United States Patent [19]

Petit

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[54] **TRAPDOOR FOR SMOKE EDUCTION**

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[30] **Foreign Application Priority Data**

Aug. 31, 1971 France 71.31539

[52] **U.S. Cl.** **98/43,** 49/1, 49/141, 49/465, 98/86

[51] **Int. Cl.** **F24f 7/06**

[58] **Field of Search** ..... 49/1, 7, 8, 141, 463, 465; 98/40 VT, 43, 43 A, 43 PS, 43 R, 86

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Attorney, Agent, or Firm—Dwight H. Smiley, Imirie and Smiley

[57] **ABSTRACT**

The trap-door comprises a wall provided with a communication opening edged by a rabbet in which is included a frame, at least lower side thereof being inclined downwards to delimit a sliding plane for a framing surrounding a panel maintained by at least one lock.

11 Claims, 7 Drawing Figures

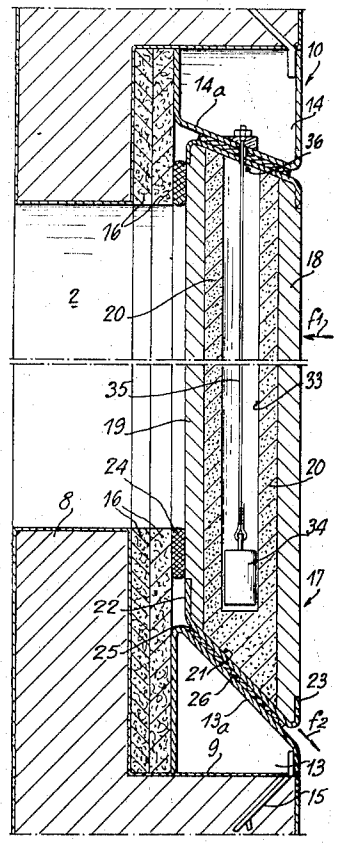


Fig.3.

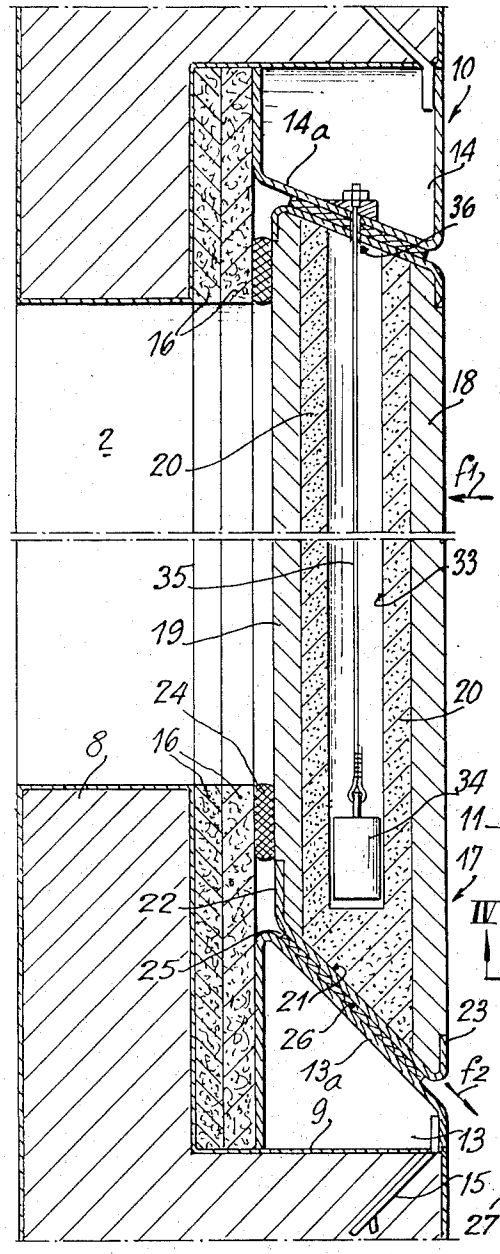


Fig.1.

