May 15, 1951 J. G. CADUFF ET AL 2,553,438

SAFETY DEVICE FOR USE WITH LADDERS

Filed Aug. 23, 1947 2 Sheets-Sheet 1

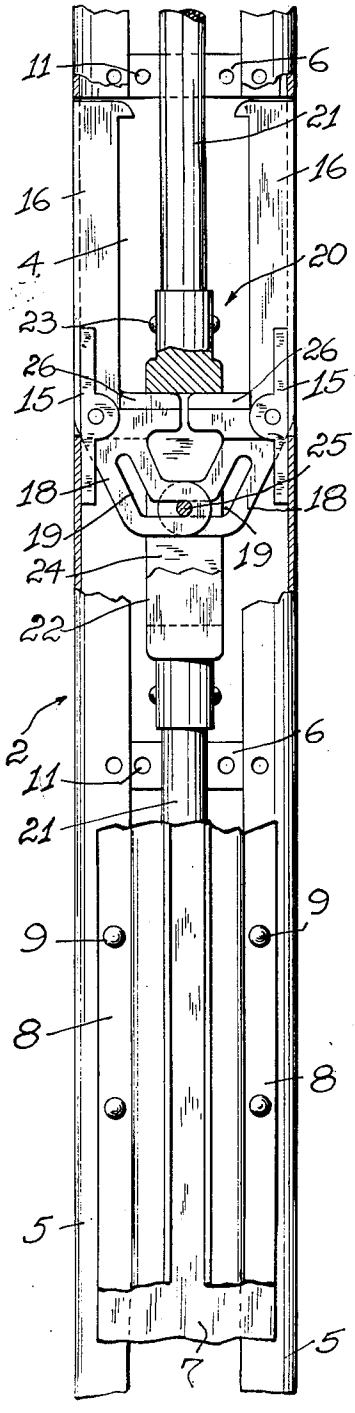


FIG. 1

FIG. 4

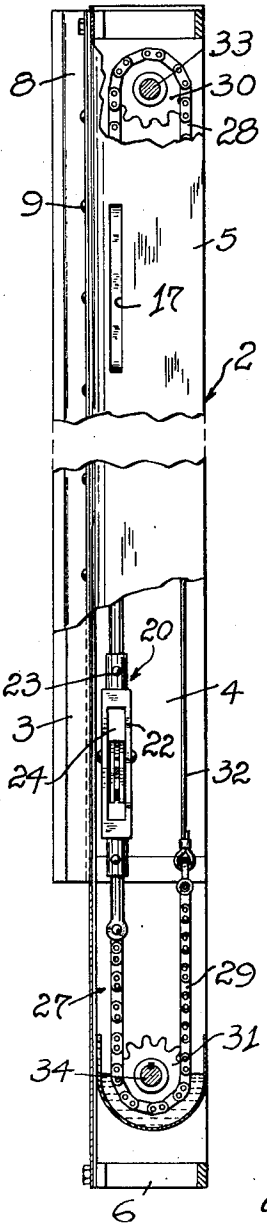


FIG. 2

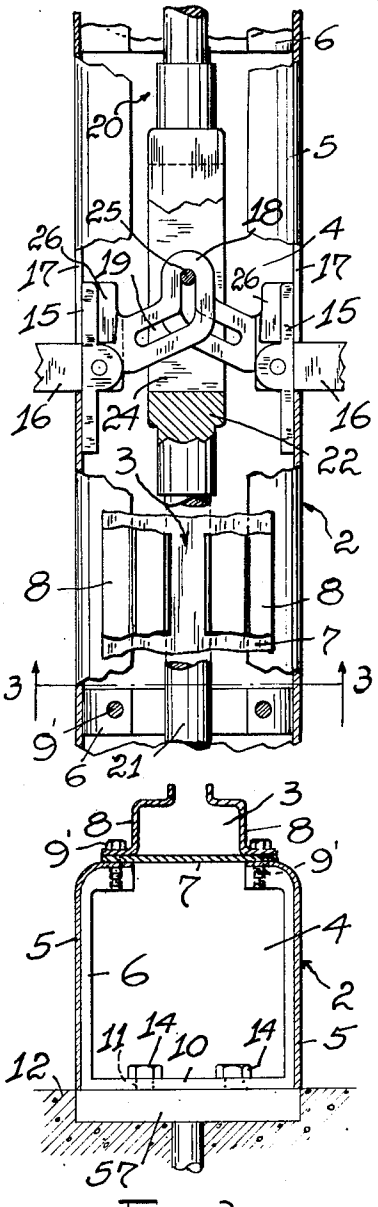


FIG. 3

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SAFETY DEVICE FOR USE WITH LADDERS

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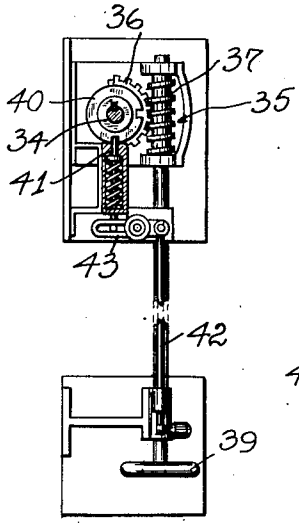


