

June 23, 1970

R. J. LYONS
EMERGENCY-RELEASABLE HOLDDOWN MECHANISM FOR HINGED
COVER OF A HATCHWAY

3,516,197

Filed June 30, 1969

2 Sheets-Sheet 1

FIG. 1

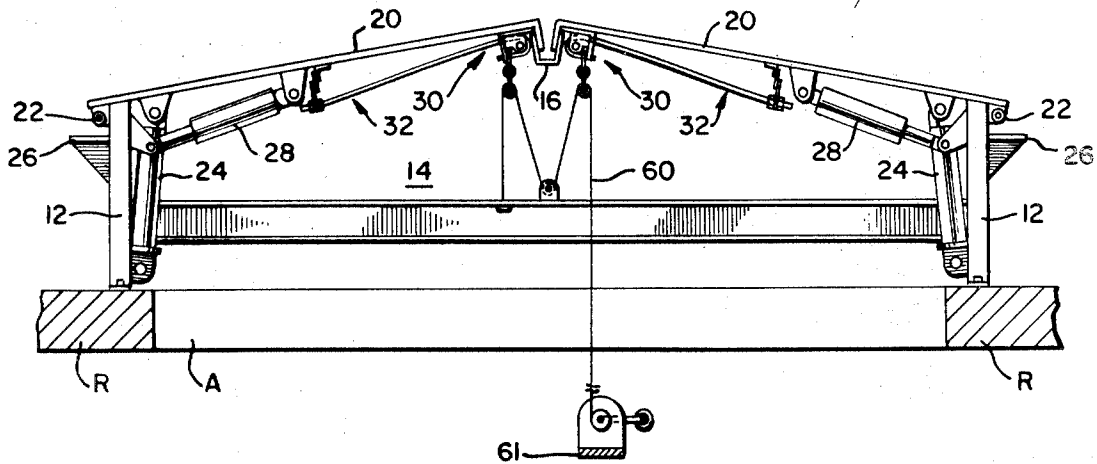


FIG. 2

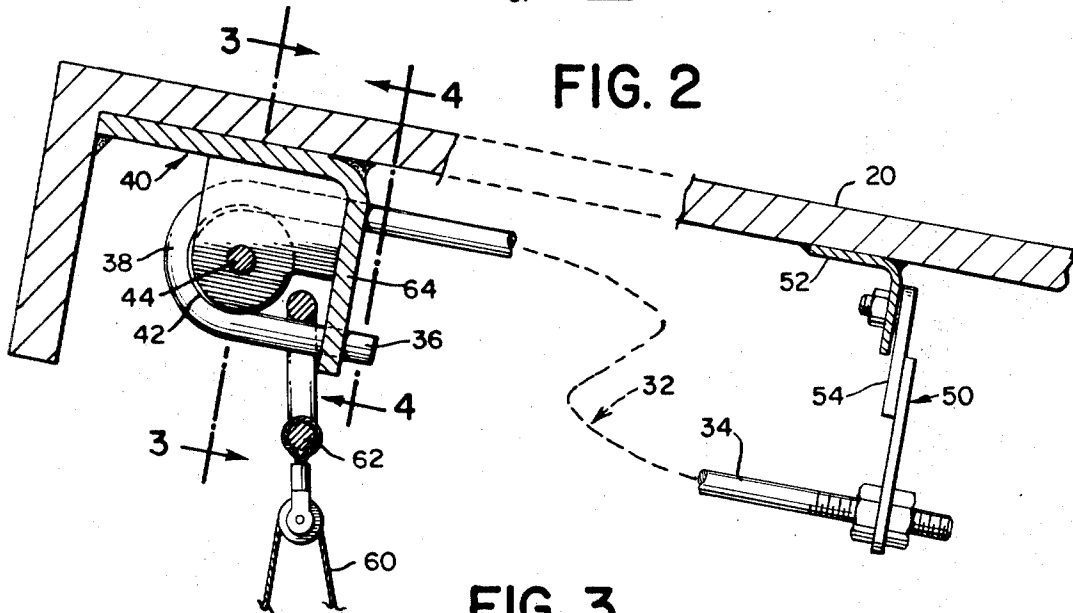
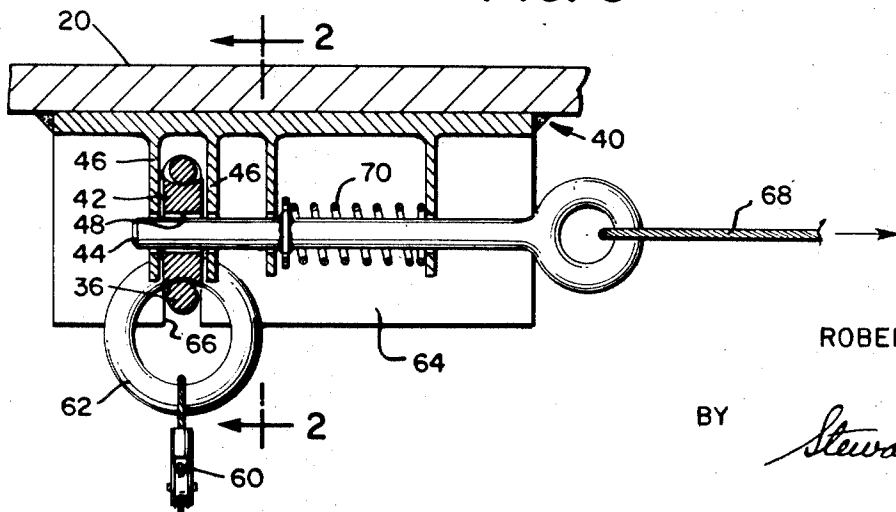


