

PATENT SPECIFICATION

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(54) EMERGENCY ESCAPE

(71) We, KABUSHIKI KAISHA NAKA GIJUTSU KENKYUSHO, a Corporation organized under the laws of Japan of 1020-178 Hassamu, Nishi-ku, Sapporo-shi, Hokkaido, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an emergency escape adapted to be housed in an opening formed in the floor of a room of a multi-storey building or the veranda of an apartment house when the escape is not in use and extends downwardly when any emergency occurs in the building or apartment house whereby the occupants in a storey of the building or apartment house can safely evacuate to a safer storey below the storey in which such emergency occurred or a safer location on the ground outside of the building or apartment house.

There have been proposed and practically employed a great variety of emergency escapes for use in multi-storey buildings. One of the most commonly employed escapes is in the form of a rope ladder which is adapted to be stored in its folded condition in an opening formed in the floor of a room of a multi-storey building or the veranda of an apartment house when the rope ladder is not in use and when the ladder is employed, the ladder is extended out of the opening. However, when the rope ladder is extended for its intended purposes, the ladder usually sways by a great extent and when the user descends down the ladder, the ladder inclines in a direction away from the user to a degree that the user encounters difficulties in descending down the ladder. This problem can be alleviated when the rope ladder is installed close to a wall of a building and the rungs of the ladder are provided with strut legs extending substantially horizontally at right angles to the rungs to abut against the wall so as to keep the ladder away from the wall.

However such a rope ladder only finds use close to a wall where the strut legs are used to maintain a space between the wall and the rungs of the ladder corresponding to the length of the strut legs. Thus, the application of the rope ladder is limited to a narrow range of areas.

Furthermore, since the conventional emergency escapes including the above-mentioned rope ladder are designed to be stored in a merely folded condition in an opening formed in the floor of a storey of a building or the stowage framework held in such an opening, and the escapes are also designed to be allowed to extend downwardly by gravity when the cover or covers of the framework is opened, prior to the use of the escapes, it is not possible to ascertain whether the conditions in the storey or other evacuation areas to which the user intends to evacuate are safe for the use of the escapes.

The present invention seeks to provide an improved emergency escape.

According to the present invention, there is provided an emergency escape for use in a building, the emergency escape comprising in combination;

a stowage framework adapted to be anchored in and occupy an opening formed in the slab of a floor, veranda or the like of said building;

upper and lower covers pivoted to the floor surface side and ceiling surface side of said framework, respectively;

linkage means pivoted to said upper and lower covers to operatively connect the covers together and open and close the lower cover upon the opening or closing of the upper cover, said linkage means holding said upper cover substantially upright when the cover is opened;

telescopically extensible escapes means comprising a plurality of telescopically connected pipe sections of different cross-sectional areas which decrease downwardly, each of said pipe sections having a rung at the lower end and the uppermost pipe section being supported

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rotatably about an axis extending horizontally (when the emergency escape is anchored to a horizontal slab) in said framework whereby when said escape means is stored in said framework each of the pipe sections is telescopically retracted into the adjacent upper pipe section and said escape means rests on said lower cover, and when said upper and lower covers are opened and said pipe sections are released, the latter telescopically extend to or adjacent to the floor surface of the lower storey of two adjacent stories involved; and

descent control means for controlling the extending descent speed of the escape means and wherewith the descent of the escape means can be releasably initiated and the escape means can be pulled up for stowage upon the closing of said upper and lower covers.

In the accompanying drawings:

Fig. 1A is a front elevational view of one preferred embodiment of an extensible emergency escape constructed in accordance with the present invention showing the escape in its operative or extended condition;

Fig. 1B is a side elevational view of said escape as shown in Figure 1A;

Fig. 1C is a longitudinal sectional view of said escape as shown in Fig. 1A showing the escape in its non-operative or collapsed condition;

Fig. 1D is a plan view on an enlarged scale of said escape as shown in Fig. 1A showing the escape in its non-operative or collapsed condition with the upper cover removed therefrom;

Fig. 2A is a fragmentary sectional view on an enlarged scale of the stowage framework of said escape as shown in Fig. 1A showing the framework in its anchored position with the escape means removed therefrom;

Fig. 2B is similar to Fig. 2A, but shows a modification of the stowage framework anchoring arrangement of Fig. 2A;

Fig. 3A is a bottom view on an enlarged scale of a preferred form of upper cover for use in connection with said stowage framework of Fig. 2A;

Fig. 3B is an inverted side elevational view in longitudinal section of said upper cover of Fig. 3A;

Fig. 3C is a fragmentary cross-sectional view on an enlarged scale of the alarm means mounted on said upper cover of Fig. 3A;

Fig. 4A is a plan view on an enlarged scale of a preferred form of lower cover for use in connection with said stowage framework of Fig. 2A with a portion of the cover cut away;

Fig. 4B is a side elevational view in

longitudinal section of said lower cover of Fig. 4A;

Fig. 4C is a fragmentary cross-sectional view especially showing the pivot support arrangement for said lower cover of Fig. 4A;

Fig. 5A is a fragmentary side elevational view in longitudinal section showing a preferred form of linkage means provided between said upper and lower covers for operatively connecting the covers to each other in an interlocking relationship;

Figs. 5B to 5D are diagrammatic views showing said linkage means in various operative positions;

Fig. 5E is a fragmentary side elevational view in longitudinal section of said linkage means as shown in Fig. 5A showing the linkage means in its partially released position together with a portion of said framework;

Fig. 5F is a diagrammatic view showing the operation of said linkage means in the partially released position corresponding to that as shown in Fig. 5E;

Fig. 5G is a fragmentary side elevational view of said linkage means as shown in Fig. 5A showing the linkage means in its fully released position together with a portion of said framework;

Figs. 5H, 5I and 5K are fragmentary views showing a modified form of linkage means of the invention in diagrammatic and in partial section, respectively;

Fig. 5J is a diagrammatic view showing said linkage means shown in Fig. 5H;

Fig. 6A is a front elevational view of a preferred embodiment of extensible emergency escape means or ladder of the invention;

Fig. 6B is a perspective view on an enlarged scale of one of a plurality of pipe sections forming said escape means or ladder as shown in Fig. 6A;

Fig. 6C is a fragmentary view in partially vertical section of the connection arrangement between adjacent pipe sections in said escape means of Fig. 6A;

Fig. 6D is a plan view of the rung associated with one of a plurality of pipe sections in said escape means as shown in Fig. 6A;

Fig. 6E is a fragmentary longitudinal sectional view on an enlarged scale of said rung as shown in Fig. 6D with a portion thereof removed therefrom;

Fig. 7A is a plan view of a preferred form of descent control means employed in said extensible escape as shown in Fig. 1A or Fig. 6A;

Fig. 7B is a cross-sectional view of the nut and associated parts of said descent control means as shown in Fig. 7A;

Fig. 7C is an end elevational view of said descent control means as shown in Fig. 7A;

Fig. 7D is a longitudinal sectional view of said descent control means as shown in Fig. 7A;

Fig. 8A is a fragmentary cross-sectional view of a modified form of descent control means of the invention as being connected to said escape means;

Fig. 8B is a plan view of said descent control means as shown in Fig. 8A;

10 Fig. 8C is an end elevational view of Fig. 8B;

15 Figs 8D, 8E and 8F are respectively a fragmentary diagrammatic and two longitudinal sectional views of the descent control means of Fig. 8B, respectively; and

20 Figs. 8G and 8H are end and side elevational views in cross-section and longitudinal section, respectively, of a further modified form of descent control means of the invention.

