United States Patent [19]

Greenleaf

[11] 3,735,838

[45] May 29, 1973

[54] **WHEELED LADDER WITH A WEIGHT ACTUATED SELF-LOCKING WHEEL THEREON**

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[73] Assignee: **Everett Sound Machine Works, Inc.,** Everett, Wash.

[22] Filed: **May 22, 1972**

[21] Appl. No.: **255,623**

[52] **U.S. Cl.** **182/15,** 182/39, 16/35

[51] **Int. Cl.** **E06c 1/397,** E06c 7/48

[58] **Field of Search** 182/15, 39; 16/44, 16/35; 104/110, 111, 118, 121

[56] **References Cited**

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Primary Examiner—Reinaldo P. Machado
Attorney—Christensen & Sanborn

[57] **ABSTRACT**

The ladder is elevated above its supporting surface and has an arm pivotally mounted on the lower end portion thereof, which is yieldably biased in one angular direction thereof, into a stopped position on the ladder. The arm in turn has a surface engaging wheel thereon, which is rotatably mounted about an axis that is spaced apart from the pivotal axis of the arm, at a point on the arm at which the wheel supports the ladder above the surface in response to the bias on the arm. When the user's weight is added to the ladder, the wheel is restrained against rotation by an element which is disposed on the ladder so as to engage the wheel when the arm and the ladder are pivoted in relation to one another in the direction opposed to the bias on the arm. However, there are means on the ladder whereby the restrainer element can be disengaged from the wheel under the condition in which the element and the arm are displaced in relation to one another in the direction opposed to the bias on the arm. Therefore, the wheel can be released for rotation even while the user remains on the ladder.