FIG. 3



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FIG. 5

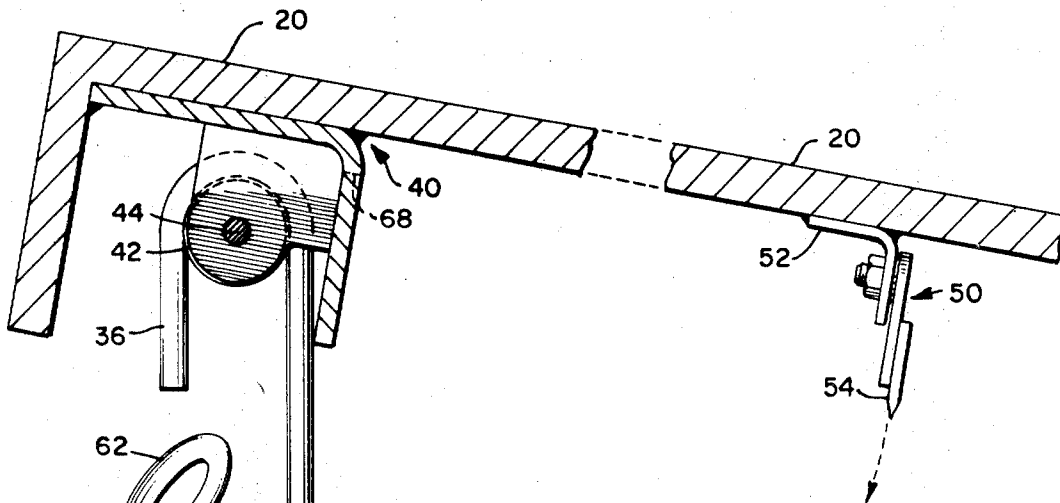
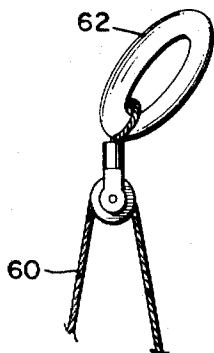
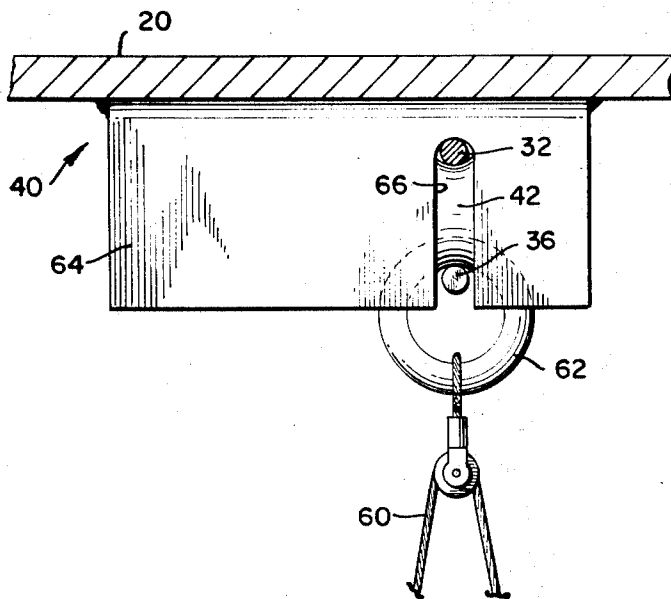