25 The present invention will be now described referring to the accompanying drawings and more particularly, to Figs. 1A to 1D which show the first embodiment of extensible emergency escape of the invention in its operative or extended and non-operative or collapsed positions. In the collapsed position, the entire escape means of the escape is received within a stowage framework A which is in turn fitted and anchored in an opening 4 formed in the floor slab of a room or veranda in a multi-storey building (not shown).

30 The framework A includes an upper cover B pivoted to the floor side of the opening 4, a lower cover C pivoted to the ceiling side of the opening 4 and linkage means in the form of a pair of linkages D which extend and interlock between the upper and lower covers B and C on the opposite sides of the covers in such a manner that when the upper cover B is manually opened or closed, the lower cover C is automatically opened or closed.

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In the collapsed position of the escape means, the upper and lower covers B and C extend horizontally and parallel to each other and in the released or extended position of the escape means, the upper cover B extends uprightly and held in position while the lower cover C suspends downwardly. One of the linkages D connects between the upper and lower covers on the same one side of the covers while the other linkage connects between the upper and lower covers on the other or opposite side of the covers, respectively.

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The escape means E is in the form of an extensible ladder and includes eight telescopically connected pipe sections 72A, 72B... 72H of different cross-section areas which successively decrease downwardly with the uppermost pipe section 72A having the largest cross-section area and the lowermost pipe section having the smallest

cross-section area. The pipe sections 72A, 72B... 72H have their respectively associated rungs 82A, 82B... 82H at the lower ends extending transversely of the associated pipe sections at right angles to the pipe sections, respectively. The uppermost pipe section 72A is rotatably supported in the framework A by means of a transverse stub shaft 85 which is in turn supported by the framework A and thus, when extended, the entire escape means E is suspended from the framework A.

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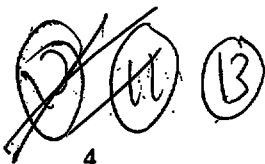
Thus, it will be noted that when it is desired to use the escape, the upper cover B is manually pivoted from the horizontal position to the upright position to cause the lower cover C to simultaneously pivot from the horizontal position to the suspending position through the linkage means D whereupon the uppermost pipe section 72A rotates about the shaft 85 in one direction and the pipe section assembly is allowed to extend downwardly by gravity and on the other hand, when it is desired to collapse the escape means E, the successive lower pipe sections are telescoped into the respectively adjacent upper pipe sections and the uppermost pipe section 72A is rotated about the shaft 85 in the other or opposite direction. Thereafter, the lower cover C is pivoted back to the horizontal position to house the escape means E within the framework A in the horizontal position. The pivotal movement of the lower cover C to the horizontal position pivots the upper cover B back to the horizontal position through the linkage means D.

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Descent control means F is provided at the upper end of the escape means E and the descent control means F is actuated only after it has been ascertained that no person is present in the underlying storey. When actuated, the descent control means F releases a ratchet mechanism 105 to allow the pipe sections to telescopically extend at a speed controlled by the descent control means F. The descent control means F includes a wire rope which is adapted to hoist to telescopically collapse the pipe sections 72A, 72B... 72H to the stowage position.

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Figs. 2A and 2B show details of the framework A of the extensible emergency escape as shown in Figs. 1A and 1B and the manner by which the framework is anchored to the associated slab. The framework A includes four upright side wall members 1 connected together to form a rectangular configuration and the side wall members each has at the upper end an upper bent edge 2 extending horizontally and outwardly of the associated upright side wall member and at the lower end a



lower bent edge 3 extending horizontally and inwardly of the associated upright side wall member.

When positioned in the opening 4 formed in the associated slab, the upper edge 2 rests on the area of the slab defining the upper edge of the opening 4 whereby the framework A is suspended in the opening 4. An annular seal 5 is interposed between the upper edges 2 of the side wall members 1 and the slab areas defining the opening 4.

A U-shaped anchor rod 7 is provided below each of the lower bent edges 3 of the side wall members 1 with one longer threaded arm 7A extending through the associated lower edge 3 and a spacer 6 positioned on the upper surface of the lower edge 3 and the other shorter arm 7B abutting against the slab area defining the opening 4 on the ceiling side of the lower storey. The U-shaped anchoring rod 7 is held in position by means of a nut 8 threaded on the longer threaded arm 7A.

The length of the arm 7A extending within the framework A can be varied depending upon the thickness of the associated slab whereby the framework A can be easily anchored to the slab. By selecting a suitable spacer 6, the framework A can be also suitably anchored to the slab. Although not shown, it is also possible that the other arm 7B of the U-shaped engaging piece 7 is previously embedded in the area of the slab defining the opening 4 prior to the anchoring of the framework A to the slab area and the one arm 7A is then inserted through the lower edge 3 of the associated side wall member 1 and spacer 6 followed by the tightening of the nut 8 onto the threaded arm 7A.

When the nut 8 is tightened onto the arm 7A of the U-shaped anchoring rod 7, since the stowage framework A is pulled downwardly or toward the ceiling of the underlying adjacent lower storey, the airtightness between the upper bent edges 2 of the framework A and the floor surface of the upper storey provided by the seal 5 is further increased. And by moving the arms 7A and 7B upwardly or downwardly, the framework A can be suitably anchored to slabs having different thicknesses.

The stowage framework A may be anchored to the associated slab by means other than the U-shaped anchoring rods 7 of Fig. 2A. Such alternative anchoring means is shown in Fig. 2B in which the parts corresponding to those shown in Fig. 2A bear the same numerals, respectively. Referring now to Fig. 2A, the alternative anchoring means is in the form of an angle 12. When the framework A is anchored to the slab by the use of a plurality of angles 12, during the finishing stage of a veranda or floor in the construction of a building,

the angles 12 are secured by one arm thereof to the outer surfaces of the side wall members 1 which form the stowage framework A by means of welding or the like and the other arms of the angles 12 are then welded to reinforcing steel bars 13 partially embedded in the base of the veranda or floor. Thereafter, mortar, concrete or the like filler 14 is placed into the veranda base surrounding the framework A, angles 12 and reinforcing steel bars 13.

Figs. 3A to 3C more clearly show the upper cover B of the stowage framework A which is adapted to be positioned in the upper portion of the slab opening 4. The upper cover B includes a base plate 20, a plurality of suitably spaced pivot arms 22 secured at one end to the undersurface of the plate at one end edge thereof and each having a loop at the other or free end and a pivot shaft 11 extending through the loop at the other end of each of the arms 22. The pivot arms 22 are fitted in openings defined by the corresponding pivot support arms (not shown) provided in suitable positions of the framework A and having openings in alignment with the loops in the arms 22. The pivot shafts 11 also extend through the aligned openings in the pivot support arms on the framework A. The upper cover B further includes a handle 23 on the upper surface of the base plate 20 by means of which the user can pivot the upper cover B upwardly about the shafts 11 to the substantially upright position and spaced and parallel transverse handholds 24 on the under-surface of the plate 20 by means of which the user can rapidly move onto the escape means E when the upper cover B is fully opened to the substantially upright position.

