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(54) **IMPROVEMENTS IN OR RELATING TO FIRE BARRIERS**

FEUERSCHUTZVORHANG

AMELIORATIONS RELATIVES A DES DISPOSITIFS COUPE-FEU

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Description

This invention relates to a fire barrier for sealing an opening in a wall against the passage of smoke and flames therethrough, in particular a fire barrier in form of a fire curtain.

The large reception areas and foyers often found in large buildings such as office complexes, hotels, banks etc, are often divided into smaller units by means of partition walls, and typically openings are provided in such walls through which business can be conducted and people can communicate. A problem with such practice is that if fire breaks out in one part of the reception area or foyer, it can spread rapidly, and in a more or less unimpeded manner, to other parts of the reception area or foyer, since the individual units have hitherto tended not to be separated by means of reinforced fire-resistant doors and other physical barriers to the passage of fire.

It is an object of this invention to overcome, or at least alleviate, this problem by providing a fire curtain which is arranged to descent to close an opening in the event of a fire. Several types of fire curtain are disclosed in FR-A-2287926. However, the fire curtains disclosed therein are in general of rather complex construction and comprise a double-skin structure formed from asbestos fabric within which are disposed a plurality of guide rods.

The present invention relates to improvements in the construction of fire curtains.

Accordingly, in a first aspect, the invention provides a fire barrier device for installation in an opening in a wall to resist the passage therethrough of fire, the fire barrier comprising a flexible curtain; support means for supporting the curtain at the upper end of said opening; and latch means for holding the curtain in a stowed configuration at the upper end of the opening, the curtain being stowed in a folded concertina form; the latch means being connectable to, and actuable by, an associated fire or smoke detector, to release the latch means, to allow the curtain to descend by free fall and unravel to close the opening; characterised in that the flexible curtain is formed from or comprises intumescent material and is sufficiently intumescent to intumesce in the presence of heat to seal the opening against the passage of fire therethrough when unravelled.

The support means can take the form of a framework, e.g. of rectangular form, which lines the opening in a wall. Such a framework will typically comprise a base member, side walls and an upper frame member spanning the side walls. The flexible curtain may be secured to the upper frame member. The side walls of the framework may be configured so as to define channels which guide the curtain as it descends to block the opening. Such channels may be defined by the side walls and inwardly directed flanges extending from the upright edges thereof.

The curtain preferably is formed from a cloth, e.g. glass cloth, impregnated with an intumescent substance or composition. Such a substance can be, for example, an alkali metal silicate such as sodium silicate, or an expandable graphite such as exfoliated graphite.

In order to facilitate folding into a concertina configuration, the curtain may be provided with substantially horizontal fixed fold lines, of alternating direction of fold. The fold lines may be fixed by virtue of being sewn into the curtain.

The curtain usually will be provided at its lower end with a weight to assist its descent. The weight can take the form of, for example, an elongate generally flat metal (e.g. steel) strip. In order to prevent impact damage as the curtain descends, the underside of the elongate strip and/or upper surface of the opening or the base member of the framework may be provided with cushioning means; for example, a foam strip.

The lower end of the curtain is preferably provided with a latching member for engagement with a complementary member of the latch means.

The latching means most preferably is in the form of an electromagnetic latch comprising an electromagnet secured to the support means or to an upper portion of the framework, and a complementary latch member secured to the lower end of the curtain, which latch member is attracted and held by the electromagnet when the electromagnet is energised.

Alternatively, the latching means can take the form of asolenoid having a plunger which, in the absence of smoke or fire, engages a suitable detent such as a recess or aperture in the complementary latch member to hold the curtain in the raised position, but which upon receipt of a signal from the smoke/fire detection means, disengages from the detent to allow the curtain to fall.

The fire barrier device of the present invention preferably is provided with electrical connections enabling it to be connected to a source of power for the electromagnet or solenoid and to smoke/fire detection means.

In another aspect, the invention provides a fire protection system comprising a fire barrier device as hereinbefore defined, and smoke/fire detection means actuable to release the latch when smoke and/or fire is detected.

The invention will now be illustrated, but not limited by reference to the particular embodiments shown in Figures 1 to 5, in which:-

Figure 1 is a front elevation of a fire shutter according to one embodiment of the invention, with the curtain shown in the "down" position;

Figure 2 is another front elevation of the embodiment shown in Figure 1, but with the curtain in the raised position;

Figure 3 is a sectional view along line I-I in Figure 2;

Figure 4 is a rear elevation of the embodiment shown in Figure 1; and

Figure 5 is a sectional view along line II-II of Figure 4.

Turning now to the drawings, it can be seen that the fire shutter comprises a framework 1, into which is

secured a fire curtain 2. An electromagnetic latch arrangement 3,4 can hold the fire curtain in a folded raised position, as shown in Figure 2, or a lowered position, as shown in Figures 1, 4 and 5.

