof which is against the floor respectively.

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Fig.1

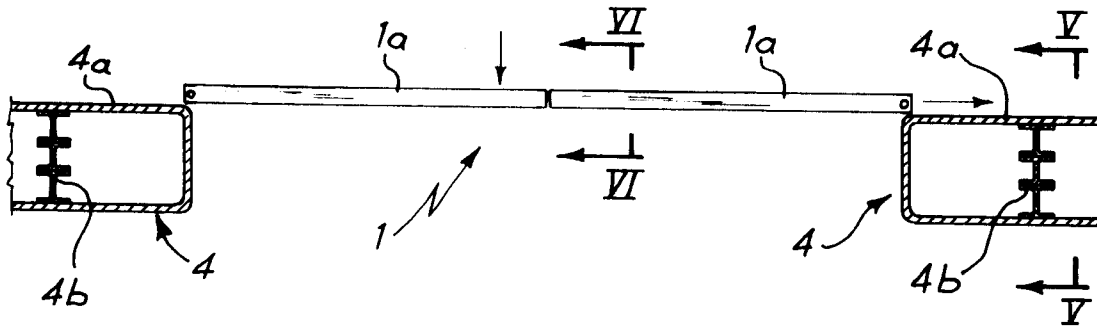


Fig.2

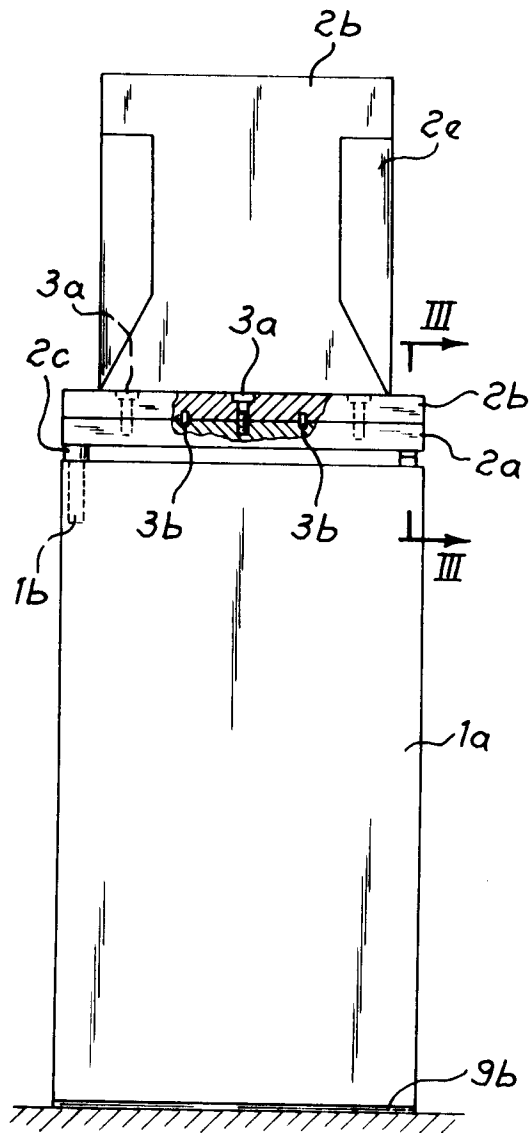


Fig.4

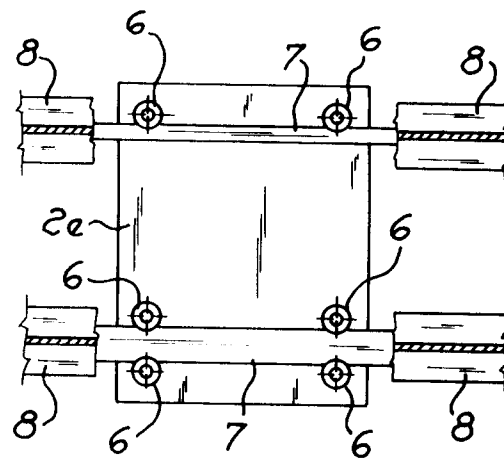
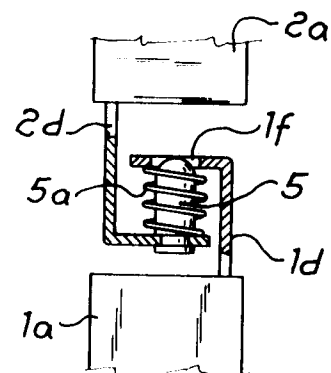