As shown in Fig. 1D, the inner surface of one of the side wall members 1 (the side wall member positioned adjacent to the end edge of the upper cover where the pivot arms 22 are provided) is provided with a pair of laterally spaced and aligned footholds 15 which cooperate with the handholds 24 for assisting the user in transferring to the escape means E.

The upper cover B has an alarm means 27 mounted on the undersurface of the base plate 20 as shown in Fig. 3C and the alarm means includes a buzzer 25 adapted to give an alarm to the occupants in the particular storey of a building of occurrence of any emergency such as fire and an illumination light 26 adapted to light the position of the escape means E and also the environmental area of the escape means to indicate whether the upper and lower covers B and C have been opened or not.

The upper cover B further includes a plurality of longitudinal and transverse

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reinforcing members 28 integrally attached to the undersurface thereof so that the cover can be prevented from deforming or distorting during its use. Furthermore, the base plate 20 of the upper cover B has an instruction label 29 secured to the undersurface thereof by means of adhesive and the label bears information relating to manipulation of the escape means and the like so that the user can leave the particular storey where a fire took place safely and rapidly by the use of the escape means E.

Figs. 4A to 4C show details of the lower cover C of the stowage framework A which is to be pivoted to the opening 4 on the ceiling side of the lower storey of the adjacent two stories of a building. The lower cover C includes a base plate 30, a plurality of suitably spaced pivot arms 32 secured to the upper surface of the plate at one end edge thereof corresponding to the pivot arms 22 associated with the upper cover B in position and number, respectively and pivot shafts 31 extending through the respectively associated pivot arms 32 and received at one end in pivotal support arms 33 on the stowage framework A for pivotally support of the lower cover C on the framework A.

The upper surface of the lower cover C is also provided in a suitable position with a rest 35 on which the escape means E rests in its substantially horizontal collapsed position and reinforcing members 38 for preventing the lower cover C from deforming or distorting during its use.

As more clearly shown in Fig. 5A, the upper and lower covers B and C are connected to each other in an interlocking relationship by means of the linkage means in the form of two linkages D for movement relative to each other. The linkages D are positioned on the opposite sides of the upper and lower covers B and C and so arranged that when the linkages D are pivoted from the position shown in Fig. 5A to the position shown in Fig. 1B, the upper cover B is pivoted to substantially the upright position and held in position and at the same time, the lower cover C is pivoted to the suspended position substantially at right angles to the framework A.

Since the pair of linkages D are identical with each other, only one of the linkage will be described referring to Figs. 5B to 5G. As shown in these Figures, the linkage D includes a link 41 eccentrically pivoted at a position closer to the pivot points 11 and 31 of the covers to the inner surface of the associated one side wall member 1 of the framework A by means of a pivot pin 42, an arm 45 having one end pivoted by means of a pivot pin 44 to a bracket 43 integrally attached to the upper cover B and the other end pivoted to one end of the link 41 and a

partially threaded bar 51 having reduced diameter threaded opposite ends on one of which an internally threaded connector 48A is threaded and on the other end of which a similar internally threaded connector 48B is threaded. The other end of the connector 48A is pivoted by means of a pivot pin 49 to an operation arm 47 which in turn pivoted at the other end to the associated pivot shaft 31 on the lower cover C and fixed to the associated pivot arm 32, and the other end of the connector 48B is pivoted to the other end of the link 41 by means of a pivot shaft 50.

When the upper and lower covers B and C are in their non-operative or closed position as shown in Fig. 5B, in the lower cover C, the combined weight W of both the cover C itself and the escape means E supported on the cover acts as a certain magnitude of clockwise direction moment T on the pivot shafts 31 associated with the lower cover C as seen in Fig. 5B. The moment T can be expressed as:

$$T = W \times L$$

where,

T: moment on the pivot shaft 31

W: combined weight of the lower cover C and escape means E thereon

L: distance between the centre of the pivot shaft 31 and centre X of gravity of the lower cover C and escape means E.

Similarly, the weight W_1 of the upper cover B provides a certain magnitude of clockwise direction moment T_1 to the pivot shafts 11 associated with the upper cover B as seen in Fig. 5B.

The moment T_1 can be expressed as:

$$T_1 = W_1 \times L_1$$

where,

T_1 : moment on the pivot shaft 11

W_1 : weight of the upper cover B

L_1 : distance between the centre of the pivot shaft 11 and the centre X, of gravity of the upper cover B.

Furthermore, in addition to the weight of the upper cover B, the pivot shafts 11 associated with the upper cover B are subjected to the moment T acting on the lower cover C as a component of force F_1 through the operation arms 47, threaded bars 51, links 41, arms 45, pivot shafts 49, 50, 42 and 46 associated with the operation arms 47, threaded bars 51, links 41 and arms 45, respectively and the pivot pins 44 on the arms 45.

Thus, assuming that the pivot point Q of the arm 45 is positioned below the line (y, y) which connects between the centre O of the pivot shaft 11 and the common pivot point

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P of the arm 45 and link 41, the pivot shaft 11 is subjected to the clockwise direction moment M_1 equal to the component of force F_1 times the moment arm l_1 , shown as the vertical distance from the center of the pivot shaft 11 to the operation line (x, x) of the component of force F_1 , i.e. the distance from the centre O of the pivot shaft 11 to the line (x, x) which connects between the common pivot point P of the link 41 and arm 45 and the pivot point Q of the arm 45 on the upper cover B.

The moment M_1 can be expressed as:

$$M_1 = F_1 \times l_1$$

where,

M_1 : moment applied on the pivot shaft 11 when the pivot point Q is positioned below the centre O of the pivot shaft 11 and the common pivot point P of the link 41 and arm 45

F_1 : component of force generated at the pivot point Q

l_1 : moment arm of force F_1 , about the pivot shaft 11.

Therefore, when the pivot point Q of the arm 45 is positioned below the centre O of the pivot shaft 11 and the common pivot point P of the link 41 and arm 45, the gravity acting on the lower cover C, that is, the clockwise direction moment T_1 acting on the pivot shaft 31 associated with the lower cover C is transmitted as the component of force F_1 to the pivot point Q of the arm 45 through the elements 47, 51, 41 and 45 of the linkage D. However, this component of force F_1 is transmitted to the pivot shaft 11 of the upper cover B as a clockwise direction moment M_1 , and thus, the pivot shaft 11 is subjected to the combined moment comprising the moment F_1 and the moment T_1 due to the weight W_1 of the upper cover B whereby the lower cover C is firmly maintained in its position for closing the opening in the stowage framework A unless the lower cover C is forced to open or damaged. On the other hand, when the pivot point Q of the arm 45 or the operation line (x, x) of the component of force F_1 is positioned on the line (y, y) connecting between the centre O of the pivot shaft 11 and the common pivot point P of the link 41 and arm 45, as shown in Fig. 5C, the moment arm l_2 will be zero and the pivot shaft 11 will not be subjected to the moment M_2 in either direction to be maintained in its balanced condition. Thus,

$$M_2 = F_1 \times l_2 = 0$$

Therefore, even in the latter case, since the pivot shaft 11 is subjected to the clockwise direction moment T_1 due to the own weight W_1 of the upper cover B, the

lower cover C will be prevented from being inadvertently opened.