FIG. 5

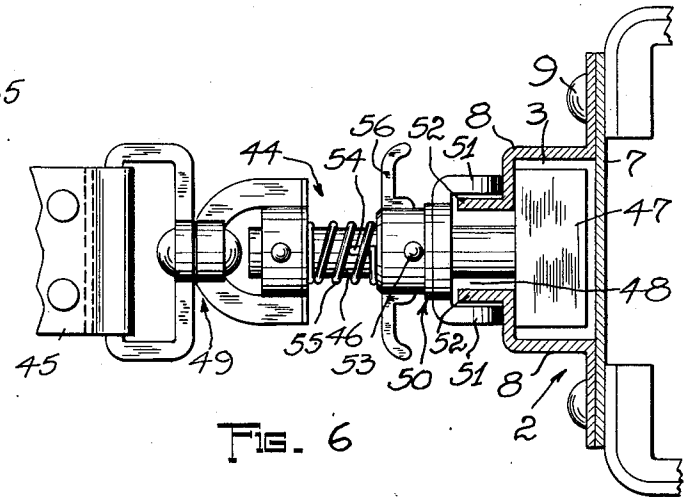


FIG. 6

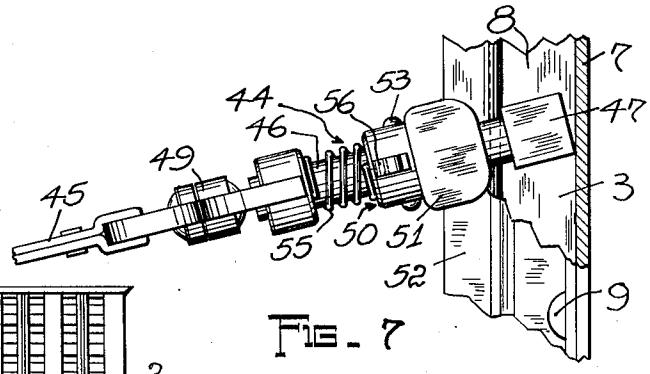


FIG. 7

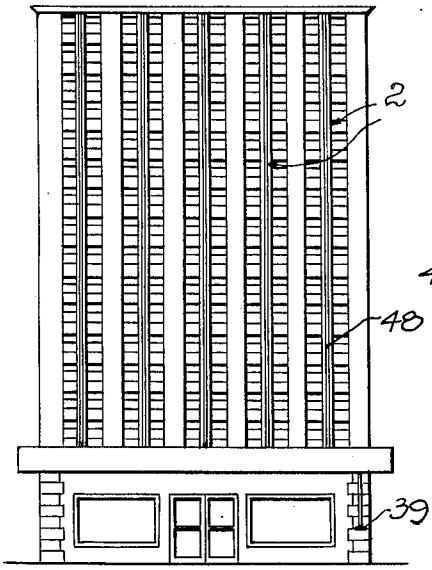


FIG. 8

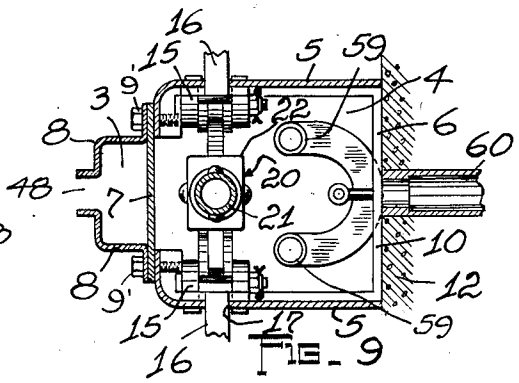


FIG. 9

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SAFETY DEVICE FOR USE WITH LADDERS

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5 Claims. (Cl. 228—67)

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This invention relates in general to fire escapes and, more particularly, to stationary fire escapes of the type attached to the outside of buildings. Present day fire escapes of this type consist of light iron ladders with landings attached to the building, are high in cost and maintenance, and ugly and offensive in appearance, therefore, these fire escapes are generally arranged in inconspicuous places not well suited for their purpose.

The primary object of the present invention is the provision of an improved stationary fire escape including in combination ladder means with concealed pivotally supported folding steps and guided, shiftable supporting devices constructed to be automatically arrested when loaded in excess of predetermined loads.

Another object of the invention is the provision of an improved stationary fire escape including in combination ladder means with concealed pivotally supported, upwardly folding steps, means for shifting the steps into operative and inoperative positions, and supporting devices shiftably arranged in vertical guide means and constructed to be automatically locked in their guide means when loaded in excess of predetermined loads.

Another object of the invention is the provision of an improved stationary fire escape including in combination ladder means with concealed, pivotally supported, upwardly folding steps, shiftable supporting devices, and guiding means for said devices, the supporting devices being constructed to be automatically locked in said guiding means when the devices are loaded in excess of predetermined loads.

In addition, the invention has certain other marked superiorities which radically distinguish it from presently known structures. These improvements or superiorities embodying certain novel features of construction are clearly set forth in the following specification and the appended claims; and a preferred form of embodiment of the invention is shown with reference to the accompanying drawing forming part of the specification.