FIG. 4



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EMERGENCY-RELEASABLE HOLDDOWN MECHANISM FOR HINGED COVER OF A HATCHWAY

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Filed June 30, 1969, Ser. No. 837,639

Int. Cl. E05f 15/20

U.S. Cl. 49—1

5 Claims

ABSTRACT OF THE DISCLOSURE

An emergency-releasable holddown mechanism is disclosed for the cover of a smoke or ventilating hatch mounted in the roof of a building. The hatch cover is heavily spring biased to open position but is normally held closed by the holddown mechanism. This mechanism incorporates a lever arm pivotally mounted at one of its ends to the cover, and emergency-releasable means at its remote end preventing pivotal movement relative to the cover. The lever also has a lateral return arm adjacent its pivoted end, and a slide ring is trapped on the lateral arm in the normal condition of the holddown mechanism. A cable or other tie means on the ring is used to hold the cover in closed position until the emergency-releasable means is actuated. When this occurs the lever swings downwardly about its pivot, thereby allowing the ring to slip off the lateral arm and the cover to spring open. The holddown mechanism also permits manual opening and closing of the cover for normal ventilation without disrupting automatic emergency operation.

This invention relates in general to an emergency releasable holddown mechanism, and more particularly to such mechanism as used in roof-mounted smoke or ventilating hatches on buildings.

Smoke or ventilating hatches are widely used in the roofs of buildings for venting the interiors quickly in emergencies to exhaust smoke or poisonous or explosive gas accumulation, e.g. that resulting from a fire. In some instances, these hatches are also used for ordinary ventilation purposes, especially in multi-story open factory areas to exhaust excessive heat trapped beneath the roof of such areas. In the typical arrangements, the cover or covers of the hatch are hinged and are heavily spring biased to open position in order to effect rapid release of the smoke, etc., in case of emergency. Such opening of the cover must take place not only against the weight of the cover itself which is metal and therefore heavy, but also against natural restraining forces such as accumulated snow and ice. The large surface area of the cover or covers needed for the intended purpose necessitates, in turn, proportionally heavy spring loading on the cover to assure its opening against the aforesaid static restraining forces. There may also be transitory or dynamic loading imposed upon the cover, such as that caused by wind blowing across the roof. As a result, the total door-opening forces required may range from around one hundred pounds per cover for the typical smaller size of opening to as much as a thousand pounds per cover for a larger size opening. Such preloads on the cover must be opposed in the closed position of the hatch by some form of holddown mechanism. The unit forces acting on the holddown mechanism are accordingly very high, making it a problem to provide an arrangement which is both capable of securely restraining the opening forces, yet assuring automatic operation of the holddown mechanism in case of fire or explosion within the building.

It is common practice to effect automatic release and opening of the hatch cover in case of fire by employing devices incorporating a low-melting metal link which

ruptures upon attainment of a predetermined elevated temperature as the result of a fire in the building. But attempts to employ fusible links directly connected to and holding the hatch cover in closed position has proved unsatisfactory in many cases, primarily because the aforesaid preloading forces on the cover are of such high order. Fusible links which have a melting or fusing temperature sufficiently low to be effective for fire detection purposes inherently lack the necessary tensile strength to continuously resist the heavy preload opening forces of the hatch cover. Attempts have therefore been made to provide an emergency release device which will withstand the high loading on the mechanism employed, without adversely affecting the temperature or other emergency-initiated condition at which that mechanism is set to operate. Such attempts have included arrangements for mounting a number of fusible links in tandem, but the difficulty then encountered is one of balancing the load equally among the separate links and effecting simultaneous design failure of them at a predetermined ambient temperature. Other proposals for solving the problem have included fusible links mounted in a triangulation device providing leverage in order to reduce the unit loading force carried by the fusible link. In another form of device disclosed in a prior copending application of the present inventor, application Ser. No. 792,624, filed Jan. 31, 1969, an emergency-actuated latch employing another form of leverage arrangement is shown. In all of those cases however, the principal purpose is simply to assure automatic opening of the hatch cover in case of emergency; not to provide means for also manually opening and closing the cover from within the building to meet normal day-to-day ventilating requirements. In those prior constructions, the cover is simply released to fly to a full open position and remains there until someone goes up on the roof and manually forces the cover back into closed and latched condition.

It is accordingly a principal objective of the present invention to provide an arrangement which permits manual control of the opening and closing of the hatch cover from within the building, as may be required by day-to-day ventilating needs, yet which at the same time affords a safe, simple and efficient emergency-releasable holddown mechanism that will override the manual control system in case of a fire, explosion or other emergency to which the release mechanism is to be sensitive.