Furthermore, when the pivot point Q of the arm 45 or the operation line (x, x) of the component of force F_1 is positioned above the line (y, y) connecting between the centre O of the pivot shaft 11 and the common pivot point P of the link 41 and arm 45, as shown in Fig. 5D, a moment arm l_2 of force F_1 about the pivot shaft 11 and the shaft 11 is subjected to a counterclockwise direction moment M_2 .

The moment M_2 can be expressed as:

$$M_2 = F_1 \times l_2$$

where,

M_2 : moment at the pivot shaft 11 when the pivot point Q is positioned above the centre O of the pivot shaft 11 and the common pivot point P of the link 41 and arm 45

F_1 : component of force applied at the pivot point Q

l_2 : moment arm of force F_1 about the pivot shaft 11.

Therefore, even in this case, when the counter-clockwise direction moment M_2 due to the component of force F_1 and the clockwise direction moment T_1 due to the weight of the upper cover B have the relationship $M_2 < T_1$, the upper and lower covers B and C will not be forced to open, but in case of $M_2 > T_1$, the upper and lower covers B and C will not remain in their closed positions under the action of their weights alone.

However, even in case of $M_2 < T_1$, there is the possibility that a slight external force is applied on the lower cover C to provide a quite unstable condition in which $M_2 < T_1$ will easily change to $M_2 = T_1$ or $M_2 > T_1$.

Therefore, according to a feature of the present invention, the pivot point Q of the arm 45 is preferably positioned at least on or below the line connecting between the centre O of the pivot shaft 11 and the common pivot point P of the link 41 and arm 45 and it is also preferable to position the common pivot point P of the link 41 and arm 45 near to the upper cover B as much as possible.

When it is desired to open the upper cover B, the upper cover B is pulled up or pivoted upwardly about the pivots 11, 22 by the handle 23 (Fig. 3A) whereupon the arms 45 are also pivoted upwardly about the pivot shafts 44.

As the upper cover B is opened or pivoted upwardly in the manner mentioned herebefore, when the pivot points Q of the arms 45 are pivoted upwardly to a position above the line connecting between the centre O of the pivot shafts 11 and the common pivot points P of the links 41 and

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arms 45, that is, when the operation lines (x, x) drawn through the pivot points Q are positioned above the centre O of the pivot shafts 11 (see Fig. 5E and 5F), the clockwise direction moment provided to the pivot shafts 11 by the component of force F_1 transmitted from the lower cover C to the upper cover B changes into a counter-clockwise direction moment or the moment in the same direction as the direction in which the upper cover is pivoted upwardly and thus, after the operation lines (x, x) drawn through the pivot points Q have been moved to the position as shown in Figs. 5E and 5F, the opening of the upper cover B is substantially accelerated.

As the upper cover B is pivoted upwardly in the manner as mentioned hereinbefore, when the links 41 and arms 45 lie substantially in the same straight plane or the upper and lower covers B and C lie substantially in vertical planes, the stops 52 at the right-hand end of the arms 45 as seen in Figs. 5E and 5G arrest the opening movement of the upper cover B to hold the upper and lower covers B and C in the vertical position (see Fig. 5G).

In response to the opening movement of the upper cover B, the links 41 and threaded bars 51 of the linkage means D are caused to pivot about their associated pivot points to open the lower cover C to its substantially vertical position as mentioned whereupon the escape means E is released to thereby allow the pipe sections 72A to 72H to telescopically extend downwardly.

In order to retract or collapse the extended escape means E into the stowage framework A, the successive lower pipe sections are telescoped into the respectively adjacent upper pipe sections by means of the descent control means as hereinafter described with the aid of a handle 115, see Fig. 1A. Then an upwardly directed force is applied on the arms 45 to disengage the stops 52 on the arms 45 from the common pivot shafts 46 of the links 41 and arms 45 so as to fold the links 41 and 45 which now extend in the straight configuration to each other to thereby pivot the upper cover B back in the closing direction about the pivot shafts 11. The downwardly directed force which forces the upper cover B to pivot back in the closing direction is transmitted through the arms 45, links 41, threaded bars 51 and operation arms 47 to the lower cover C which is then pivoted upwardly or back in the closing direction above the pivot shafts 31.

During the initial stage of the closing operation of the upper and lower covers B and C, since the weight of the escape means acts as a clockwise direction moment or lower cover opening direction moment on

the lower cover C and also acts as a component of force in the counter-clockwise direction or upper cover opening direction moment on the upper cover B, the downwardly directed force acting on the upper cover B should be substantially great. As the upper cover B is closed against the upper cover opening moment, the moment diminishes gradually until the centre O of the pivot shafts 11, the pivot points Q of the arms 45 and the common pivot points P of the links 41 and arms 45 lie substantially in the same horizontal plane (see Fig. 5C) whereupon the moment is offset by the component of force transmitted from the lower cover C to maintain the upper and lower covers B and C in the substantially closed position.

Especially when the upper and lower covers are closed, in the upper cover B, the pivot points Q are positioned lower than the centre O and pivot points P (as seen in Fig. 5B), since the component of force on the lower cover C acts as a clockwise direction moment on the pivot shafts 11 as mentioned hereinbefore, after the upper cover B has been pivoted in the closing direction by a small amount, the upper and lower covers B and C can be then automatically pivoted in the closing direction without requiring any additional manual force.

By suitably selecting the length of the arm 45, link 41 and threaded bar 51 and pivotal mounting position in each of the linkages D, the opening angle of the covers and the force required for opening the covers can be varied as desired.

Figs. 5H to 5K show a further modified form of linkage means in the form of a pair of linkages D' includes a link 63 having a rod 61 of adjustable length with one end pivoted to the lower cover C by means of a pivot shaft 62 adjacent to the associated pivot shaft 31, an arm 66 having one end pivoted by means of a pivot pin 65 to a bracket 64 secured to the upper cover B and a slider 69 slidably fitted on a guide member 67 provided on one of the side wall members 1 forming the stowage framework A and pivoted to the other ends of the link 63 and arm 66 by means of a pivot pin 68.

As in the case of the linkage D as shown in Fig. 5A, in the escape stowage position, the relationship between the centre O' of the pivot shaft 11, the pivot point Q' of the arm 66 on the upper cover B and the common pivot point P' of the arm 66 and link 68 is preferably positioned as shown in Fig. 5J, that is, the pivot point Q' of the arm 66 is preferably positioned on or lower than the line (y', y') connecting between the centre O' of the pivot shaft 11 and the common pivot point P' of the arm 66 and link 63.