Fig.3



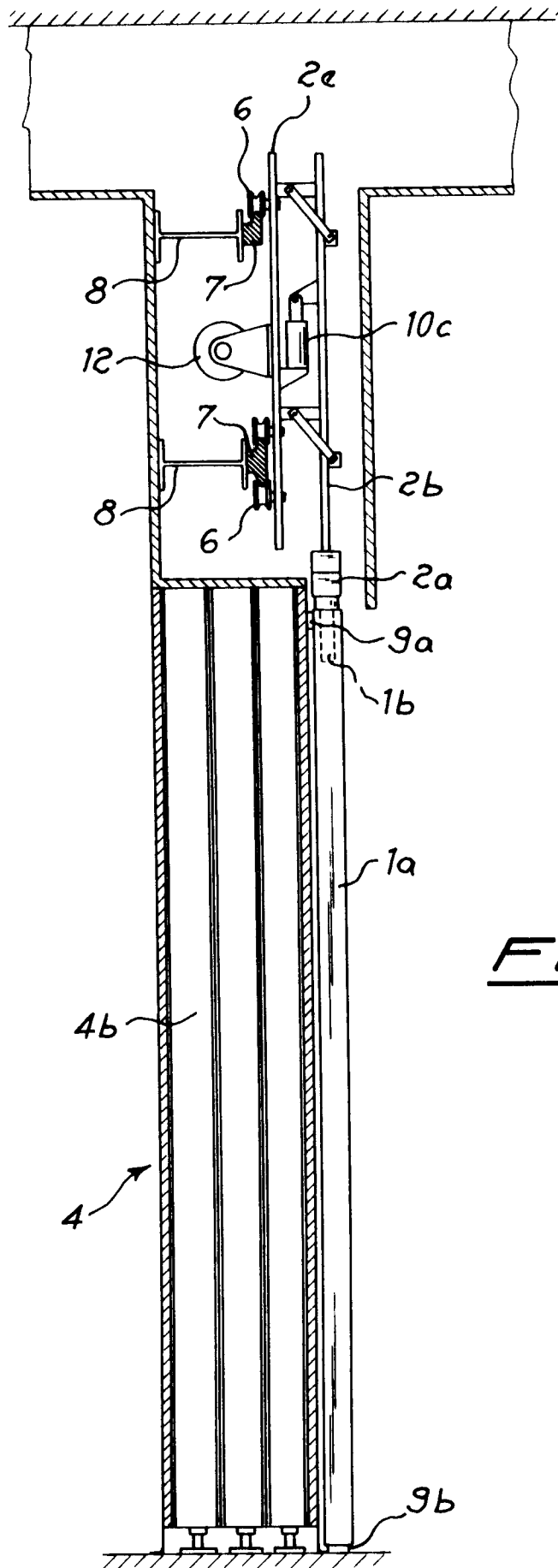


Fig. 5

Fig. 6

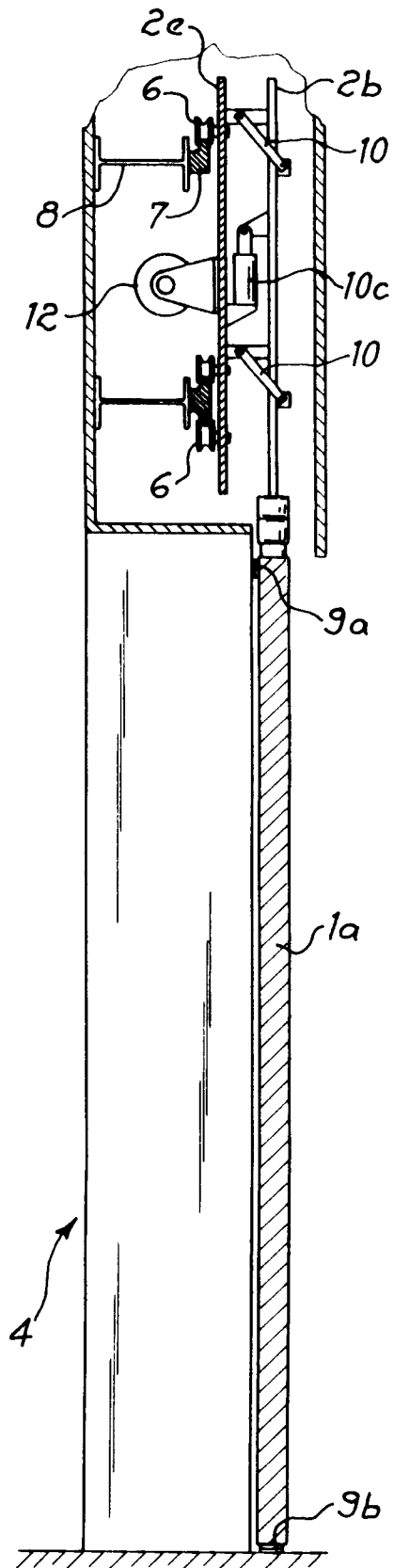
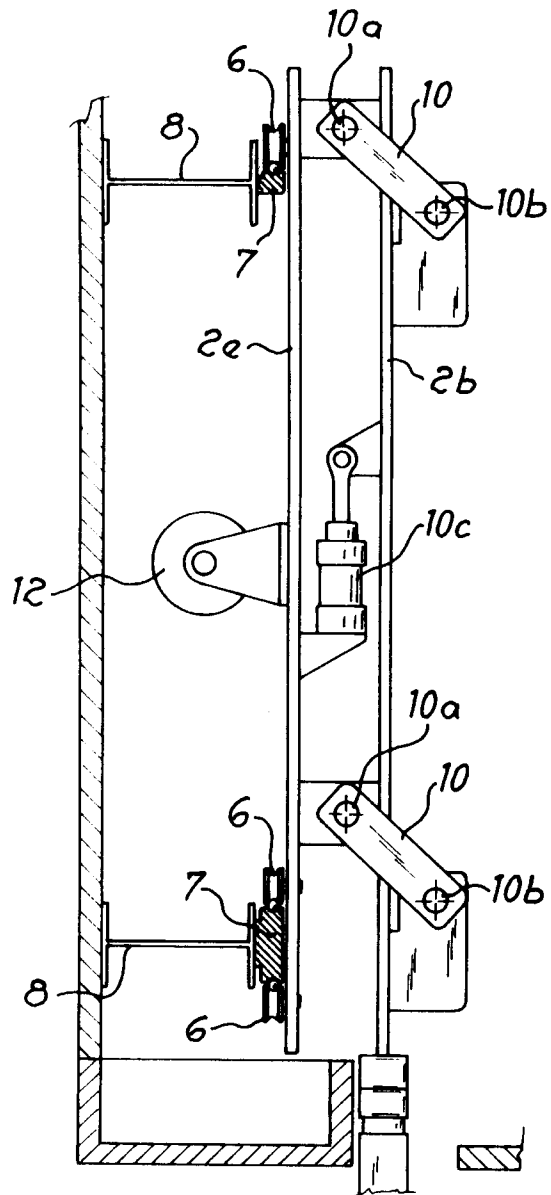


Fig. 7





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EUROPEAN SEARCH REPORT

Application Number

EP 93 20 0176

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)
Y	GB-A-1 263 136 (THE STANLEY WORKS) * page 1, line 76 - page 4, line 124; figures * ---	1-3,5,6	E06B3/50 E06B3/46 E05D15/58 E05D15/06
Y	DE-A-2 053 689 (GABLER) * page 4, paragraph 5 - page 5, paragraph 2; figures * ---	1-3,5,6	
A	US-A-3 412 507 (STERNER) * column 2, line 19 - column 4, line 45; figures * -----	1,4,6	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			E06B E05D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 13 MAY 1993	Examiner DEPOORTER F.
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			