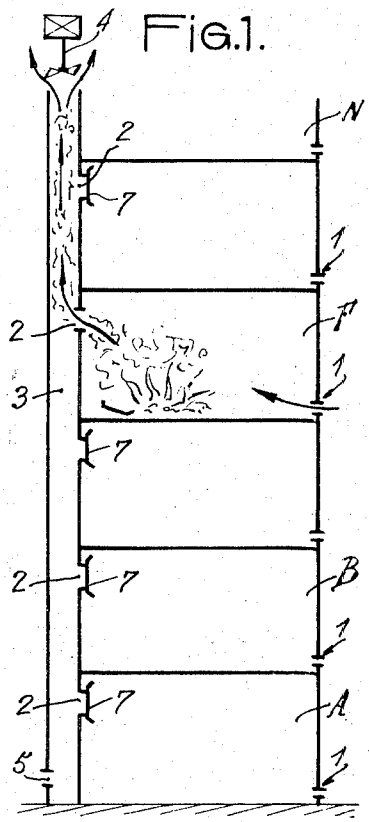


Fig.2.

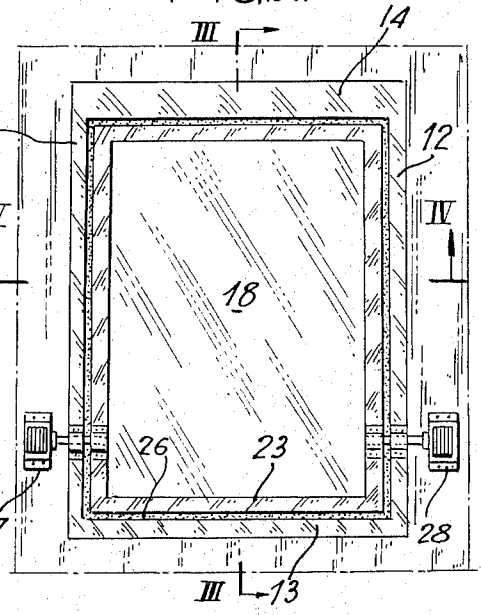


Fig.4