11 Claims, 15 Drawing Figures

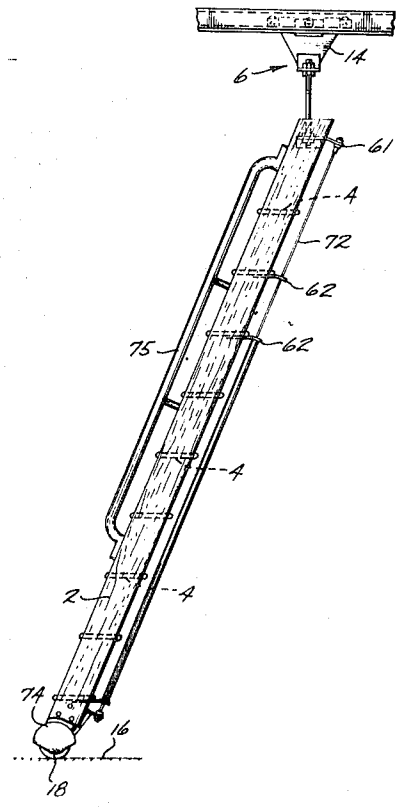


Fig. 1

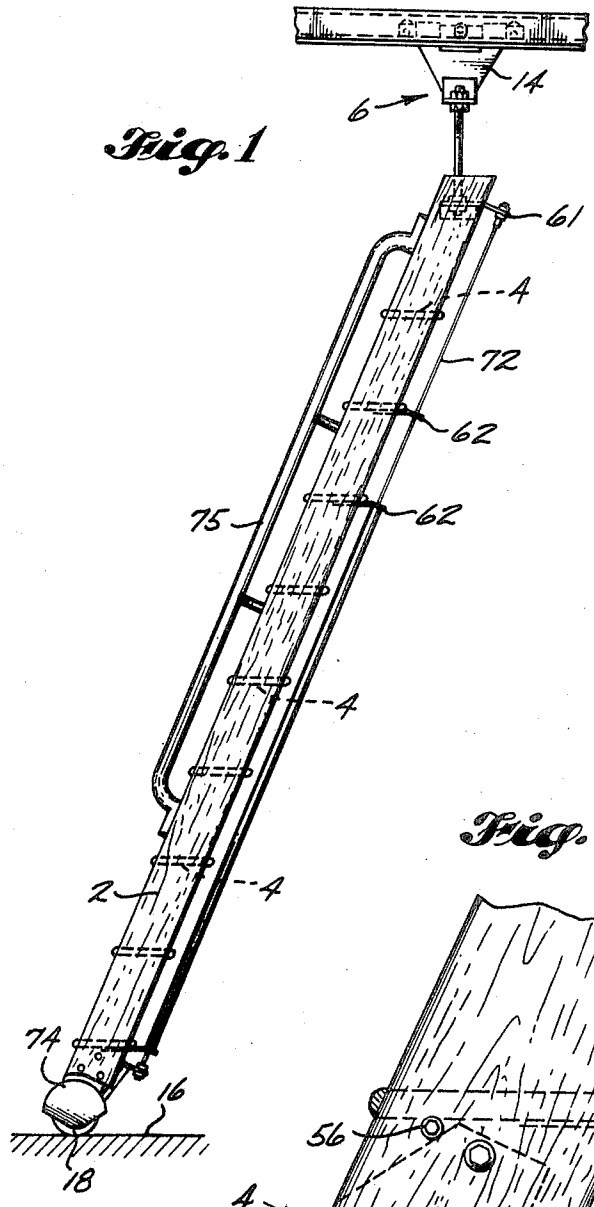


Fig. 2

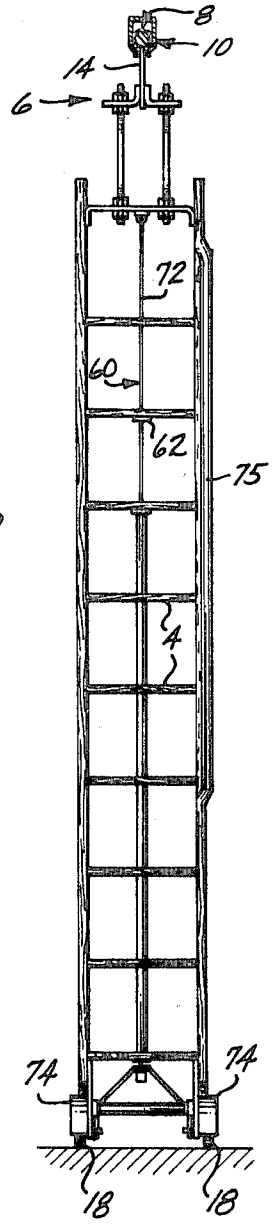
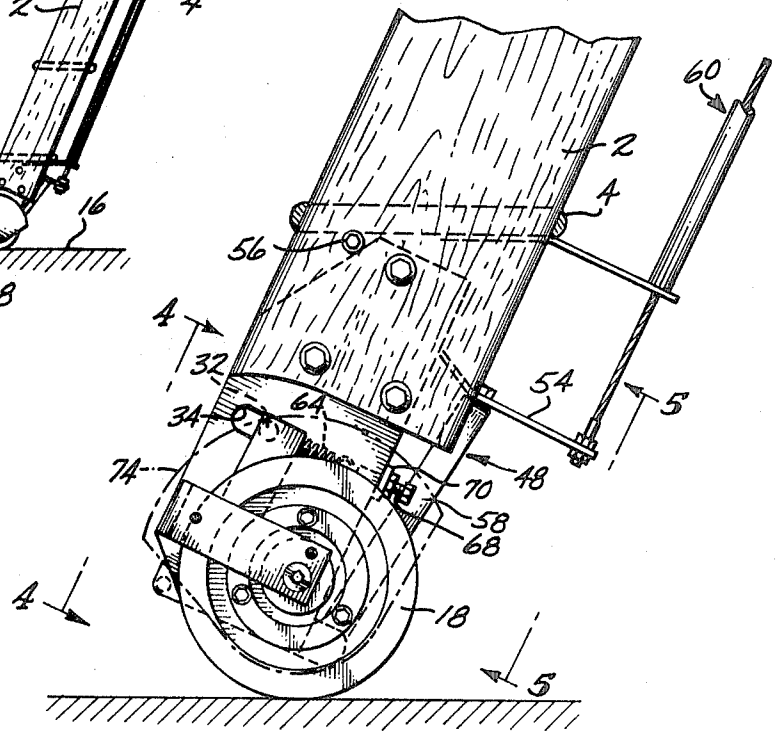