Now, the operation of the linkages D' in

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opening the upper and lower covers will be described. When the upper cover B is opened, the lower cover C is also opened through the linkage means D'. As the upper cover B is opened, the slider 69 to which the link 63 and arm 66 are pivoted slides along the guide member 67 toward the rotary shaft 11 to pivot the link 63 and arm 66 in the upper cover opening direction about the pivot points 62, 64. When the upper cover B is pivoted to the fully open position or substantially upright position, the stopper 70 pivoted by a pivot pin on a bracket secured to the guide member 67 engages the common pivot pin 68 of the link 63 and arm 66 to arrest the slidable movement of the slider 69 to thereby stop the opening movement of the upper cover B and hold the upper cover in position.

In the closing of the upper and lower covers B and C, the stopper 70 is disengaged from the pivot shaft 68 on which the link 63 and arm 66 are pivoted and a downwardly directed force is applied on the upper cover B to pivot the cover in the closing direction about the pivot shaft 11.

In the cover opening and closing operation, the action of the linkages D' is the same as described in connection with the linkages D of Figs. 5B, 5C and 5D and description of the action of the linkages D' will be omitted herein.

Figs. 6A to 6E show the escape means E of the escape of the invention more clearly. The escape means E comprises eight pipe sections 72A, 72B...72H of substantially oval cross-section having different cross-sectional areas; these are telescopically connected to each other and reduce in cross-sectional area downwardly in succession. Each of the pipe sections 72A, 72B...72H has four circumferentially spaced raised portions 74 in the outer periphery at the upper end of the pipe section and the corresponding number of similarly spaced indented portions 76 in the inner periphery at the lower end of the associated pipe section, respectively. The inner periphery of each of the pipe sections 72 is recessed in portions corresponding to the raised portions 74 and similarly, the outer periphery of the pipe section is recessed in portions corresponding to the indented portions 76, respectively for the purpose to be described hereinafter. The lower end of each of the raised portions 74 is formed with a wedge-shape as shown by 73 and similarly, the upper end of each of the indented portions 76 is formed with a corresponding wedge-shape as shown by 75. With the above construction of the pipe sections 72, each of the pipe sections is telescopically received within the adjacent

upper larger pipe section. In extending the escape means E comprising the telescopically connected pipe sections 72A, 72B...72H, the wedge-shaped lower end 73 of the raised portion 74 on each pipe section engages in the correspondingly shaped upper end 75 of the raised portion 76 in the adjacent or upper larger pipe section whereby the upper pipe section suspends the lower pipe section therefrom (see Fig. 6C).

The pipe sections 72A, 72B...72H have at the lower ends transverse rungs 82A, 82B...82H, respectively (see Fig. 6D).

Each of the rungs 82A, 82B...82H comprises a pair of rung means each including a central semi-circular anchoring portion 77 fastening about substantially one half of the periphery of the associated pipe sections 72A, 72B...72H at the bottom thereof and a pair of rung members 78, 78 extending outwardly from the opposite sides of the central anchoring portion 77. The adjacent rung members 78, 78 of the pair of rung means are connected together by means of screws to thereby anchor the thus formed rung to the associated pipe section. The rungs of the respective pipe sections 72A, 72B...72H are shown by numerals 82A, 82B...82H, respectively in Fig. 6A.

Each of the rungs 82A, 82B...82H is formed of a resilient material and covered with a non-skid member 80 having the rugged surface 79 thereon and a pair of foot engaging projections 81 are provided at the opposite ends each of the rungs 82A, 82B...82H (see Figs. 6D and 6E).

In the foregoing, although description has been made of the embodiment of escape means E which comprises eight telescopically connected pipe sections 72A, 72B...72H, the number of such telescopically connected pipe sections 72A, 72B...72H is variable within the range of six to twelve pipe sections depending upon the height of upper and lower stories in a particular building where the escape of the invention is to be installed. As shown in Fig. 6A, since the uppermost pipe section 72A of the escape means E is supported in a suspending relationship in the stowage framework A so that the particular pipe section can rotate about the support shaft 85 journaled in a bracket 84 suitably secured to the side wall members 1 of the stowage framework A, in order to retract the escape means E from its extended position, the upper and lower covers B and C are pivoted to the closing position to telescopically retract the successive lower pipe sections 72B, 72C...72H into their respective upper pipe sections 72A, 72B...72G and the collapsed pipe section assembly is rotated about the shaft 85 to be

positioned onto the escape means rest 35 (see Fig. 1C and 1D) and stored within the framework A with the upper and lower covers held in the closed position.

When the collapsed escape means E is desired to be employed for its intended purpose, the upper cover B is released and the release of the upper cover automatically opens the lower cover C through the interlocking function of the linkage means arrangement as mentioned hereinabove. As the lower cover C is opened, the escape means E is rotated about the support shaft 85 to be suspended from the shaft 85. After it has been ascertained that no person is present in the lower storey below the escape, a descent control means F on the uppermost pipe section 72 is released whereby the successive pipe sections telescopically extend to provide an evacuation passage to or adjacent to the floor surface of the lower storey. In order to protect the user from possible hazard, the upper end of the uppermost pipe section 72A is covered with a rubber cap 87.

Furthermore, as seen from Fig. 1B, a wire rope 88 extend between and is anchored to the uppermost pipe section 72A and one of the side wall members 1 of the stowage framework A so that the wire rope restrains the extended escape means E from swaying laterally and at the same time, disposes the escape means E at a small angle with respect to the vertical to thereby accelerate the descent of the user along the escape.

The descent control means F is provided at the upper end of the uppermost pipe section 72A as shown in Figs. 7A to 7D and serves to releasably anchor the escape means E comprising the pipe sections 72A, 72B . . . 72H, adjusts the extension speed of the escape means, pulls the escape means up and retracts the escape means into the framework A.

The descent control means F comprises two substantially U-shaped opposite bearing plates 90, 90 having their legs connected together, a threaded drive shaft 91 rotatably supported in the bearing plates, a drum 94 fixedly mounted on the drive shaft 91 within the uppermost pipe section 72A and having an integral brake plate 93 on one side, a spring seat 98 freely received on the drive shaft 91 on the outer side of the brake plate 93 and having a substantially horse shoe-shaped skirt extension 95 and a central boss 96 having a hole 97 bored in the seat 98 remotod from the extension 95, a nut 100 threaded on the threaded end 99 of the drive shaft 91 and a coiled spring 101 interposed between the brake plate 93 and nut 100.

The nut 100 has a plurality of circumferentially spaced integral

projections 102 in the periphery and one of the projections 102 is slidably received within the guide groove 104 in a guide plate 103 secured to the bearing plates 90.

Furthermore, the descent control means F includes a ratchet mechanism 105 which allows the drive shaft 91 to rotate in one direction.

The ratchet mechanism 105 includes a ratchet 106 secured to one end of the drive shaft 91 which extends out of the adjacent bearing plate 90, engaging lever 108 pivoted on a pivot shaft 107 supported in the other bearing plate 90 for engaging with the ratchet 106, a biasing spring 109 engaging the lever 108 at one end and secured at the other end to the support shaft 107 and a locking lever 110 for limiting the rotation of the engaging lever 108.