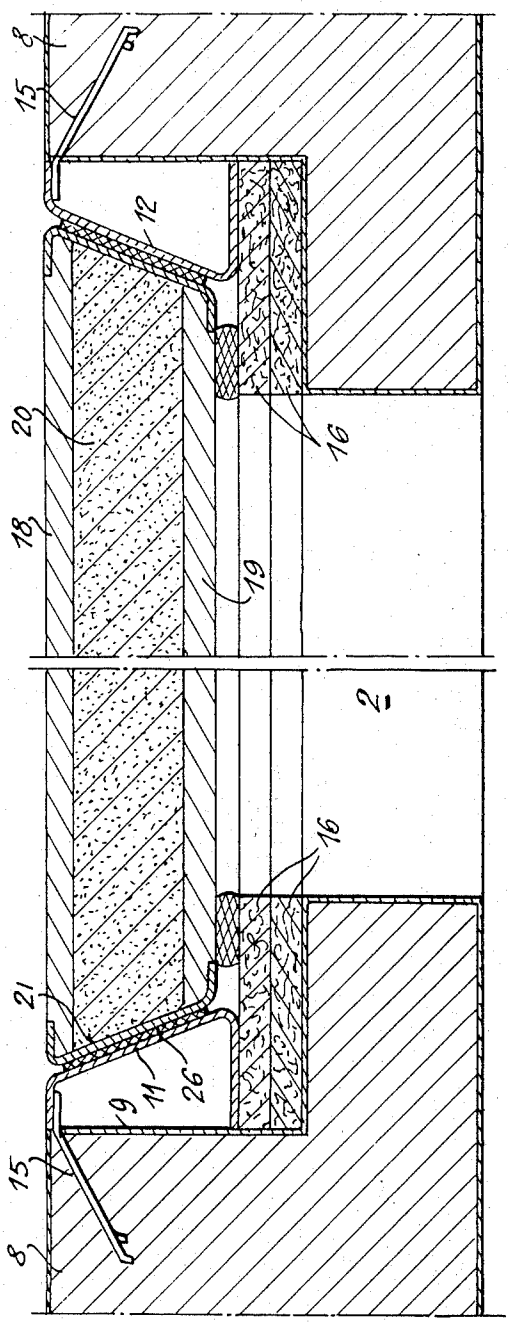
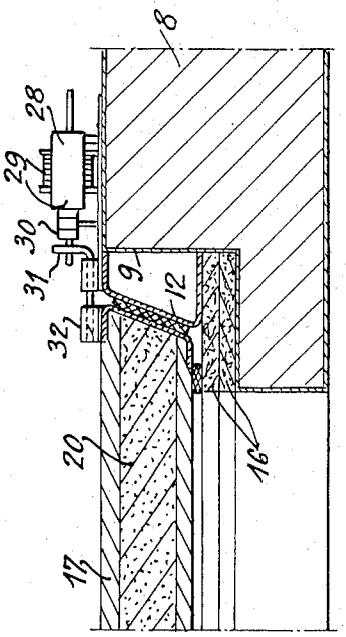
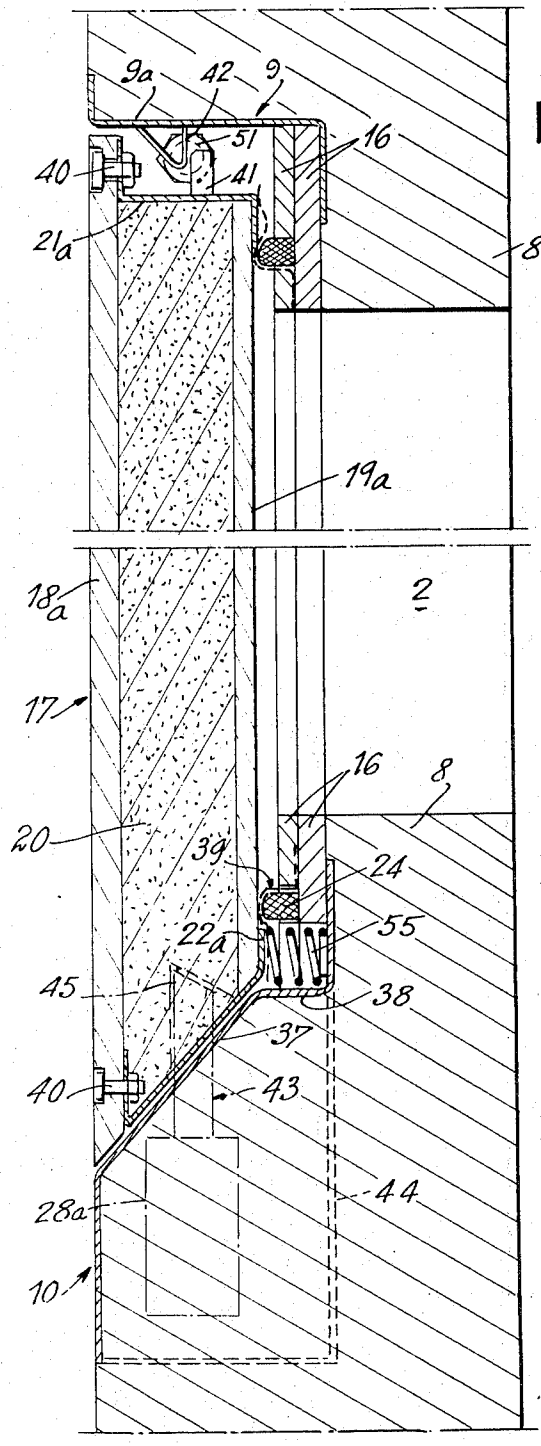


Fig.5.