Fig. 3



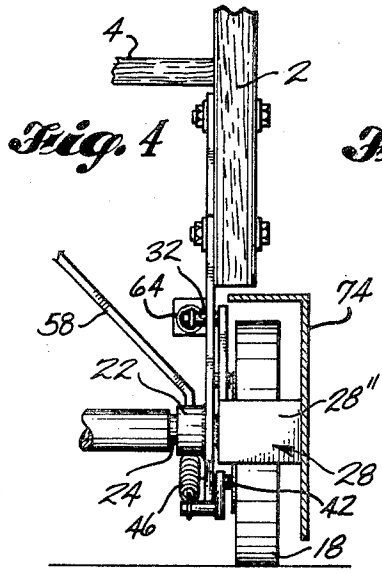


Fig. 4

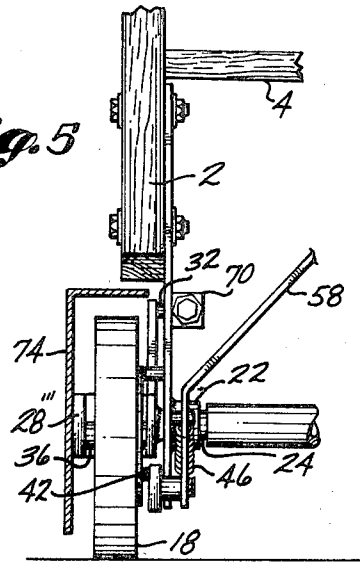


Fig. 5

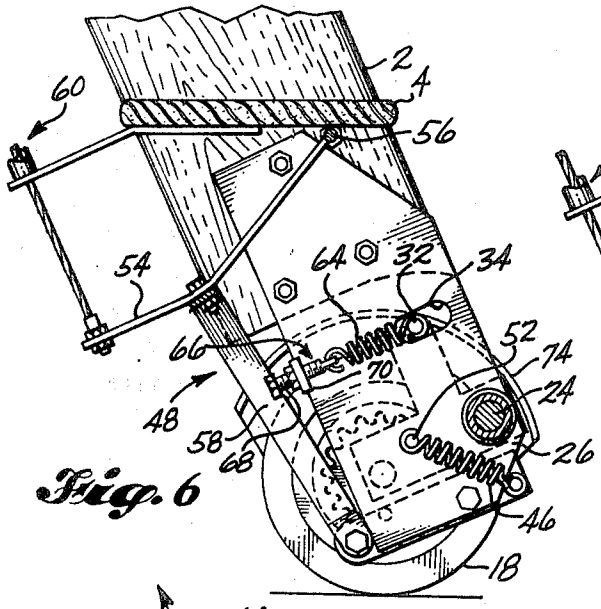


Fig. 6

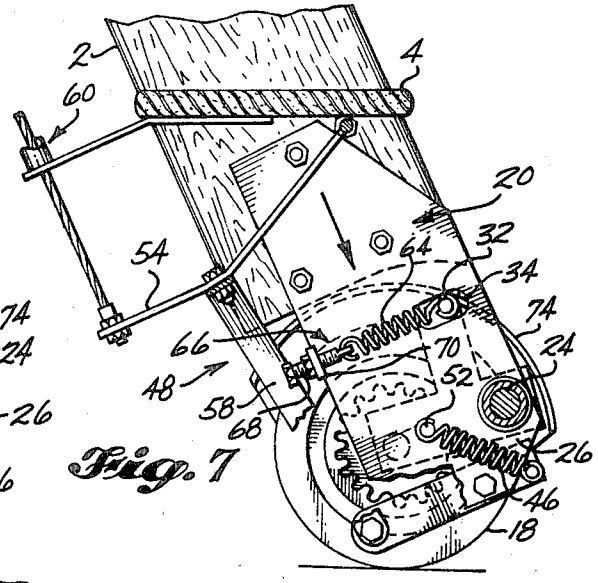


Fig. 7

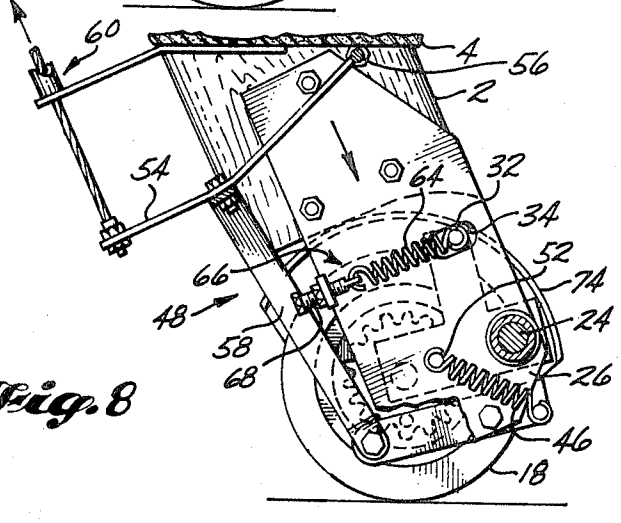


Fig. 8

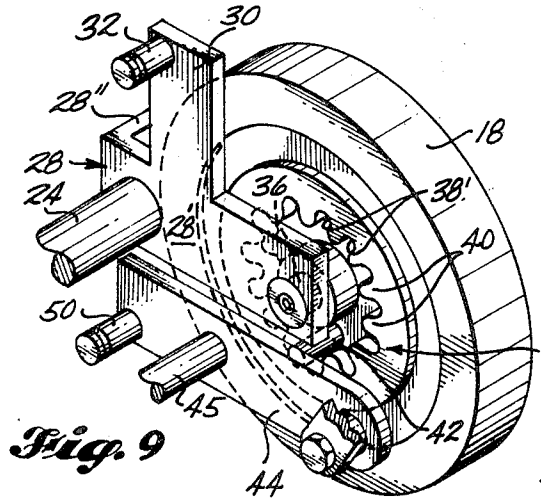


Fig. 9

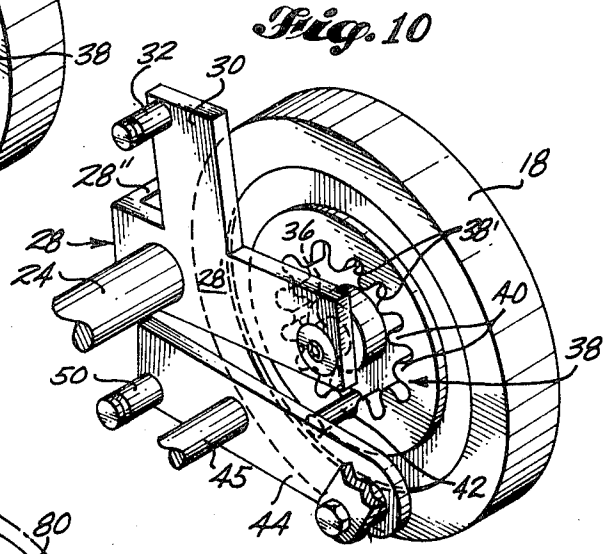