The framework 1 is formed of an appropriate metal such as mild steel and comprises a base member 5, side walls 6, upper frame member 7, and front and rear cross members 8 and 9 respectively. Base member 5, side walls 6, and front and rear cross members 8 and 9 may be formed integrally by fabrication from a single strip or sheet of steel plate or can be constructed by welding together the members 5 and side walls 6. The upright edges of each side wall 6 are bent inwardly to form flanges 10; this being most readily apparent from Figure 3. The side wall 6, together with its associated flanges 10, defines a channel to guide the travel of the fire curtain 2 between raised and lowered positions. The upper frame member 7 is formed with flanged edges which fit over the upper edges of the cross members 8 and 9 and are detatchably secured thereto by screws 12.

Affixed to the underside (e.g. by welding) of the upper frame member 7 are steel brackets 13 which are L-shaped in cross section. The portions 14 of the brackets 13 outstanding from the surface of upper frame member 7, are drilled to receive screws 15. The outstanding portions 14 together with the screws 15 together constitute a means for attaching the upper edge of the fire curtain 2 to the frame member 7.

Secured to the lower edge of the fire curtain 2 by means of screws 16 and elongate brackets 17 of L-shaped cross-section, is an elongate flat steel plate 18, which is sufficiently heavy to ensure that the fire curtain descends fully. Affixed to the underside of steel plate 18, e.g. by means of an appropriate adhesive, is an elongate strip 19 of a resilient plastics foam or sponge material, which serves to cushion the steel plate 18 against the base member 5. Extending forwardly of the steel plate 18, from a point approximately equidistant from the two side walls 6, is a generally tongue-shaped member 20, which can be formed integrally with the plate 18 or manufactured separately and welded thereto. Secured to the upper surface of tongue-shaped member 20, by means of a screw (not shown) is a generally circular metal plate 4, which constitutes part of the electromagnetic latch mechanism.

Attached to the front cross member 8, by means of screws and extending across the width of the frame 1 is a hood or skirt-like arrangement 21, which is formed integrally from bent steel strip. Disposed beneath the hood 21, at approximately the mid-point between the two side walls 6 is an electromagnetic latch 3. The latch 3 is connected, by means of external wiring to an appropriately sited smoke detector (not shown) or to another component of a smoke/fire detection system. A reset switch 23 is provided so that the electromagnetic latch 3,4 can be re-energised following premature release, or after testing of the system.

The fire curtain 2 is formed of a glass cloth, impregnated with an intumescent material, examples of which include alkali metal silicates such as sodium silicate.

The curtain 2 has fold lines 24 sewn into it at intervals along its length. Such fold lines assist the folding of the curtain into a "concertina" configuration when held in the raised position.

The fire shutter typing is installed in a suitable window aperture in a wall or partition (not shown) and drilled holes are provided in framework 1 to enable attachment by means of screws, nails or like fixing means. Once installed, in normal use, the electromagnetic latch 3 is maintained in an energised state, thereby attracting latch member 4 and holding the curtain 2 in the folded raised position as shown in Figure 2.

If the smoke/fire detection system detects the presence of smoke or flames in the vicinity, the electromagnetic latch 3,4 is de-energised, and the magnetic attraction between latch members 3 and 4 thus disappears. The curtain 2 then falls under its own weight and the weight of metal plate 18, guided by the channels defined by side walls 6 and flanges 10, to close the opening. The foam or sponge layer 19 cushions the fall of the plate 18 and prevents damage to the base member 5. In the event that excess temperatures associated with fire are created adjacent the curtain, the intumescent material with which the curtain is impregnated intumesces and seals the opening against the passage of fire.

The embodiment illustrated in the drawings Figures 1 to 5 is presented for the purposes of exemplification only and is not intended to limit the scope of the invention in any way. It will readily be apparent that numerous modifications and alterations could be made to the embodiment illustrated, without departing from the the invention as claimed, and all such modifications and alterations are intended to be within the scope of this application.

Claims

1. A fire barrier device for installation in an opening in a wall to resist the passage therethrough of fire, the fire barrier comprising a flexible curtain (2); support means (7,13,14,15) for supporting the curtain (2) at the upper end of said opening; and latch means (3,4,20) for holding the curtain (2) in a stowed configuration at the upper end of the opening, the curtain (2) being stowed in a folded concertina form; the latch means (3,4,20) being connectable to, and actuable by, an associated fire or smoke detector, to release the latch means (3,4,20), to allow the curtain (2) to descend by free fall and unravel to close the opening; characterised in that the flexible curtain (2) is formed from or comprises intumescent material and is sufficiently intumescent to intumesce in the presence of heat to seal the opening against the passage of fire therethrough when unravelled.

2. A fire barrier device according to claim 1 wherein the support means takes the form of a framework (1) which lines the opening in a wall.

3. A fire barrier device according to claim 2 wherein the support means is in the form of a rectangular framework (1) comprising a base member (5), side walls (6) and an upper frame member (7) spanning the side walls (6).

4. A fire barrier device according to claim 3 wherein the flexible curtain (2) is secured to the upper frame member (7).

5. A fire barrier device according to claim 3 or 4 wherein the side walls (6) of the framework (1) are configured so as to define channels which guide the curtain (2) as it descends to block the opening.

6. A fire barrier device according to claim 5 wherein the channels are defined by the side walls (6) and inwardly directed flanges (10) extending from the upright edges thereof.