The locking lever 110 is eccentrically supported on the adjacent bearing plate 90 by means of a pivot shaft 111. Furthermore, as shown in Fig. 7C (in which the mechanism is shown rotated through 90° from the normal), the pivot shaft 111 of the locking lever 110 is positioned with respect to the straight line (a, a) extending from the contact point with the engaging lever 108 so that with the levers 108 and 110 in the positions shown in broken line, lever 110 is urged against stop 112 by the action of spring 109 through lever 108.

When the engaging lever 108 is rotated so as to disengage the lower end of the lever 108 from the ratchet 106, the locking lever 110 is allowed to drop and rotate in the counter-clockwise direction as seen in Fig. 7C until the lever 110 engages one of the projections 112 on the bearing plate unit 90 to assume a substantially upright position to thereby prevent the now freed engaging lever 108 from pivoting back in the engaging direction.

The drum 94 has a wire rope 113 wound thereabout with one end of the wire rope anchored to the drum and the other end of the wire rope 113 extends through the successive pipe sections 72A, 72B . . . 72H and is anchored to the lowermost pipe section 72H. The drum 94 has a pair of flanges 114 on the opposite sides to prevent the wire rope 113 from slipping out of the drum 94.

In the stored position of the escape means E, the wire rope 113 is held on the drum 94 in its wound condition and the engaging lever 108 of the ratchet mechanism 105 is in mesh with the ratchet 106.

The operation of the descent control means F will be now described. When it is desired to employ the escape, the upper cover B is first opened to thereby open the lower cover C accordingly and in response

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to the opening of the upper and lower covers B, C, the escape means E rotates about the shaft 85 to be suspended in a substantially vertical position from the shaft 85.

5 With the escape means E in such position, when the engaging lever 108 is urged to move out of its engagement with the ratchet 106, the escape means E initiates its descent movement by its own weight.

10 As the escape means E descends in the manner as mentioned hereinabove, the wire rope 113 is payed out of the drum 94 to impart a rotational force to the drive shaft 91. The spring seat 98 is so arranged that in order to impart an inertia to the escape means E during the initial stage of the descent of the escape means, the spring seat 98 is allowed to rotate about the shaft 91 by a small amount.

20 However, after the spring seat 98 has rotated by such a small amount, the spring seat 98 abuts against the inner surface of the uppermost pipe section 72A via its extension 95 to be stopped thereby.

25 Since the brake plate 93 is firmly urged against the spring seat 98 under the force of the spring 101 which is held in its compressed condition by the nut 100, the rotation of the drive shaft 91 is constrained whereby the descent speed of the escape means E is controlled.

30 When the escape means E further descends by its own weight against the control provided by the abutment of the spring seat 98 against the brake plate 93 under the force of the spring 101, as the drive shaft 91 rotates, the nut 100 which has its one projection 102 received in the guide groove 104 is caused to slidably move away from the spring seat 98 to thereby slacken the spring 101. As a result, the frictional resistance provided by the spring seat 98 and brake plate 93 decreases gradually and the drive shaft increases its rotational speed gradually to thereby accelerate the descent of the escape means E. As the escape means E further descends, the frictional resistance provided by the brake plate 93 and spring seat 98 disappears to allow the escape means E to descend freely.

35 While the pipe sections of the freely descending escape means E are telescopically extending, the engaging lever 108 is, of course, maintained out of engagement with the ratchet 106 by the locking lever 110.

40 When the escape means E is desired to be retracted to the storage position within the framework A, the retractable handle 115 (see Fig. 1A) provided on the undersurface of the upper cover B is moved out of its retracted position to the operative position in which the handle engages the end of the

drive shaft 91 remote from the lower cover C. The handle 115 is then turned to rotate the drive shaft 91 so as to wind the wire rope 113 onto the drum 94 to thereby raise the escape means E up. Thereafter, the engaging lever 108 is pivoted to engage the ratchet 106 to thereby lock the escape means E in its locked position.

45 Figs. 8A to 8F show a further modified form of descent control means F'. The descent control means F' includes two substantially U-shaped bearing plates 120, 120 secured to the uppermost pipe section 72A and connected together, a drive shaft 121 journaled in the bearing plates 120, 120, a drum 124 secured to the drive shaft 121 by means of a pin 122 within the uppermost pipe section 72A and having a brake lining 123 attached to one side of the drum, a friction plate 126 freely mounted on the drive shaft 121 on the side of the drum 124 where the brake lining 123 is provided and having an enlarged skirt extension 125 adjacent to the inner surface of the bearing plate unit 120, 120, a brake piece 131 freely mounted on the drive shaft 121 adjacent to the friction plate 126 and having a brake lining 127, a spring 132 interposed between the brake piece 131 and drum 124 for normally urging the lining and drum away from each other, four circumferentially spaced lever abutment members 133 secured to the drive shaft 121 adjacent to the brake piece 131 and four circumferentially spaced levers 137 pivoted to the lever abutment members 133 by means of pivot shafts 136, respectively. Each of the levers 137 has a weight 134 at one end and an eccentric abutment face 135 at the other end adjacent to the brake piece 131. As more clearly shown in Figs. 8E and 8F, the brake piece 131 is mounted on the drive shaft 121 against inadvertent rotation about the shaft by means of a key way 129 formed in a central boss 130 on the side of the brake piece 131 adjacent to the friction plate 126 and a key 128 formed in the periphery of the drive shaft 121 and engaged in the key way.

50 The drum 124 has a wire rope 138 wound thereabout and one end of the wire rope is anchored to the drum and the other end extends through the eight pipe sections 72A, 72B...72H and is anchored to the lowermost pipe section 72H.

55 A ratchet mechanism 105 is secured to the adjacent end of the drive shaft 121 to allow the drive shaft to rotate in one direction. The corresponding parts of the ratchet mechanism 105 are identical with those of the ratchet mechanism of Figs. 7A to 7D and thus, the parts of the modified ratchet mechanism 105 of Figs. 8A to 8F are shown with the same numerals. Description of the modified form of ratchet

mechanism of Figs. 8A to 8F is omitted herein.

In the operation of the modified form of descent control means F', the upper cover B is opened to open the lower cover C accordingly and the escape means E is rotated about the shaft 85 and suspended from the shaft 85.

10 With the escape means E suspended from the rotary shaft 85, the engaging lever 108 is urged away from or to disengage from the ratchet 106 whereupon the escape means E is allowed to initiate the descent by its own weight.

15 As the escape means E descends gradually, the wire rope 138 is payed out of the drum 124 to impart a rotational force to the drive shaft 121.

20 As the drive shaft 121 rotates, the four levers 137 eccentrically pivoted to the corresponding number of lever abutment members 133 secured to the drive shaft 121 are rotated about their respective pivot shafts 136 under the action of centrifugal force to throw the ends having the weights 134 radially and outwardly away from the axis of the drive shaft 121 (in the A direction in Fig. 8E) and also urge the ends 135 of the levers supporting the pivot pins 136 to abut against the brake piece 131 which is in turn urged against the drum 124. When the brake piece 131 is abutted against by the levers 137 in the manner mentioned above to abut against the drum 124, the brake piece 131 is caused to slide along the drive shaft 121 in the arrow B direction (Fig. 8E) to firmly compress the friction plate 126 between the brake lining 137 on the brake piece 131 and the brake lining 123 on the drum 124 to thereby restrain the rotation of the drive shaft 121. As a result, the gravity descent speed of the escape means E is controlled at a predetermined constant speed until the escape means extends to or adjacent to the floor surface of the lower storey of the adjacent two stories in a building involved.