Fig. 10

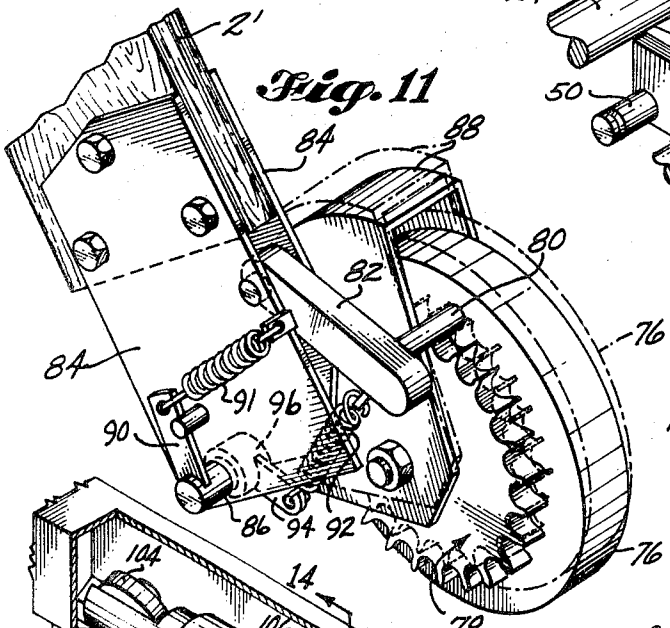


Fig. 11

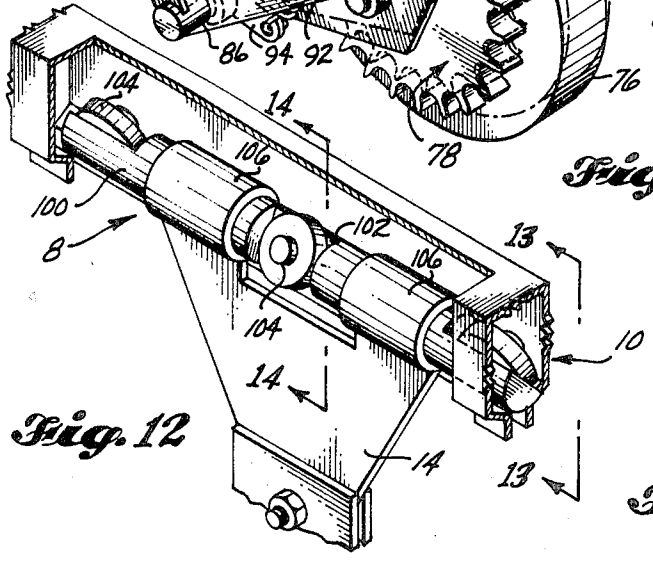


Fig. 12

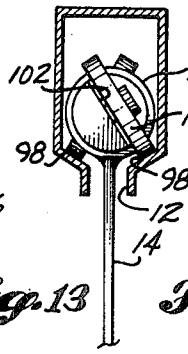


Fig. 13

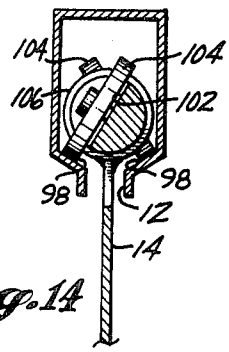


Fig. 14

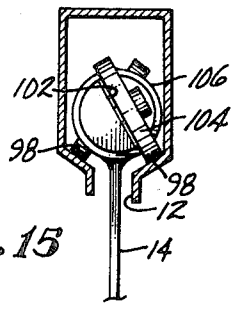


Fig. 15

WHEELED LADDER WITH A WEIGHT ACTUATED SELF-LOCKING WHEEL THEREON

FIELD OF THE INVENTION

This invention is concerned with a wheeled ladder, and in particular with a ladder of this nature in which the wheel automatically locks itself against rotation when the user's weight is added to the ladder, but which is also equipped with means whereby the wheel can be released for rotation even while the user remains on the ladder.