7. A fire barrier device according to any one of the preceding claims wherein the curtain (2) is formed from a cloth impregnated with an intumescent substance or composition.

8. A fire barrier according to any one of the preceding claims wherein the curtain (2) is provided with substantially horizontal fixed fold lines (24) of alternating direction of fold.

9. A fire barrier device according to any one of the preceding claims wherein the curtain (2) is provided at its lower end with a weight (18) to assist its descent.

10. A fire barrier according to claim 9 wherein the weight (18) is in the form of an elongate generally flat metal strip.

11. A fire barrier device according to claim 10 wherein the underside of the elongate strip (18) and/or the upper surface of the opening or the base member of the framework are provided with cushioning means (19).

12. A fire barrier device according to any one of the preceding claims wherein the lower end of the curtain is provided with a latching member (4,20) for engagement with a complimentary member (3) of the latch means.

13. A fire barrier device according to any one of the preceding claims wherein the latching means (3,4,20) is in the form of an electromagnetic: latch (3,4) comprising an electromagnet secured to the support means or to an upper portion of the framework (1), and a complimentary latch member (4,20) secured to the lower end of the curtain (2), which latch member (4,20) is attracted and held by the electromagnet when the electromagnet is energised.

14. A fire barrier device according to any one of the preceding claims wherein the latching means (3,4,20) is in the form of a solenoid having a plunger which, in the absence of smoke or fire, engages a suitable detent such as a recess or aperture in the complimentary latch member to hold the curtain in the raised position, but which upon receipt of a signal from the smoke/fire detection means, disengages from the detent to allow the curtain (2) to fall.

15. A fire barrier device according to any one of the preceding claims which is provided with electrical connections enabling it to be connected to a source of power for the electromagnet or solenoid and to smoke/fire detection means.

16. A fire protection system comprising a fire barrier device as defined in any one of the preceding claims, and smoke/fire detection means actuable to release the latch when smoke and/or fire is detected.

Patentansprüche

1. Feuerschutzbarriere zum Einbau in eine Wandöffnung, um den Durchtritt von Feuer zu verhindern, mit einem flexiblen Vorhang (2), einer Kaltevorrichtung (7, 13, 14, 15), um den Vorhang (2) am oberen Ende der Öffnung zu lagern, und einer Verriegelungsvorrichtung (3, 4, 20), um den Vorhang (2) in einer gepackten Konfiguration am oberen Ende der Öffnung zu halten, wobei der Vorhang (2) in Ziehharmonikafaltung gepackt ist und die Verriegelungsvorrichtung (3, 4, 20) mit einem zugeordneten Feuer- oder Rauchdetektor verbindbar und von diesem betätigbar ist, um die Verriegelungsvorrichtung (3, 4, 20) freizugeben und dem Vorhang (2) zu ermöglichen, frei herabzufallen und sich zu entfalten, um die Öffnung zu verschließen, dadurch gekennzeichnet, daß der flexible Vorhang (2) aus einem sich aufblähenden Material besteht oder dieses aufweist und ausreichend aufblähend ist, um bei Auftreten von Hitze derart aufzublähen, um die Öffnung im entfalteten Zustand gegen den Durchtritt von Feuer abzudichten.

2. Feuerschutzbarriere nach Anspruch 1, dadurch gekennzeichnet, daß die Haltevorrichtung die Form eines Rahmens (1) besitzt, der die Wandöffnung auskleidet.

3. Feuerschutzbarriere nach Anspruch 2, dadurch gekennzeichnet, daß die Haltevorrichtung die Form

eines rechteckigen Rahmens (1) besitzt, der ein Grundteil (5), Seitenwände (6) und ein die Seitenwände (6) überbrückendes, oberes Rahmenteil (7) aufweist.

4. Feuerschutzbarriere nach Anspruch 3, dadurch gekennzeichnet, daß der flexible Vorhang am oberen Rahmenteil (7) angebracht ist.

5. Feuerschutzbarriere nach Anspruch 3 oder 4, dadurch gekennzeichnet, daß die Seitenwände (6) des Rahmens (1) so konfiguriert sind, daß sie Kanäle bilden, die den Vorhang (2) führen, wenn er zum Versperren der Öffnung herunterfällt.

6. Feuerschutzbarriere nach Anspruch 5, dadurch gekennzeichnet, daß die Kanäle von den Seitenwänden (6) und sich von deren aufrechten Kanten erstreckenden, nach innen gerichteten Flanschen (10) gebildet sind.

7. Feuerschutzbarriere nach einem der Ansprüche 1 bis 6, dadurch gekennzeichnet, daß der Vorhang (2) von einem Gewebe gebildet ist, das mit einer aufblähenden Substanz oder Zusammensetzung imprägniert ist.

8. Feuerschutzbarriere nach einem der Ansprüche 1 bis 7, dadurch gekennzeichnet, daß der Vorhang (2) mit im wesentlichen horizontalen, festen Faltlinien (24) alternierender Faltrichtung versehen ist.

9. Feuerschutzbarriere nach einem der Ansprüche 1 bis 8, dadurch gekennzeichnet, daß der Vorhang (2) an seinem unteren Ende mit einem das Herabfallen unterstützenden Gewicht (18) versehen ist.