The invention is illustrated by the embodiment of a holddown mechanism in a double-doored roof hatch shown in the accompanying drawings, and described in detail hereinafter.

In the drawings:

FIG. 1 is an end elevational view of a double-doored smoke hatch incorporating novel holddown mechanism, the hatch being positioned on an access opening in the roof of a building and one end wall of the hatch being removed in the illustration to show the interior construction more clearly;

FIG. 2 is a fragmentary view, partly in cross-section and on enlarged scale, of the holddown mechanism seen in FIG. 1;

FIG. 3 is a sectional view in elevation taken on line 3—3 of FIG. 2;

FIG. 4 is a fragmentary side view, partly in section, taken on line 4—4 of FIG. 2; and

FIG. 5 is a view, similar to FIG. 2 but showing the holddown mechanism in emergency-actuated condition.

Referring to FIG. 1, a smoke hatch is shown in closing relation to an access opening A let into a roof R of a building through which smoke or other hot gases are to be vented. The hatchway housing includes the usual fixed structural members comprising interconnected

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sheet metal side walls 12 and gabled end walls 14 (of which only back one appears in FIG. 1). The end walls are interconnected at their apexes by a longitudinal channel or trough 16. Each of the side and end walls is bolted or otherwise secured to the roof R in conventional manner around the access opening A.

Mutually closing doors or covers 20, also of metal plate or sheet and reinforced and insulated if necessary, are each hinged along a top edge of a respective side wall 12, as at 22. These swing inwardly and downwardly into closing position relative to the supporting hatch structure and access opening A. In the fully closed position, the free edges of the covers substantially abut in the trough formed by the longitudinal channel 16. The covers are spring-biased to open position relative to the hatch structure by compression spring sets 24. These are mounted between and secured to the side walls and covers 20 in conventional manner in spaced position along the hinged edge of the respective covers. Depending on the size of the cover, a number of these compression spring sets 24 will be employed in order to give a total opening or lifting force sufficient not only to overcome the weight of the cover but the additional weight of any loading imposed by it by wind forces, accumulated snow or ice. In order to cushion the sudden shock of the covers in arriving at full open position on their sudden release, i.e. the shock occurring when the hinged edges of the doors spring back against stops 26 fastened to the side walls 12 of the hatch structure, it is conventional to provide shock absorbers 28 which are also attached to and extend between the side walls 12 and the covers 20 in known manner.

In order to retain covers 20 in closed position, as shown in FIG. 1, against the opening force of compression spring sets 24, each cover is provided with an emergency-actuated holddown mechanism indicated generally at 30. Since the holddown mechanism is identical for each of the two covers, only one such device will be described herein, it being understood that the other is merely a duplication of the first.

Referring more particularly now to FIGS. 2-5, hold-down mechanism 30 comprises a lever in the form of an elongated bar 32 having a crook at one end providing a longer leg 34, a return or short lateral leg 36 and an interconnecting bend 38. Lever 32 is pivotally supported at its crooked end in a trunnion block 40 which is secured, as by welding, adjacent the underside of the unhinged lip of cover 20. Lever 32 is provided with a bearing block 42 which is clamped in the bend at the crooked end of the lever, and pivot pin 44 passes through spaced walls 46 of trunnion 40 and through a central aperture 48 of bearing block 42. Lever 32 is thus free to swing about pivot 44 on trunnion 40.

In the normal condition of holddown mechanism 30, the free or remote end of the longer leg 34 of lever 32 is fastened to the underside of the cover 20 by an emergency-releasable linking assembly 50. The assembly here consists of a bracket 52 welded to the underface of cover 20, and a fusible metal link 54 connected between bracket 52 and the remote end of longer leg 34 of the lever. The lever is thus maintained generally parallel to the underside of the cover in this normal condition. However, link 54 is made of a low-melting metal and is so designed that if the ambient temperature at the underside of cover 20 reaches a predetermined maximum, the link will rupture, allowing lever 32 to swing downwardly about pivot 44 to the position shown in FIG. 5.