The invention is especially applicable to wheeled ladders which are movably suspended from a track, such as the main frame ladders used in telephone exchanges, and the shelf ladders used in libraries, shoe stores and the like. However, it is also applicable to wheeled ladders which are not so suspended, and will be explained hereafter in terms of a track suspended ladder only for the sake of illustration.

SUMMARY OF THE INVENTION

The ladder of the present invention is elevated above its supporting surface, and has an arm pivotally mounted on the lower end portion thereof, which is yieldably biased in one angular direction thereof, into a stopped position on the ladder. The arm in turn has a surface engaging wheel thereon, which is rotatably mounted about an axis that is spaced apart from the pivotal axis of the arm, at a point on the arm at which the wheel supports the ladder above the surface in response to the bias on the arm. When the user's weight is added to the ladder, the wheel is restrained against rotation by an element which is disposed on the ladder so as to engage the wheel when the arm and the ladder are pivoted in relation to one another in the direction opposed to the bias on the arm. However, there are means on the ladder whereby the restrainer element can be disengaged from the wheel under the condition in which the element and the arm are displaced in relation to one another in the direction opposed to the bias on the arm. Therefore, the wheel can be released for rotation even while the user remains on the ladder.

Preferably, the wheel is positively locked against rotation by virtue of having a series of recesses therein which are relatively angularly disposed about the rotational axis of the wheel, for engagement by a lug which is disposed on the ladder so as to engage one of the recesses when the arm and the ladder are pivoted in relation to one another in the direction opposed to the bias on the arm.

To enable the lug to be disengaged under the relatively displaced condition of the arm, the lug is disposed on a dog which is pivotally mounted on the lower end portion of the ladder in a plane parallel to that of the arm, and yieldably biased in the same angular direction as the arm, into a stopped position on the ladder. For ease of operation, moreover, the dog has an actuator connected therewith, which extends lengthwise of the ladder, to points on the upper end portion thereof, and is manually operable at any one of the aforesaid points to pivot the dog in the direction opposed to the bias thereon.

In the presently preferred embodiments of the invention, the dog and the arm are pivotally mounted on one standard of the ladder; the axes of the dog, the arm, and the wheel are all parallel to one another; and the recesses with which the lug is engageable, are defined by a ratchet on one side of the wheel.

In those instances where the ladder is movably suspended from a track, it is preferred to employ a track which is elongated, V-shaped and has a longitudinally extending slot in the bottom thereof, between the angularly related surfaces thereof. The carriage for supporting the ladder on the track includes a pair of relatively inner and outer rotatably engaged members which are disposed above the track, and the outer of which has a device suspended therefrom in the slot, on which the ladder is hung. The inner member is elongated on a parallel to the track, and has longitudinally spaced recesses therein, which are disposed at relatively angularly spaced points thereabout. A plurality of track engaging wheels are rotatably mounted on the inner member, in the recesses, about axes which extend substantially parallel to alternate surfaces of the track, as the wheels are considered from one recess to the next, lengthwise of the inner member. Consequently, should one or the other surface of the track become deformed with respect to the manufactured V-shaped cross section thereof, the hanger device will nevertheless remain freely suspended in the slot because of the ability of the carriage to accommodate to the deformation.

BRIEF DESCRIPTION OF THE DRAWINGS

These features will be better understood by reference to the accompanying drawings which illustrate two embodiments of the lock mechanism as it is applied to such a track suspended ladder.