10. Feuerschutzbarriere nach Anspruch 9, dadurch gekennzeichnet, daß das Gewicht (18) die Form eines länglichen, im wesentlichen flachen Metallstreifens besitzt.

11. Feuerschutzbarriere nach Anspruch 10, dadurch gekennzeichnet, daß die Unterseite des länglichen Streifens (18) und/oder die obere Oberfläche der Öffnung oder des Basisteils des Rahmens mit einem Polster (19) versehen ist.

12. Feuerschutzbarriere nach einem der Ansprüche 1 bis 11, dadurch gekennzeichnet, daß das untere Ende des Vorhanges mit einem Verriegelungsteil (4, 20) zum Eingriff mit einem komplimentären Teil (3) der Verriegelungsvorrichtung versehen ist.

13. Feuerschutzbarriere nach einem der Ansprüche 1 bis 12, dadurch gekennzeichnet, daß die Verriegelungsvorrichtung (3, 4, 20) in Form einer elektromagnetischen Verriegelung (3, 4) ausgebildet ist, die einen an der Haltevorrichtung oder einem oberen Abschnitt des Rahmens (1) angebrachten Elektromagneten und ein komplimentäres Verriegelungsteil (4, 20) aufweist, das am unteren Ende des Vorhangs (2) angebracht ist, wobei das Verriegelungsteil (4, 20) von dem Elektromagneten angezogen und festgehalten wird, wenn dieser energiert ist.

14. Feuerschutzbarriere nach einem der Ansprüche 1 bis 13, dadurch gekennzeichnet, daß die Verriegelungsvorrichtung (3, 4, 20) als Solenoid ausgebildet ist, der eine Tauchspule aufweist, die bei Nicht-Vorhandensein von Rauch oder Feuer mit einem geeigneten Anschlag, beispielsweise einer Ausnehmung oder einer Öffnung in dem komplimentären Verriegelungsteil in Eingriff steht, um den Vorhang in der hochgezogenen Position zu halten, jedoch bei Empfang eines Signals von dem Rauch-/Feuer-Detektor von dem Anschlag freikommt, um dem Vorhang (2) das Herabfallen zu ermöglichen.

15. Feuerschutzbarriere nach einem der Ansprüche 1 bis 14, gekennzeichnet durch elektrische Anschlüsse, die eine Verbindung zu einer Stromquelle für den Elektromagneten oder Solenoiden und zu dem Rauch-/Feuer-Detektor ermöglichen.

16. Feuerschutzsystem mit einer Feuerschutzbarriere nach einem der vorhergehenden Ansprüche und einem Rauch-/Feuer-Detektor, der zum Lösen der Verriegelung betätigbar ist, wenn Rauch und/oder Feuer festgestellt ist.

Revendications

1. Un dispositif de fermeture coupe-feu pour une installation dans une ouverture, dans une paroi, pour résister au passage du feu au travers, la fermeture coupe-feu comprenant un rideau flexible (2); un moyen de support (7,13,14,15) pour supporter le rideau (2) au niveau de l'extrémité supérieure de ladite ouverture; et un moyen de verrouillage (3,4,20) pour maintenir le rideau (2) dans une configuration repliée au niveau de l'extrémité supérieure de l'ouverture, le rideau (2) étant replié suivant une forme en accordéon repliée; le moyen de verrouillage (3,4,20) étant raccordable à, et actionnable par, un détecteur de feu ou de fumée associé pour libérer le moyen de verrouillage (3,4,20) pour permettre au rideau (2) de descendre en chute libre et de se défaire pour fermer l'ouverture; caractérisé en ce que le rideau flexible (2) est formé à partir ou comprend un matériau intumescent et est suffisamment intumescent pour se gonfler en présence de chaleur pour sceller l'ouverture contre le passage du feu au travers quand il est défait.

2. Un dispositif de fermeture coupe-feu conformément

à la revendication 1 dans lequel le moyen de support prend la forme d'un cadre (1) qui borde l'ouverture dans un mur.

3. Un dispositif de fermeture coupe-feu conformément à la revendication 2 dans lequel le moyen de support est sous la forme d'un cadre rectangulaire (1) comprenant un élément de base (5), des parois latérales (6) et un élément de cadre supérieur (7) enjambant les parois latérales (6).

4. Un dispositif de fermeture coupe-feu conformément à la revendication 3 dans lequel le rideau flexible (2) est fixé à l'élément de cadre supérieur (7).

5. Un dispositif de fermeture coupe-feu conformément à la revendication 3 ou 4 dans lequel les parois latérales (6) du cadre (1) sont configurées de façon à définir des canaux qui guident le rideau (2) tandis qu'il descend pour bloquer l'ouverture.

6. Un dispositif de fermeture coupe-feu conformément à la revendication 5 dans lequel les canaux sont définis par les parois latérales (6) et des brides dirigées vers l'intérieur (10) s'étendant à partir de leurs bords verticaux.

7. Un dispositif de fermeture coupe-feu conformément à l'une quelconque des revendications précédentes dans lequel le rideau (2) est formé à partir d'un tissu imprégné avec une substance ou une composition intumescente.