To maintain cover 20 normally in its closed position as seen in FIG. 1, a cable 60 or similar tie member is connected between holddown means 30 and a winch 61 or alternatively a stationary structural member (not shown) within the building served by the hatchway. Connection of cable 60 to the holddown mechanism 30 is made by a slide ring 62 secured to the cable and received over the shorter or return leg 36 of the lever 32. In order

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to positively retain the slide ring 62 on the return leg 36, an abutment 64 constituting an end wall or flange of trunnion 40 is slotted as at 66 to receive the crooked end of the lever. Thus in the normal position of lever 32, return leg 36 is generally transverse of and adjacent to abutment 64 so that the slide ring 62 is trapped between the abutment and bearing block 42, preventing the ring from sliding off the free end of leg 36. So long as lever 32 is in this normal position, therefore, cable 60 is operably connected to the cover 20 and operation of the winch 61 will permit manual opening and closing of the cover 20 for normal ventilating purposes where this is desired, without interfering in any way with the automatic emergency operation of the holddown mechanism.

In the automatic emergency operation of the device, when the fusible link 54 is severed, lever 32 swings downwardly by gravity and the moment applied to leg 36 by cable 60. In so doing, the free end of return leg 36 moves downwardly away from abutment 64 so that slide ring 62 is no longer trapped on the leg and is free to slide off. See FIG. 5. This of course immediately releases door 30 which is swung to its open position by compression spring sets 24, as previously described.

In some instances it may be desirable to provide manually operable means for externally releasing the hatchway covers, as in the case of a fireman on the roof requiring access to the building, etc. For this purpose, pivot pin 44 is slidably mounted in trunnion member 40 and is provided with a pull cable 68 connected to an external release handle located in any suitable position on the outer wall of the hatchway structure. As seen in FIG. 3, pin 44 is spring loaded by compression spring 70 to maintain its pivotal engagement in bearing block 42 of the lever 32, but can be axially withdrawn by cable 68 against the spring compression to allow the bearing block and its associated crooked end of lever 32 to fall out of trunnion 40.

Whereas the embodiment specifically illustrated in the accompanying drawings shows a fusible metal link as the emergency-releasable member, it will be apparent that various other types of devices may be substituted for this member. For example, any of the commercially available electronic devices sensitive to smoke, flame, explosion, poisonous gas accumulation or the like can be employed in place of the fusible link as the trigger mechanism for the lever. The arrangement in any such case still makes use of the feature that the emergency-releasable member is not subjected directly to the full cover opening preload force but only to a substantially reduced loading effected by the mechanical advantage of the lever. While the lever arrangement specifically described here employs only a single bar, it will be apparent that the single lever may be replaced by two or more connected in series to increase the mechanical advantage and reduce the load on the emergency-releasable member accordingly.

What is claimed is:

1. An emergency-releasable holddown mechanism for a hinged cover of a hatchway, wherein the cover is heavily spring biased to open position but is normally restrained in closed position by said mechanism, and wherein said hatchway includes fixed structural members for mounting it over an access opening in the roof of a building, said holddown mechanism comprising in combination:

lever means including an elongated bar having pivot means at one end and emergency-releasable means at the end remote from said pivot means;

trunnion means mountable on the underside of said hatchway cover adjacent an unhinged edge thereof and pivotally supporting said bar for swinging movement relative to said cover;

means securable to said cover adjacent the remote end of said bar for connection of said emergency-releasable means thereto to dispose said bar normally in substantially parallel relation to said cover and to

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prevent downward swinging movement on said pivot means;

said bar having at its pivot end a short, laterally disposed, return leg extending toward said remote end, and a slide ring received on said return leg;

an abutment disposed adjacent said pivot means with which said return leg coacts to trap said slide ring on said return leg in the normal parallel position of said bar;

and tie means for connecting the slide ring to a fixed structural member to maintain said cover in closed position on said hatchway;

said elongated bar being freed to swing downwardly when said emergency-releasable means is actuated whereby to move said return leg away from said abutment and allow said ring to slide off said return leg.

2. Emergency-releasable holddown mechanism as defined in claim 1, wherein said trunnion means is provided with a wall disposed transversely of said bar, said wall having a slot within which said return leg is received in the normal parallel position of said bar to provide said abutment for retaining said slide ring.

3. Emergency-releasable holddown mechanism as defined in claim 1, wherein said elongated bar is crook-shaped and the crook forms both the pivot-engaging means and return leg of said lever.

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4. Emergency-releasable holddown mechanism as defined in claim 1, wherein said pivot means includes a pivot pin and a bearing in said bar for receiving said pin, means slidably mounting said pin in said trunnion means for axial reciprocation into and out of bearing engagement with said bearing means of the bar, and means normally biasing said pin into bearing engagement.

5. Emergency-releasable holddown mechanism as defined in claim 1, wherein the tie means connected to said slide ring is reciprocable to permit raising and lowering said hatchway cover from a remote position within a building served by said hatchway.

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U.S. Cl. X.R.

49—7; 98—86