In the drawings,

FIG. 1 is a side elevational view of the ladder as it is seen when employing one embodiment of the mechanism;

FIG. 2 is a front elevational view of the same;

FIG. 3 is a part side elevational view of the lower end of the ladder, where the mechanism is mounted in conjunction with the wheels thereof;

FIG. 4 is a part cross-sectional view along the lines 4—4 of FIG. 3;

FIG. 5 is a part cross-sectional view along the lines 5—5 of FIG. 3;

FIG. 6 is a part elevational view of the ladder in the normal unloaded condition thereof, as it is seen from a point inside thereof, opposite the lower, wheeled end of the ladder;

FIG. 7 is another such view of the ladder in the loaded condition thereof;

FIG. 8 is a third such view in the loaded but released condition thereof;

FIG. 9 is a part perspective schematic view of the lock mechanism for one wheel, when the ladder is in the normal unloaded condition thereof;

FIG. 10 is another such view of the mechanism when the ladder is in the loaded condition thereof;

FIG. 11 is a part perspective, lower end view of the ladder when employing the other embodiment of the mechansim;

FIG. 12 is a partially removed, part perspective view of the carriage and the track for the ladder;

FIG. 13 is a cross-sectional view along the lines 13—13 of FIG. 12;

FIG. 14 is another such view along the lines 14—14 of FIG. 12; and

FIG. 15 is a schematic view corresponding to that of FIG. 13, but illustrating the operation of the carriage when the track is deformed.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, it will be seen that the ladder comprises a pair of spaced, parallel, end mitered standards 2 which are interconnected by a flight of spaced, parallel steps 4 that are tilted in relation to the standards to assume a horizontal disposition when the ladder is in the normally inclined, upright, suspended, selectively mobile condition thereof.

To maintain this condition, the ladder is suspended on a gantry-like trolly device 6 which is suspended in turn on a roller-borne carriage 8 housed within a horizontally disposed track 10 having a slot 12 in the bottom thereof, for the sleeved hanger 14 of the trolly 6. In addition, the ladder is elevated above the floor 16 therebelow, and is supported on a pair of wheels 18 which are outriggered from the standards to releasably lockingly engage with the ladder when a weight is added to the flight of steps thereon.

Referring firstly to this latter feature in particular, it will be seen that the standards 2 have longitudinally extending plates 20 scabbed on to the inside lower end surfaces thereof, and the plates 20 in turn have bosses 22 on the insides thereof, within which a bushed shaft 24 is journaled in a horizontally disposed, crosswise condition between the plates. The bosses 22 are disposed at corresponding points on the chamfered, relatively forward, lower end corners 26 of the plates, and the shaft 24 passes through the plates 20 at these points, and projects outwardly therefrom, where, welded to the outlying ends of the shaft, is a pair of correspondingly U-shaped brackets 38, each having a bar-like thumb 30 upstanding thereon. The brackets 28 are inverted to the front and oriented in a crosswise plane generally perpendicular to the ladder, and are appended to the shaft 24 at points on the inside legs 28′ thereof, adjacent the junctures of the legs with the bight portions 28″ of the brackets. The thumbs 30 are also disposed on these legs, at points adjacent the shaft, and each thumb has a stud bolt 32 thereon, which projects inwardly of the ladder and passes through a transversely oriented slot 34 in the adjacent plate 20. In addition, the inside and outside legs 28′ and 28‴ of each bracket are joined by an axle 36, adjacent the ends of the legs, and one wheel 18 is rotatably mounted on the axle, between the legs. The wheel 18 has an annular ratchet 38 secured to the inside face thereof, concentric with the axle, and the ratchet has internally oriented teeth 40 thereon, which cooperate with a lug 42 on the midportion of a dog 44 which is pivotally mounted to a pin 45 on the plate 20, in juxtaposition with the wheel, below the inside leg 28′ of the bracket. One end of the dog is under the control of a coiled spring 46, and the other is under the control of a lever mechanism 48 which operates to pivot the dog against the bias of the spring 46. The spring is interconnected between a stud bolt 50 on the one end of the dog, and another such bolt 52 located on the inside face of the plate, at a point to the rear of the shaft. The lever mechanism 48 includes an oblique-angled bar lever 54 which is pivotal about a spindle 56 mounted below the underside of the first step, and which is interconnected to the other end of each dog by means of a pair of oblique-angled links 58 that angle down to the ends of the dogs from the crook of the lever 54. The lever is operated from one of a number of points on the ladder, by means of a partially housed Bowden wire assembly 60 extending up the length of the ladder from the tip of the lever, to a connecting point 61 adjacent the top thereof, there being guides 62 cantilevered from various steps of the ladder to support the assembly 60.