8. Une fermeture coupe-feu conformément à l'une quelconque des revendications précédentes dans laquelle le rideau (2) est fourni avec des lignes de pliage fixes essentiellement horizontales (24) à direction de pliage alternée.

9. Un dispositif de fermeture coupe-feu conformément à l'une quelconque des revendications précédentes dans lequel le rideau (2) est pourvu au niveau de son extrémité inférieure d'un poids (18) pour aider sa descente.

10. Une fermeture coupe-feu conformément à la revendication 9, dans laquelle le poids (18) est sous la forme d'une bande de métal allongée généralement plate.

11. Un dispositif de fermeture coupe-feu conformément à la revendication 10 dans lequel le côté inférieur de la bande allongée (18) et/ou la surface supérieure de l'ouverture ou de l'élément de base du cadre sont pourvus d'un moyen d'amortissement (19).

12. Un dispositif de fermeture coupe-feu conformément à l'une quelconque des revendications précédentes dans lequel l'extrémité inférieure du rideau est pourvue d'un élément de verrouillage (4,20) pour un engagement avec un élément complémentaire (3) du moyen de verrouillage.

13. Un dispositif de fermeture coupe-feu conformément à l'une quelconque des revendications précédentes dans lequel le moyen de verrouillage (3,4,20) est sous la forme d'un dispositif de verrouillage électromagnétique (3,4) comprenant un électro-aimant fixé au moyen de support ou à une portion supérieure du cadre (1) et un élément de verrouillage complémentaire (4,20) fixé à l'extrémité inférieure du rideau (2), lequel élément de verrouillage (4,20) est attiré et retenu par l'électro-aimant quand l'électro-aimant est alimenté en énergie.

14. Un dispositif de fermeture coupe-feu conformément à l'une quelconque des revendications précédentes dans lequel le moyen de verrouillage (3,4,20) est sous la forme d'un solénoide ayant un plongeur qui, en l'absence de fumée ou de feu, engage une butée appropriée telle qu'une encoche ou ouverture dans l'élément de verrouillage complémentaire pour maintenir le rideau dans la position élevée mais oui lors de la réception d'un signal provenant d'un moyen de détection de fumée/de feu, se désengage de la butée pour permettre au rideau (2) de tomber.

15. Un dispositif de fermeture coupe-feu conformément à l'une quelconque des revendications précédentes qui est fourni avec des connexions électriques lui permettant d'être raccordé à une source de courant pour l'électro-aimant ou le solénoïde et à un moyen de détection de fumée/de feu.

16. Un système de protection coupe-feu comprenant un dispositif de fermeture coupe-feu tel que défini dans l'une quelconque des revendications précédentes, et un moyen de détection de fumée/de feu actionnable pour libérer le dispositif de verrouillage quand de la fumée et/ou du feu sont détectés.