9a
42
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19a
18a
2
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22a
55
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38
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28a
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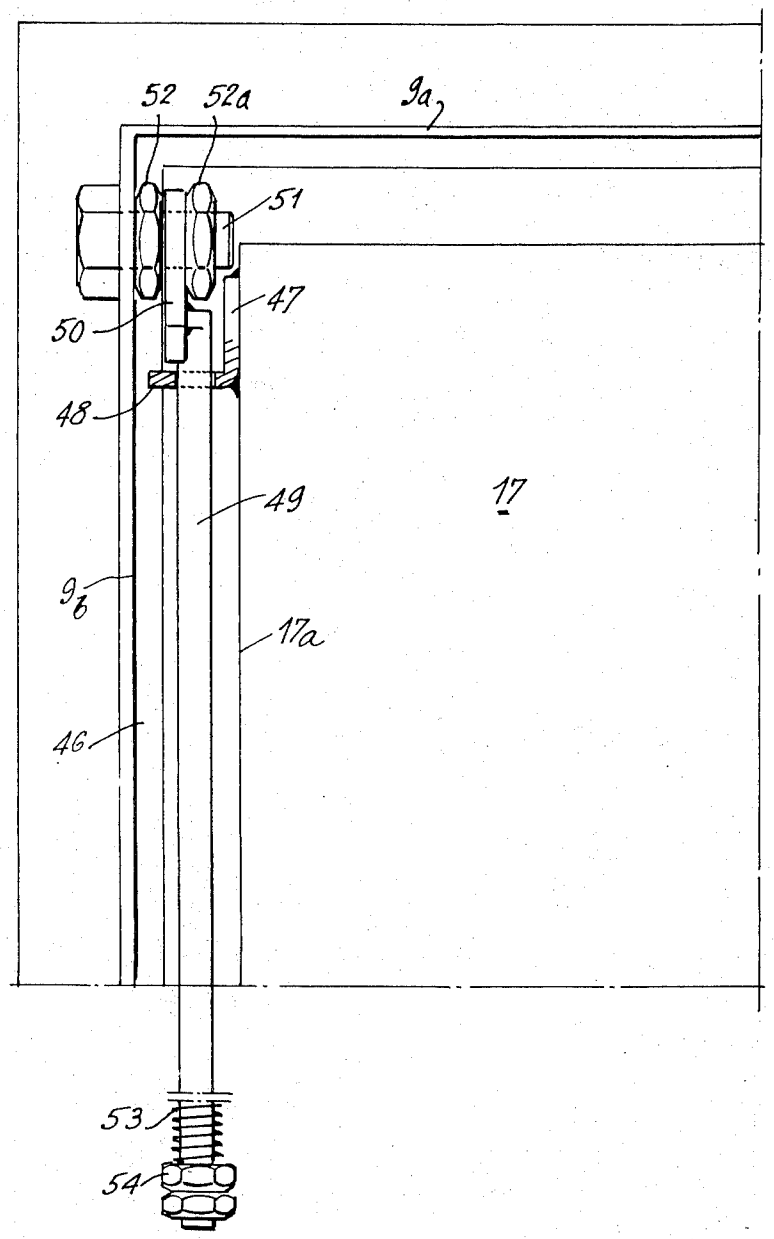
Fig.6.

Fig. 7.



TRAPDOOR FOR SMOKE EDUCTION

The present invention relates to a trap-door providing eduction of the smoke caused by a fire on one of the floors of a building. Said trap-door can be remote controlled to make possible the approach of a seat of a fire in the most advantageous conditions to provide putting out of said fire and fast evacuation of people.

Because of the design of the trap-door, the trap-door of the invention is of an extremely accurate operation, even if it is submitted to a high raise in temperature.

According to the invention, the trap-door for smoke eduction in various buildings comprising an eduction passage having to be selectively put in communication with upper portion of each of successive dwelling floors of a building is characterized by a wall which is provided for insulating the eduction passage from each floor of the building, said wall having a communication opening flanged by a deep rabbet opening towards each dwelling floor and in which is included a substantially rectangular metallic frame, said frame having at least lower side thereof which is inclined towards said dwelling floor to delimit a sliding plane for a metallic framing of a complementary shape peripherically surrounding an insulating panel having a framing which is maintained against said frame by at least one lock.