In the drawings:

Fig. 1 is a fragmentary front elevation, partly broken away, of a stationary fire escape constructed in accordance with the invention, showing the steps of the ladder portion of the fire escape in folded up position.

Fig. 2 is a fragmentary view similar to Fig. 1, showing the steps of the ladder portion of the fire escape in opened up position.

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Fig. 3 is a sectional view on line 3—3 of Fig. 2.

Fig. 4 is a fragmentary side elevation, partly in section, of the stationary fire escape showing the operating means for shifting the steps of the ladder portion to folded up and opened up position.

Fig. 5 is a plan view of the worm drive arrangement actuating the operating means disclosed in Fig. 4.

Fig. 6 is a fragmentary cross-sectional view through the fire escape showing in elevation in its guide channel the safety supporting member.

Fig. 7 is a fragmentary side view, partly in section, of the fire escape showing in side elevation in its guide channel the safety supporting member in wedged in position effected by excessive load.

Fig. 8 is a front elevation of a skyscraper with a fire escape arrangement embodying the invention; and

Fig. 9 is a cross sectional view through a stationary fire escape construction with heating outlets arranged therein.

Referring now in detail to the exemplified form of the invention shown in the drawings, reference numeral 2 denotes an elongated fire escape structure provided with vertically arranged parallel front and rear channels 3 and 4. This structure embodies two sections, one of which is assembled from oppositely arranged side panels 5 and U-shaped bracket members 6, and the other one of which consists of an elongated plate 7 and angularly shaped, flanged side members 8, the sections being secured together and to each other by rivets 9 and bolts 9'. The bracket members space the side panels with respect to each other and include in their web portions 10 perforations 11 permitting attachment of the fire escape structure to a wall 12 by bolts 14 or in any other suitable manner.