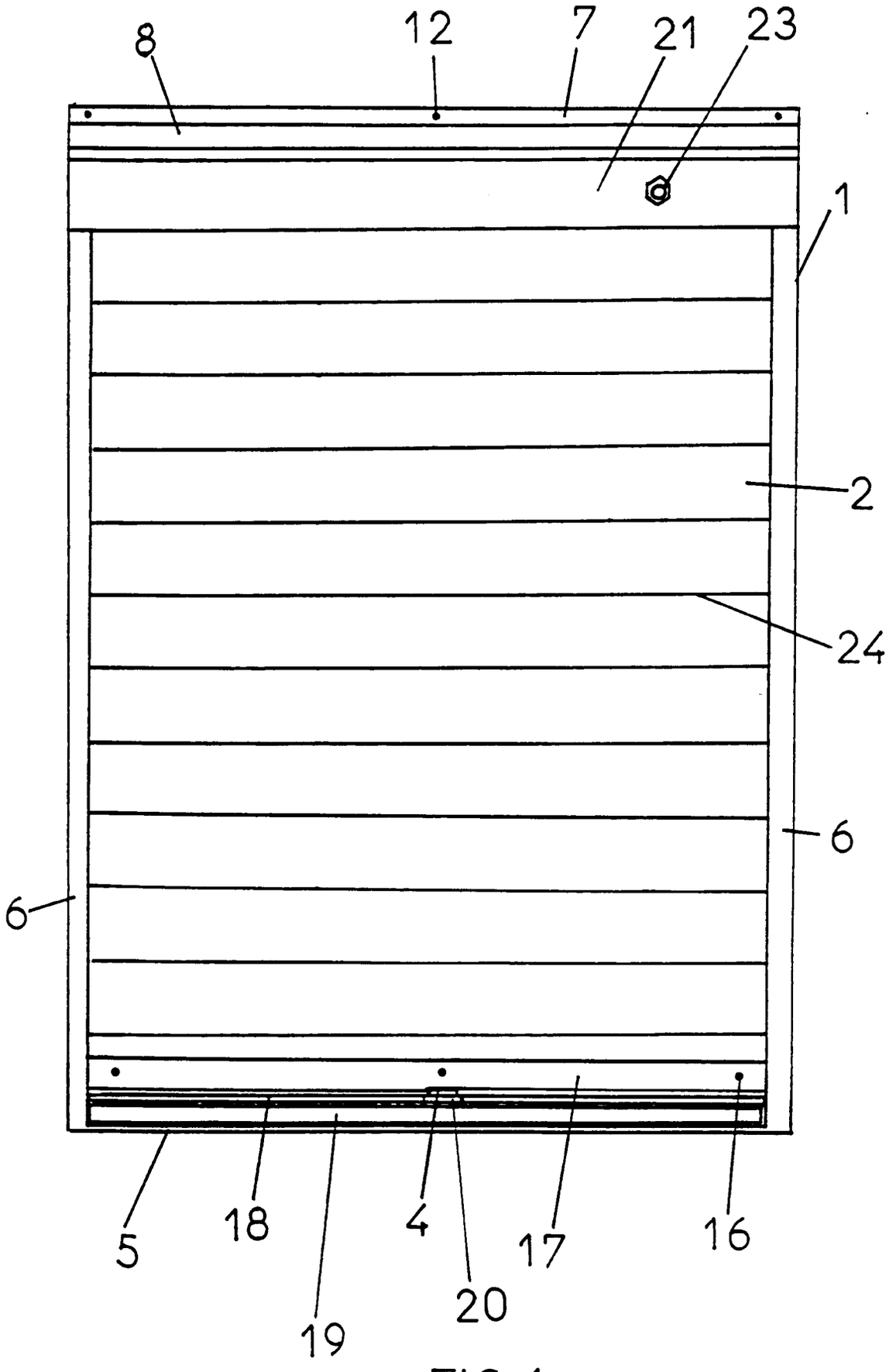


FIG. 1

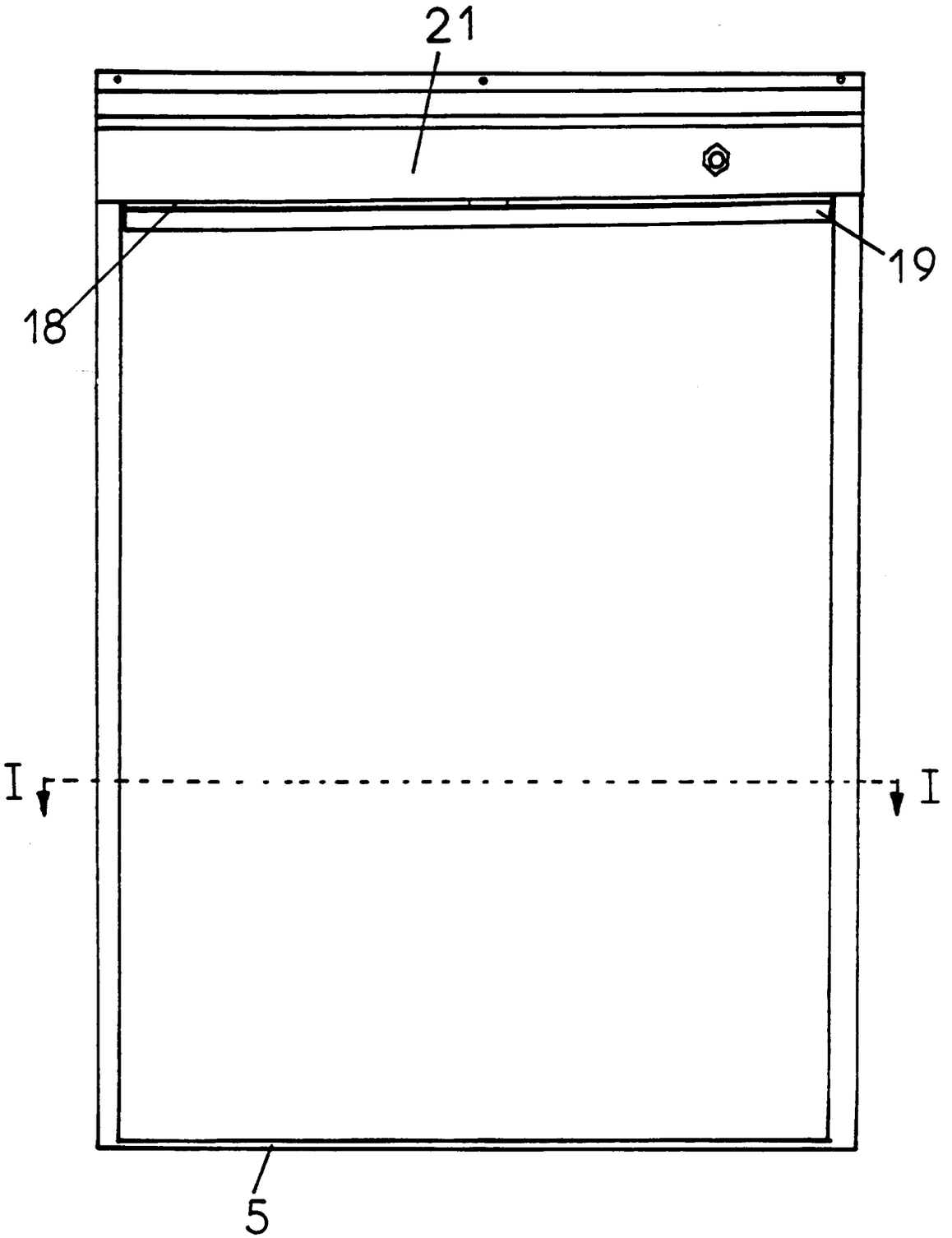