Various other characteristics of the invention are moreover revealed from the following detailed description.

Embodiments of the invention are shown by way of none restrictive examples in the accompanying drawings.

FIG. 1 is a diagram of a construction building embodying trap-doors for smoke eduction according to the invention.

FIG. 2 is a front view of the trap-door of the invention. FIG. 3 is an enlarged transverse sectional view taken along line III—III of FIG. 2.

FIG. 4 is a transverse sectional view taken along line IV—IV of FIG. 2.

FIG. 5 is a partial sectional view of a detail of embodiment.

FIG. 6 is a sectional view, similar to FIG. 3, of a variant of embodiment.

FIG. 7 is a partial front view illustrating another detail of embodiment.

FIG. 1 shows a building comprising various floors A, B . . . N, all of them communicating with the outside through fresh air delivering inlets 1 normally designed close to the floor. Besides, openings 2 are designed on each floor to run into a common passage 3, the same being possibly provided, as represented, with a device 4 for drawing up air in a view of establishing a permanent upwards circulation from the base of the passage 3 which may be provided with an opening 5. The openings 2 are designed close to the ceiling of each floor and said openings are normally closed by trap-doors 7, the same having the possibility to be selectively remote controlled to provide eduction of the smokes if a fire breaks out on one of the floors as diagrammatically shown concerning a floor F. The trap-doors 7 of the floors which have not been reached by the fire must remain closed to avoid any spreading of hot gas and smoke which could cause occurrence of other seats of fire, thus constituting an inconvenience for the people having the responsibility to fight against the fire.

FIGS. 2 to 5 show how are realized the trap-doors 7. First of all, the passage 3 which is utilized for the smoke eduction is separated from the dwellings by a wall 8 able to resist to a fire, for example a wall made of concrete. The openings 2 are made into said wall wherein is delimited, to flange said openings 2, a peripheric groove or rabbet 9 opening towards the inside of the rooms of the construction building.

The groove 9 is utilized for placing a frame 10, preferably made of metal and which is constituted, as shown in FIGS. 3 and 4 by two similar vertical uprights 11 and 12 substantially delimiting a right-angled trapezium. The front sides of the iron uprights 11 and 12 are forming a similar angle to delimit a widened passage converging towards the opening 2. The vertical uprights 11 and 12 are connected by a lower cross-piece 13 and an upper cross-piece 14, both constituted by metal parts in the shape of right-angled trapezium.

However, as best shown in FIG. 3, the side 13*a* of the cross-piece 13 is converging towards the opening 2, while the side 14*a* of the cross-piece 14 has an opposite slope and extends according to a slope which is smaller than that of the side 13*a* of the cross-piece 13. The frame 10 is designed to be entirely inserted into the groove 9 and said frame is fixed to the wall 8, for instance by means of anchoring-irons 15.

As shown in the drawings, the width of the frame 10 is smaller than the depth of the groove 9, and blocks 16 made of insulating material and resisting to the fire are inserted between the frame and the bottom of the groove. Said blocks 16 can for example be made of asbestos agglomerate or other similar material.

The trap-door itself is constituted by a panel 17 comprising facing plates 18 and 19, the latter one at least being made of insulating and heat-resisting material. The facing plates are surrounding a web 20 which is possibly made of calcined rock, alveolate concrete, ceramic fiber or other similar material. The periphery of the panel 17 is enclosed into a metal framing 21, the shape of which being exactly a complement to the shape of the opening which is let free by the frame 10.

In a view of suitably enclosing the panel 17, the framing 21 comprises lateral flanged edges 22 and 23. The height of the flanged edge 22 is selected for completely including the same into the groove 9, thus a joint 24 made of soft insulating material can be placed between the blocks 16 and the facing plate 19 by directly bearing on said plate. Thus is avoided a heat bridge which could be constituted by the framing 21. Besides, and as shown in the drawings, the framing 21 manages with the frame 10 a ring-like space 25 in which is placed a continuous joint 26, the same being also made of soft insulating and heat resisting material.