50 The condition of the ratchet mechanism 105 of the descent control means F' when the escape means E descends and the manner in which the pipe sections of the escape means are telescopically retracted for storage are identical with those as described in connection with the embodiment of Figs. 7A and 7D and description thereof will be omitted herein.

60 The descent control means F'' of Figs. 8G and 8H is a further modification of the descent control means F' of Figs. 8A to 8F. In the embodiment of Figs. 8G and 8H, the arrangement is so made that the upper portion of a friction plate 146 freely mounted on the drive shaft 121 is slidably received on a pin 149 extending through a guide plate 148 which is in turn secured to

the bearing plate unit 120 by means of a bracket 147 and when the friction plate 146 is abutted by brake linings 123, 127 rotating at a high speed, the friction plate 146 is prevented from inadvertently rotating by the rotational force of the brake linings.

The corresponding parts of the embodiment of descent control means F'' of Figs. 8G and 8H are shown by the same numerals denoting the identical parts of the embodiment of descent control means F' and description of the same will be omitted herein.

The above described emergency escape, with or without the modifications, has the advantage that it does not require to be secured at its lower end, but is substantially free of sway and can be used at any desired location such as within a room or on a veranda. Further, the descent or extension speed of such an escape can be controlled as desired and the escape is easy to use.

While preferred embodiments of the invention have been here shown and described, it will be understood that skilled artisans may make minor variations without departing from the scope of the appended claims.

WHAT WE CLAIM IS:—

1. An emergency escape for use in a building the emergency escape comprising in combination;

a stowage framework adapted to be anchored in and occupy an opening formed in the slab of a floor, veranda or the like of said building;

upper and lower covers pivoted to the floor surface side and ceiling surface side of said framework, respectively;

linkage means pivoted to said upper and lower covers to operatively connect the covers together and open and close the lower cover upon the opening or closing of the upper cover, said linkage means holding said upper cover substantially upright when the cover is opened;

telescopically extensible escape means comprising a plurality of telescopically connected pipe sections of different cross-sectional areas which decrease downwardly, each of said pipe sections having a rung at the lower end and the uppermost pipe section being supported rotatably about an axis extending horizontally (when the emergency escape is anchored to a horizontal slab) in said framework whereby when said escape means is stored in said framework each of the pipe sections is telescopically retracted into the adjacent upper pipe section and said escape means rests on said lower cover, and when said upper and lower covers are opened and said pipe sections



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mechanism of Figs. 8A to 8F is omitted herein.

In the operation of the modified form of descent control means F', the upper cover B is opened to open the lower cover C accordingly and the escape means E is rotated about the shaft 85 and suspended from the shaft 85.

10 With the escape means E suspended from the rotary shaft 85, the engaging lever 108 is urged away from or to disengage from the ratchet 106 whereupon the escape means E is allowed to initiate the descent by its own weight.

15 As the escape means E descends gradually, the wire rope 138 is payed out of the drum 124 to impart a rotational force to the drive shaft 121.

20 As the drive shaft 121 rotates, the four levers 137 eccentrically pivoted to the corresponding number of lever abutment members 133 secured to the drive shaft 121 are rotated about their respective pivot shafts 136 under the action of centrifugal force to throw the ends having the weights 134 radially and outwardly away from the axis of the drive shaft 121 (in the A direction in Fig. 8E) and also urge the ends 135 of the levers supporting the pivot pins 136 to abut against the brake piece 131 which is in turn urged against the drum 124. When the brake piece 131 is abutted against by the levers 137 in the manner mentioned above to abut against the drum 124, the brake piece 131 is caused to slide along the drive shaft 121 in the arrow B direction (Fig. 8E) to firmly compress the friction plate 126 between the brake lining 137 on the brake piece 131 and the brake lining 123 on the drum 124 to thereby restrain the rotation of the drive shaft 121. As a result, the gravity descent speed of the escape means E is controlled at a predetermined constant speed until the escape means extends to or adjacent to the floor surface of the lower storey of the adjacent two stories in a building involved.

45 The condition of the ratchet mechanism 105 of the descent control means F' when the escape means E descends and the manner in which the pipe sections of the escape means are telescopically retracted for storage are identical with those as described in connection with the embodiment of Figs. 7A and 7D and description thereof will be omitted herein.

50 The descent control means F'' of Figs. 8G and 8H is a further modification of the descent control means F' of Figs. 8A to 8F. In the embodiment of Figs. 8G and 8H, the arrangement is so made that the upper portion of a friction plate 146 freely mounted on the drive shaft 121 is slidably received on a pin 149 extending through a guide plate 148 which is in turn secured to

the bearing plate unit 120 by means of a bracket 147 and when the friction plate 146 is abutted by brake linings 123, 127 rotating at a high speed, the friction plate 146 is prevented from inadvertently rotating by the rotational force of the brake linings. 70

The corresponding parts of the embodiment of descent control means F'' of Figs. 8G and 8H are shown by the same numerals denoting the identical parts of the embodiment of descent control means F' and description of the same will be omitted herein. 75

The above described emergency escape, with or without the modifications, has the advantage that it does not require to be secured at its lower end, but is substantially free of sway and can be used at any desired location such as within a room or on a veranda. Further, the descent or extension speed of such an escape can be controlled as desired and the escape is easy to use. 80 85

While preferred embodiments of the invention have been here shown and described, it will be understood that skilled artisans may make minor variations without departing from the scope of the appended claims. 90

WHAT WE CLAIM IS:—

95 1. An emergency escape for use in a building the emergency escape comprising in combination;

a stowage framework adapted to be anchored in and occupy an opening formed in the slab of a floor, veranda or the like of said building; 100

upper and lower covers pivoted to the floor surface side and ceiling surface side of said framework, respectively; 105

linkage means pivoted to said upper and lower covers to operatively connect the covers together and open and close the lower cover upon the opening or closing of the upper cover, said linkage means holding said upper cover substantially upright when the cover is opened; 110

telescopically extensible escape means comprising a plurality of telescopically connected pipe sections of different cross-sectional areas which decrease downwardly, each of said pipe sections having a rung at the lower end and the uppermost pipe section being supported rotatably about an axis extending horizontally (when the emergency escape is anchored to a horizontal slab) in said framework whereby when said escape means is stored in said framework each of the pipe sections is telescopically retracted into the adjacent upper pipe section and said escape means rests on said lower cover, and when said upper and lower covers are opened and said pipe sections 115 120 125

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are released, the latter telescopically extend to or adjacent to the floor surface of the lower storey of two adjacent stories involved; and

5 descent control means for controlling the extending descent speed of the escape means and wherewith the descent of the escape means can be releasably initiated and the escape means can be pulled up for
10 stowage upon the closing of said upper and lower covers.