FIG. 2

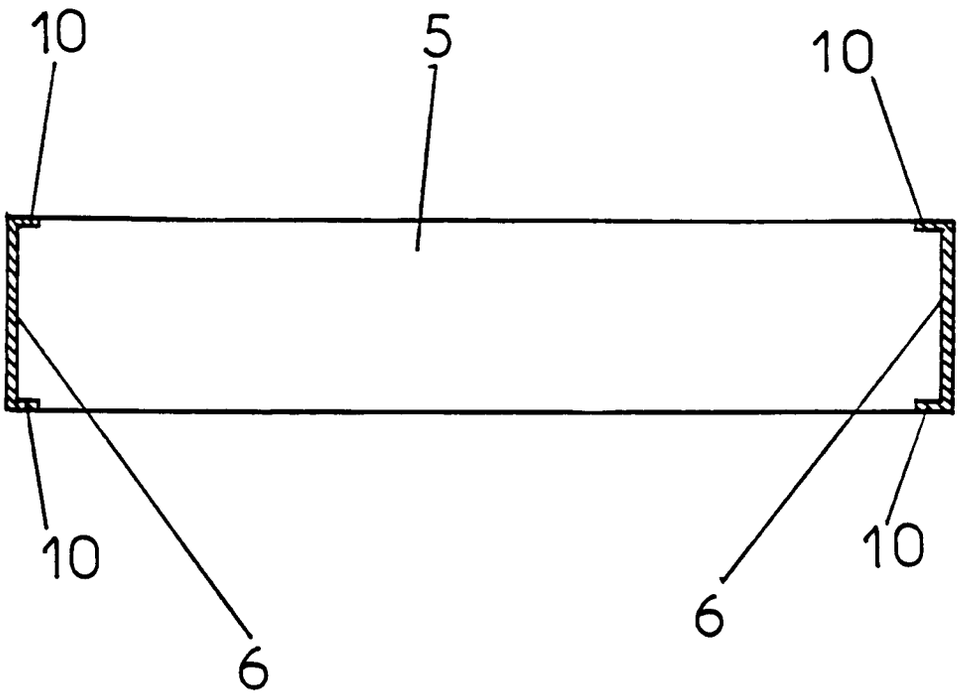


FIG.3