As shown in FIG. 3 and due to the slope of the sides 13*a* and 14*a* of the cross-pieces 13 and 14 delimiting a passage which becomes narrower towards the opening 2, it is possible to insert the panel 17 to compress the joint 26 on the whole length thereof. Actually, the uprights 11 of the frame 10 and the front sides of the framing 21 also delimit a convergent passage, thus a thrust applied according to the direction of arrow f_1 on the panel 17 evenly compresses the joint 26 and thus ensures a tight closing. Since on the other hand the slope of the side 13*a* of the cross-piece 13 is more accentuated than that of the side 14*a* of the cross-piece 14, then if the panel 17 is not maintained, it can slide,

substantially in the direction shown by arrow f_2, and consequently clear out the opening 2 to put in communication the dwelling floor comprising the trap-door with the smoke eduction passage 3. The panel 17 is normally maintained by locks 27, 28 (FIG. 2) which are, for example, placed on the uprights 11, 12 close to the lower portion of the same. It is also possible to place the locks inside the cross-piece 13 of the frame 10 so that the same be entirely hidden from the sight. The locks 27, 28 can be, for example, constituted as shown in FIG. 5, that is by means of an electro-magnet 29, the core 30 thereof directly controlling a bolt 31, the end of which being introduced into a blot-clasp 32 carried by the panel 17.

When the electro-magnet of each lock is controlled, the bolt 31 is released from the bolt-clasp thereof and the panel, which is not maintained any longer close to the lower portion thereof, slides through gravity in the direction shown by arrow f_2.

To still increase the safety of use, it is possible to manufacture the bolt-clasp 32 and/or the bolt 31 of a material melting at a relatively low temperature thus providing the panel to clear the opening 2 even, if for any reason, the electro-magnets controlling the locks have not been operated.

Though being not generally required, it can be deemed advantageous that the panel 17 had not the possibility to fall brutally. For that purpose, said panel can be insidely provided with a boring 33, inside of which is placed a slowing down device 34 which may be constituted by a small piston connected by a cable 35 to the cross-piece 14 of the frame 10. It is to be noticed from FIG. 3 that the cable 35 runs through a hole 36 designed in the upper cross-piece of the framing, said small hole forming, in some way, a limiting device for the flow of air sent out through the piston 34 and providing a slow down of the panel of which the fall onto the ground is prevented by the piston 34 when the same comes to a stop with said upper cross-piece of the framing 21.

According to the embodiment shown in FIGS. 6 and 7, the frame 10 is shaped as shown in the drawings to take the shape of the groove 9 of wall 8, said groove delimiting, at the lower portion of the opening 2, an inclined edge 37; the other edges, comprising the upper edge 9*a* (FIG. 6) and the two lateral edges 9*b* (FIG. 7) extending, for example as shown, at right angle with respect to the sides of wall 8.

The frame 10 delimits a housing at the upper portion of the lower inclined edge 37, said housing 38 being lined up with the bottom of the groove of the other sides for positioning, all around the groove, blocks 16 made of insulating material and advantageously fixed through glueing. The block being directed towards the opening of the groove is provided with a slot for maintaining the joint 24 made of soft insulating material, the same being advantageously maintained by a strip 39 made of stainless steel or similar material, the ends of said strip being inserted between the two blocks 16 as shown in dotted line in the drawings.

The panel 17 constituting the trap-door is made in a similar way as explained in the above disclosure by means of facing plates 18*a* and 19*a* made of insulating and heat-resisting material, and said plates are cut at the periphery thereof to show a shape corresponding to the shape of the space delimited by frame 10.

The two panels 18*a*, 19*a* are connected together by a framing 21*a* fixed on the panel 18*a* by screws and nuts 40, said framing encasing the rear edge 22*a* of the panel 19*a*. The space delimited between the two panels is filled up with an appropriate material, for example a complex of plaster and inorganic fibers.