2. An emergency escape as claimed in claim 1, in which said stowage framework includes an outwardly and horizontally bent edge at the upper end and an inwardly and horizontally bent edge at the lower end whereby said stowage framework is held in said opening formed in the slab by inserting the framework into the opening, engaging
15 said bent edge at the upper end on the periphery of the opening to suspend the framework from the slab, applying the end of one arm of a U-shaped anchoring rod against the ceiling side surface of said slab about said opening
20 whilst passing the other threaded arm of said U-shaped anchoring rod through said bent edge at the lower end and fastening a nut on said threaded other end, thereby causing the one arm of the U-shaped anchoring rod to bear up against the ceiling side of the slab and the bent edge at the upper end of the framework to bear down against the floor side of the slab.

3. An emergency escape as claimed in claim 1, in which said stowage framework includes anchoring angles provided on side wall members which constitute the framework whereby said framework is held
35 in position by securing said anchoring angles to reinforcing steel bars partially embedded in the base of the slab and placing mortar, concrete or the like about the framework to cover said angles and steel bars.

4. An emergency escape as claimed claim 1, claim 2 or claim 3, in which said upper cover includes a cover plate, a plurality of suitably spaced pivot arms secured to the undersurface of said plate at one end thereof and pivot shafts journaled in said
45 pivot arms for pivoting the upper cover to the framework.

5. An emergency escape as claimed in claim 4, in which said upper cover includes a handle secured to the upper surface of said cover plate, handholds provided on the undersurface of said cover plate by means of which the user can quickly move onto
50 said escape means, a buzzer provided on said undersurface of the cover plate to advise the position of the escape and the fact that said upper cover is open and illumination means for lighting the environment surrounding the escape.

6. An emergency escape as claimed in claim 5 in which said lower cover includes a cover plate, pivot arms provided on the upper surface of said cover plate at one end thereof and pivot shafts journaled in pivot arms provided on said framework and in said pivot arms associated with the lower cover for pivotally supporting the lower cover in said stowage framework, the lower cover being pivoted to the framework at the same side thereof as the upper cover.

7. An emergency escape as claimed in claim 6 in which said linkage means comprises two linkages each including a link eccentrically pivoted to said framework on one of the two sides of the framework adjacent to the side at which the upper and lower covers are pivoted, an arm pivoted at one end to the undersurface of said upper cover and at the other end to an end of the link, and threaded bars having at one end a threadedly received connector pivoted to an associated operation arm pivoted to one of said pivot shafts on the upper surface of said lower cover and at the other end a similar threadedly received connector pivoted to the other end of the link.

8. An emergency escape as claimed in claim 7, in which each of the two linkages is so arranged that the pivot point of the respective arm at said upper cover is positioned on or below a straight line connecting the common pivot point of the respective link and the other end of the arm and the axis of the pivot shafts about which the upper cover is pivoted.

9. An emergency escape as claimed in claim 6 in which said linkage means comprises two linkages each including a link provided with a substantially centrally positioned adjusting rod and having one end pivoted to said lower cover adjacent to said pivot shafts associated with the lower cover, an arm having one end pivoted to a bracket secured to said upper cover and the other end pivoted to the other end of said link, and a slide piece slidably fitted on a guide member provided on the inner surface of the side wall members forming said framework and pivoted to the other end of said arm and link.

10. An emergency escape as claimed in claim 9, in which each of the two linkages is so arranged that the pivot point of the respective arm on said upper cover is positioned below a straight line connecting the common pivot of the respective link and the other end of the arm and the axis of the pivot shafts about which the upper cover is pivoted.

11. An emergency escape as claimed in any preceding claim, in which each telescopically connected pipe section is



oval in cross-section and has on the outer peripheral surface a plurality of circumferentially spaced integral raised portions at the upper end of the pipe section and on the inner peripheral surface a corresponding number of circumferentially spaced raised portions at the lower end of the pipe section for engaging the mating raised portions on the outer peripheral surface of the adjacent lower pipe section whereby when said escape means is extended, the raised portions on the outer periphery of the lower pipe section engage the associated raised portions on the inner periphery of the upper pipe section.

12. An emergency escape as claimed in any preceding claim, in which said descent control means includes a threaded drive shaft rotatably supported in bearing plates secured to the uppermost pipe section, a drum secured to said drive shaft and having a brake plate attached to one side thereof, a wire rope wound on the drum with one end anchored to the drum and the other end anchored to the lowermost pipe section, a spring seat positioned on the side of said brake plate opposite from said drum and having a skirt extension at one end loosely accommodated within the uppermost pipe section and the other end freely mounted on said drive shaft, a nut threaded on the threaded end portion of said drive shaft and constrained from rotation about said drive shaft, a spring positioned about said drive shaft between said brake plate and nut, the arrangement being such that when the descent of the escape means is initiated, the wire rope pays out from the drum initially with no brake torque applied by the brake plate to the drum until the skirt extension comes into contact with the upper most pipe section and thereafter with a brake torque which decreases as the shaft rotates within the nut thereby reducing compression of the spring and the force with which such compression urges the spring seat against the brake plate.

13. An emergency escape as claimed in any of claims 1 to 11, in which said descent control means includes a drive shaft rotatably supported in bearing plates secured to the uppermost pipe section, a drum secured to said drive shaft and having a brake lining attached to one side thereof, a wire rope wound on the drum with one end anchored to the drum and the other end anchored to the lowermost pipe section, a friction plate freely mounted on said drive shaft adjacent to the brake lining on the drum and having a skirt extension loosely

accommodated within the uppermost pipe section, a brake piece slidably mounted on said drive shaft and having a brake lining on the side thereof facing said friction plate, a spring mounted on said drive shaft between said brake piece and said drum, at least two lever abutments secured to said drive shaft adjacent to said brake piece and levers having eccentric abutment faces on the side thereof adjacent to said brake piece and eccentrically pivoted to said lever abutments by means of pivot shafts adjacent to said drive shaft, the arrangement being such that when the descent of the escape means is initiated, the wire rope pays out from the drum initially with no brake torque applied by the brake linings to the drum until the skirt extension comes into contact with the uppermost pipe section and thereafter with a brake torque dependent on speed of rotation of the drum and the lever abutments which fly out under the action of centripetal action and urge the brake piece towards the drum against the bias of the spring thereby urging the brake linings into contact with the friction plate.

14. An emergency escape as claimed in claim 12 or claim 13, in which said descent control means further comprises a ratchet mechanism, wherewith descent of the escape means can be initiated, including a ratchet secured to one end of said drive shaft, an engaging lever rotatably mounted — on said bearing plates by means of a support shaft — for engaging with said ratchet, a biasing spring secured to said support shaft at one end and engaging said engaging lever at the other end for biasing the engaging lever into contact with the ratchet, and a locking lever for limiting the rotation of said engaging lever and holding the engaging lever out of contact with the ratchet when the former has been rotated against the biasing spring to initiate the said descent.

15. An emergency escape for use in a building substantially as hereinbefore described with reference to Figures 1A to 1D, Figure 2A or 2B, Figures 3A to 4A, Figures 5A and 5G or 5E to 5I, Figures 6A to 6E and Figures 7A to 7D or 8A to 8F or 8G and 8H of the accompanying drawings.

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