The fire escape structure 2 pivotally supports in bearings 15 secured to the inner faces of side panels 5 steps 16 which in their folded up position are arranged within rear channel 4 and in their opened up position extend through slots 17 in side panels 5. These steps, which are best described as lever members pivoted between their opposite ends to bearings 15, have inner end portions 18 angularly slotted at 19, and these slotted end portions are coupled with a vertically shiftable operating member 20 effecting shifting of steps 16 into opened up and closed position, when such member is shifted upwardly or downwardly. Member 20 is assembled from tubular sections 21 connected with each other by

longitudinally slotted coupling members 22 which are secured to the respective tube sections by rivets 23. Coupling members 22 are arranged opposite the steps 16 so that the slots 24 of members 22 align with the slotted end portions 18 of the steps. The end portions 18 of steps 16 extend into the slot of the respective coupling member and are coupled with each other and said coupling members by pins 25. Slotted end portions also include lateral extensions 26 which cooperate with the side plates 5 in arresting excessive movement of steps 16 when in opened up position.

Member 20 is shifted by a chain drive 27 including a chain 28 coupled with the upper end of member 20 and a chain 29 coupled with the lower end of said member. The chains 28 and 29 engage sprocket gears 30 and 31 and are connected to each other by a cable 32. Sprocket gear 30 is freely rotatably mounted on a shaft 33 and sprocket gear 31, the driver, is keyed to a drive shaft 34 which is coupled with a worm drive 35 embodying a worm gear section 36 keyed to shaft 34 and a manually rotatable worm shaft 37 engaging worm gear section 36. The worm shaft 37 is axially extended and carries a handwheel 39 facilitating manual rotation of the worm shaft. The worm section 36 includes a peripherally slotted disc 40 which cooperates with a spring-pressed plunger 41 to lock the worm gear section 36 and therewith operating member 20 in predetermined positions. Plunger 41 is unlocked by shifting of operating shaft 42 coupled with plunger 41 by a lever 43.

The front channel 3 of the fire escape structure 2 forms guiding means for a shiftable safety supporting device 44 safeguarding a person descending the unfolded steps 16 of the fire escape structure. This supporting device has attached thereto a safety belt 45 and embodies a cylindrically shaped body member 46 provided with a rectangularly shaped base portion 47. This base portion is dimensioned to fit channel 3 when in one position and to be freely extended into or removed from said channel through slot 48 in the flanged longitudinally slotted front wall of the channel when rotated to another position.

The supporting device 44 supports at its outer end a swivel member 49 mounting safety belt 45 and slidably and non-rotatably supports on its cylindrical body member 46 a collar member 50 having laterally spaced guide plates 51 which are spaced to engage the outer faces of flanges 52 of angularly shaped members 8. The collar member is slidably and non-rotatably interlocked with supporting device 45 by a pin 53 extended through a slot 54 in the cylindrical body member 46 and is forced toward its base portion 47 by a compression spring 55 so that guide plates 51 of the supporting device when arranged in channel 3 engage the outer faces of flanges 52 and prevent rotation of such supporting device. Removal of the device from front channel 3 and extension of such device into said channel can be effected when collar member 50 with guide plates 51 is shifted against the tension of compression spring 55 by means of a cross member 56 on the collar member, the cross member forming a handgrip facilitating such shifting.

The compression spring 55 is dimensioned to draw the rectangularly shaped base portion 47 of supporting device 45 into engagement with the inside face of front channel 3 and permit sliding of said base portion in said channel when the supporting device is pulled downward with slight force. However, any sudden pull of substantial force on safety belt 45, such as for example effected by the weight of a person stumbling while descending the steps of the fire escape structure, causes compression of spring 55 and tilting of base portion 47 to engage the opposed front and rear walls of the front channel and to lock the supporting device in said channel, thus preventing a fall of the stumbling person under all conditions.