The panel 17 is provided at the upper portion thereof with at least one finger 41 designed to be engaged behind a stop 42 of the frame 10 upon positioning the panel, the same being then maintained by bolts 43 controlled by one or various electro-magnets 28*a* placed into one or various housings 44 designed into the wall 8 behind the lower portion of the frame 10.

One or various corresponding bolt-clasps 45 are of course designed into the front portion of the panel 17.

FIG. 7 shows that the lateral sides 17*a* of the panel 17 delimit, with the corresponding edge of the frame 10, a space 46 of which the bottom is constituted by the blocks 16.

A square iron 47 is fixed at the upper portion of each side 17*a* of the panel 17 and said square iron is provided, in the arm 47*a* thereof, with a hole 48 for passage of a rod 49. Said rod is articulated, by means of an eyelet 50 extending the same, on a spindle 51 constituted by a bolt supported by the frame 10 and on which are screwed up nuts 52, 52*a* for holding the eyelet 50.

The rod 49, at the lower portion thereof, is provided with a spring 53 retained by nuts 54 forming a stop.

Besides what has been described in the above disclosure, at least a resilient element 55, for example a spring, is placed into the blocks 16 in the bottom of the housing 38 delimited by the frame 10 at the lower portion of the groove, said spring tending consequently to push back the lower portion of the panel 17.

For positioning the panel 17, the finger or fingers 41 of the same have only to be engaged behind the stop 54, then the lower portion of the panel must be pushed against the action of the spring 55 up to the moment when the panel is locked by the bolt 43 of the electro-magnet 28*a*. In said position, the panel is firmly applied against the joint 24.

Although it has not been represented, it is obvious that the trap-door can be included into prefabricated elements made of masonry, plaster, etc.

The invention is not restricted to the embodiments shown and described in detail, for various modifications thereof can moreover be applied to it without departing from the scope of the invention.

I claim:

1. In a building construction including a room wall having at least one eduction passage provided with an aperture for communication between said eduction passage and rooms of said building, the wall portion defining the bottom portion of said aperture being downwardly sloped towards the room, a trap door having the same shape as that of said aperture and inserted therein and resting on said bottom portion for closing the aperture, and locking means between said wall and said trap door and retaining said door in said aperture, whereby unlocking of said locking means causes said trap door to slide down by gravity along said downwardly sloped bottom portion to open said aperture.

2. The arrangement according to claim 1, wherein the apertures are each delimited by a substantially rectangular metal frame having a downwardly directed bot-

tom flange while the top flange of said frame defines with the bottom flange an upwardly directed angle, lateral flanges of said frame converging towards the eduction passage.

3. The arrangement according to claim **1**, wherein the wall delimiting the aperture is separated from the trap-door by insulating blocks bearing against the trap door on the posterior side thereof.

4. The arrangement according to claim **3**, wherein the insulating blocks are provided with a soft insulating joint which is supported by a stainless and heat-resisting strip surrounding it and which is supported by the blocks.

5. The arrangement according to claim **1**, wherein the apertures are flanged by a deep rabbet.

6. The arrangement according to claim **1**, wherein the trap-door comprises facing plates made of insulating and heat resisting material and surrounding a web.

7. The arrangement according to claim **1**, wherein the locking means are constituted by at least one electro-magnet.

8. The arrangement according to claim **1**, further comprising means to prevent the trap door to fall down onto the floor of the room.

9. The arrangement according to claim **8**, wherein said means are constituted by a retarding device connected between the trap door and to the wall delimiting the aperture.

10. The arrangement according to claim **9**, wherein said means are constituted by a stroke limiting device comprising rods placed on each side of the trap door and pivotally mounted on spindles supported at the edge of the trap door and passing through brackets fixed on the side of the trap door and comprising damping means at the lower portion thereof.

11. The arrangement according to claim **1**, wherein at least one resilient means is placed between the wall delimiting the aperture and the trap door at the base thereof, said resilient means tending to eject the trap door.

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