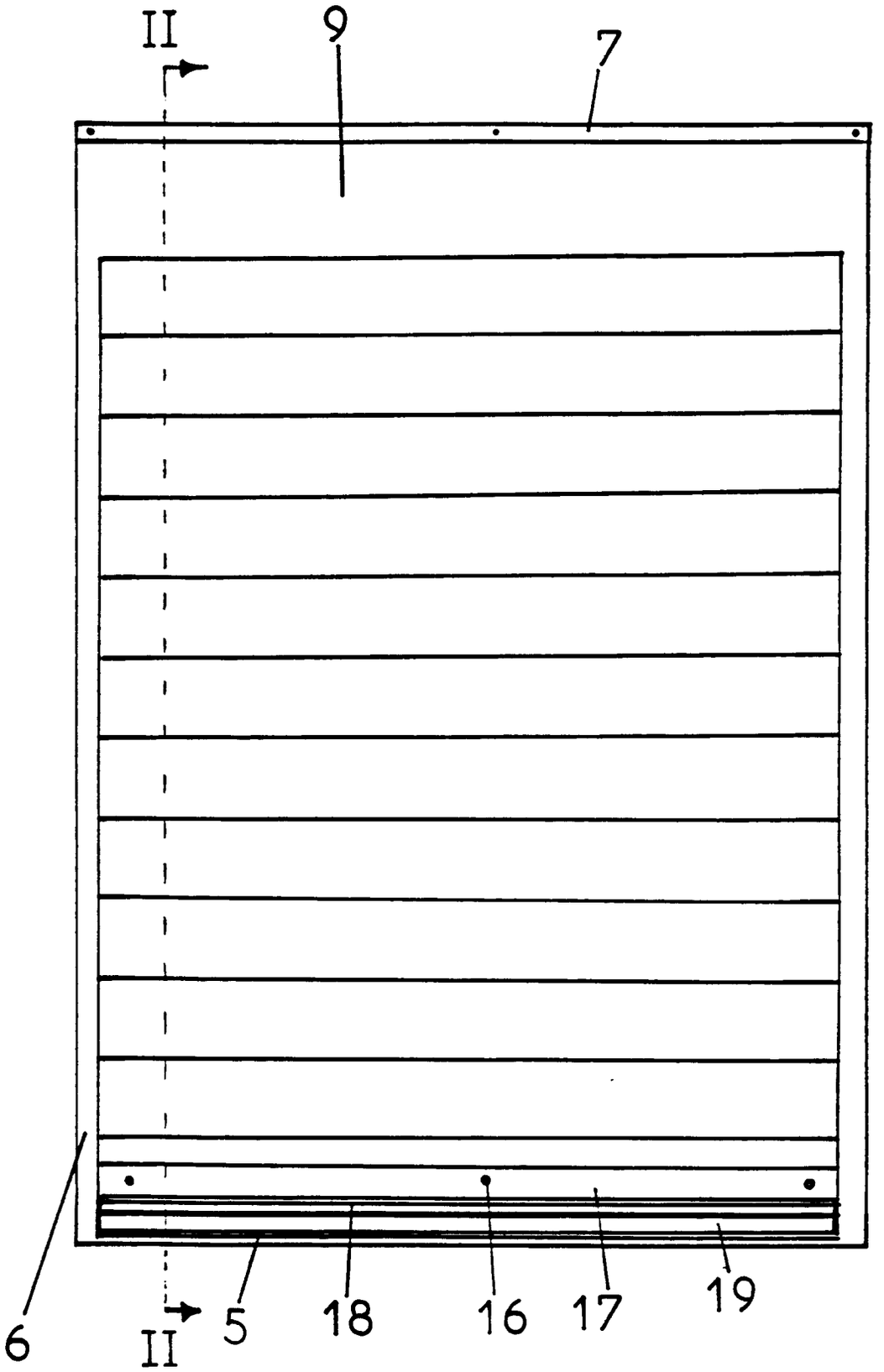


FIG. 4

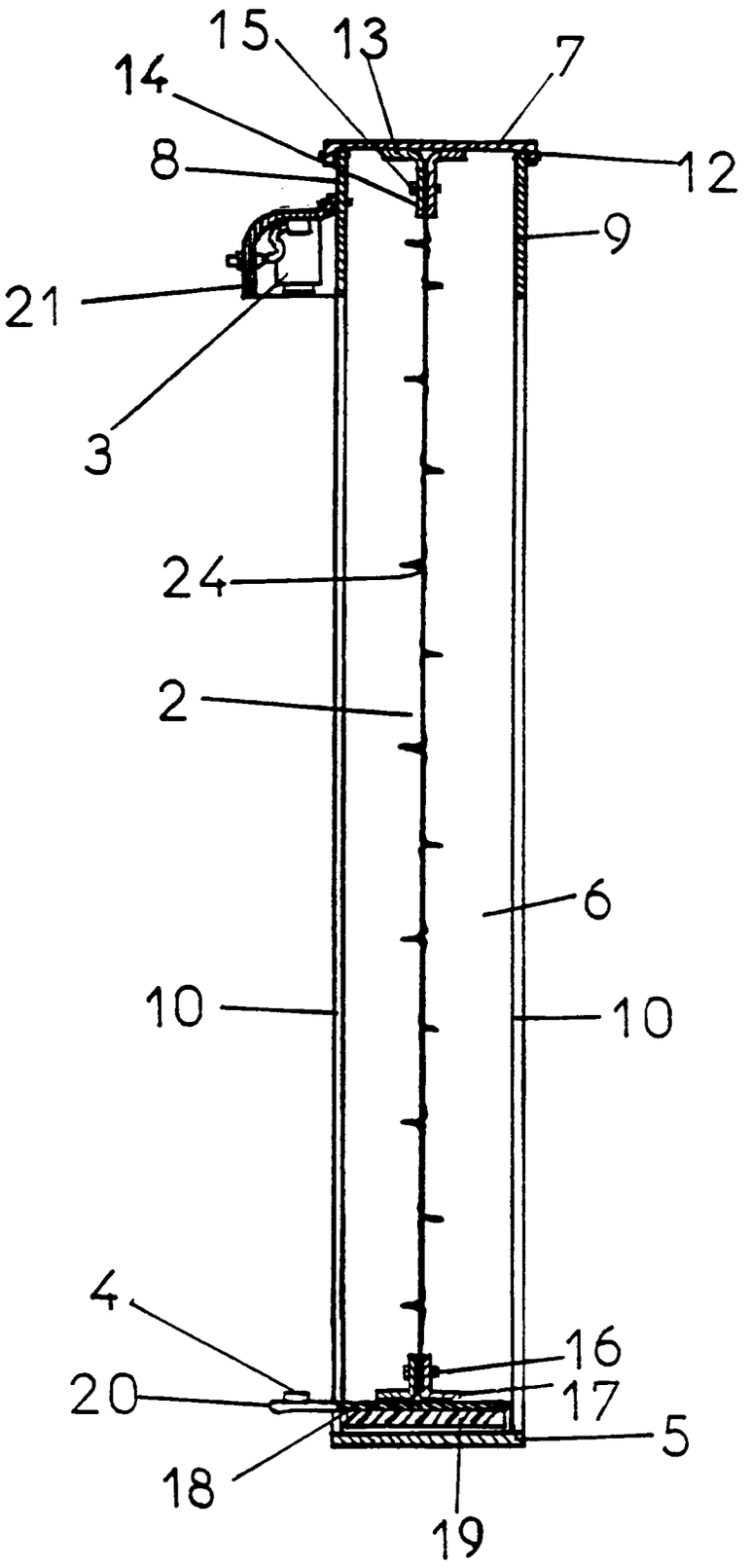


FIG. 5