The described fire escape structure is preferably manufactured in sections readily to be secured to the wall of a building by bolts 14 attaching for example U-shaped bracket members 6 to anchor plates 57 in the wall of such building. A thus constructed stationary fire escape does not interfere with the architectural design of a building, as the steps are generally fully concealed, but will give highest efficiency as such steps are readily and easily shifted from their concealed position to working position, and as the shiftable safety supporting devices are easily engaged with or disengaged from the front channel 3 of the fire escape. If climatic conditions require, the channel structure of the disclosed fire escape may readily be heated to avoid corrosion or forming of ice in channels 3 and 4, all as indicated in Fig. 9 of the drawings showing hot air outlets 59 in rear channel 4, which are in communication through a pipe 60 with a hot air distributing system, not shown.

Having thus described our invention, what we claim is:

1. In a ladder-like fire escape a vertically-extended, hollow guide member of U-shaped cross section having inwardly turned edge portions to provide said member with a front wall having an elongated, vertical slot therein, an elongated supporting member having at its one end a head portion slidably arranged in said guide member, said head portion having elongated cross section dimensioned to permit in one predetermined position inserting of the head portion through said slot into said guide member and in another predetermined position retaining of said head portion in said guide member, said head portion, furthermore, having a height dimensioned to effect jamming of the head portion in said guide member when such head portion is in its other predetermined position and tilted with respect to said guide member, and means shiftably mounted on said supporting member and cooperating with said guide member adapted to prevent rotation of the head portion of said supporting member when such head portion is placed in the said other one predetermined position.

2. In a ladder-like fire escape a vertically extended hollow guide member of U-shaped cross section having inwardly turned edge portions to provide said member with a front wall having an elongated vertical slot, an elongated supporting member including at one end a head portion having elongated rectangular cross section, said head portion dimensioned to permit in one predetermined position inserting of said head portion through said slot into said guide member and in another predetermined position retaining of said head portion in said guide member, said head portion, furthermore, having a height dimensioned to effect jamming of said head portion in said guide member when said head portion is in its other predetermined position and tilted with respect to said guide member, and spring-controlled means slidably mounted on said supporting member and adapted to yieldingly shift said support-

ing member so that its head portion engages the inside face of the slotted front wall of the guide member when the head portion of said supporting member is positioned within said guide member.

3. A fire escape as described in claim 2, wherein the said vertically extended guide member includes flanges outwardly extended from the said elongated vertical slot, wherein said spring-controlled means are slidably mounted on said supporting member, wherein a compression spring forces said spring-controlled means toward the head portion of said supporting member, and wherein said spring-controlled means includes spaced means adapted to engage said flanges and prevent rotation of the said head portion when same is yieldingly forced into contact with the slotted front wall of said guide member.

4. A fire escape as described in claim 2, wherein said vertically extended guide member includes flanges outwardly extended from the edges of said elongated vertical slot, wherein said spring-controlled means on said elongated supporting member includes axially shiftable guide means yieldingly shifted by a compression spring mounted on said supporting member toward the head portion of said supporting member, said shiftable guide means consisting of spaced plates having a height greater than the height of said vertical flanges to effect yielding clamping engagement of the head portion of said supporting member with the inside face of the slotted front wall of the guide member.

5. In a ladder-like fire escape a vertically extended hollow guide member of U-shaped cross section having inwardly turned edge portions to provide the guide member with a front wall having an elongated vertical slot therein, an elongated supporting member removably extended with its one end into said guide member and vertically shiftably arranged with respect thereto, said guide member including at said one end a head portion of elongated, rectangular cross section, dimensioned to permit in one predetermined position free inserting of said head portion through said slot into said guide member and in another predetermined position retaining of said head portion in said guide member, said head portion having a height dimensioned to effect jamming of the head portion in said guide member when such head portion is in its other predetermined position and tilted with respect to said guide member, and spring-controlled shiftable means on said supporting member adapted to cooperate with the said guide member in yieldingly shifting said supporting member so that the rear face of said head portion contacts the inside face of the slotted front wall of the guide member, and means on said shiftable means cooperating with said guide member in preventing axial rotation of the head portion of said supporting member when its head portion is positioned to be retained in said guide member.

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