Referring now to FIGS. 6–8, it will be seen that from this point of view, the brackets 28 are loaded in a counterclockwise direction about the shaft, by means of other coiled springs 64 which are secured to the bolts 32 of the thumbs at one end, and at the other end, to a pair of adjustable take-up devices 66 each comprising a threaded rod 68 which is threadedly engaged in an apertured flange 70 on the rearwardly facing edge of the plate. Thus, in the normal, unloaded condition of the ladder, the bracket 28 and wheels 18 maintain a posture with respect to the plates and dogs, such that the lugs 42 on the dogs are disengaged from the ratchet 38, leaving the wheels free to turn. See FIG. 6. However, when the weight of the user is added to the ladder, the wheels and brackets are caused to pivot in the clockwise direction about the shaft, against the bias of the springs 64, and with the result that the lugs on the dogs engage in recesses 38′ of the ratchets. See FIG. 7. At this point, therefore, the wheels are no longer free to turn, and the ladder is thus locked in position by the continued presence of the user thereon. Should the user choose to disengage the lugs, however, he may grab the cable 72 of the Bowden wire assembly, and pivot the dogs in the clockwise direction, so as to effect disengagement of the lugs as in FIG. 8. This may be accomplished, moreover, even while the user remains on the ladder, and so long as he continues to raise the dogs with the cable, he may propel himself and the ladder relative to the floor 16 thereunder.

Ordinarily, the take-up devices 66 are adjusted to a point at which the lugs 42 will engage with the ratchets 38 only after the man has assumed a position on the second step up from the bottom of the ladder, or higher.

A part annular fender 74 of U-shaped cross section, is secured to the outside leg 28‴ of each bracket for purposes of housing the upper sides of the wheels. A rail 75 on the right-hand standard assists in climbing the ladder.

In the embodiment of FIG. 11, each wheel 76 has an externally toothed ratchet 78 on the outside face thereof, and the ratchet cooperates with a lug 80 on a dog 82 which is pivotally interconnected between a pair of spaced parallel plates 84 scabbed to the end of each standard 2′ of the ladder. The plates have an axle 86 journaled therebetween, and the part annular fender housing 88 of the wheel is outriggered from the axle, and loaded in the counterclockwise direction of the Figure by a stopped, spring-loaded lever 90 on the axle, the spring for same being seen at 91. The loading on the dog 82 is provided by another spring 92 which is secured to an arm 94 on a bushing 96 that is fixed between the plates 84, with the axle 86 passing therethrough.

Referring next to the carriage 8 and the track 10 for the ladder, it will be seen that the track 10 has oppositely inclined surfaces 98 on the V-shaped bottom thereof, to either side of the slot 12, and the carriage 8 comprises an elongated cylindrical bolt 100 which

has semicircular sections thereof removed at spaced intervals therealong, to form a corresponding number of flats **102** therein, which are disposed in diametrical planes of the bolt that are perpendicular to alternate surfaces **98** of the track. The flats **102** have narrow cylindrical rollers **104** trunioned thereon, and the rollers ride on alternate surfaces of the track to maintain the hanger **14** of the trolly in a central plane of the slot **12.** This is true, moreover, even where the bottom of the track gives way on one side or the other of the trolly, as in FIG. **15.** In such a case, even though the right-hand side of the bottom is deformed from the manufactured condition of the track, the carriage still maintains the centralized disposition of the hanger, due to the fact that the bolt **100** is rotatably journaled in the sleeves **106** of the hanger, the sleeves being spaced apart to accommodate the intermediate flat **102** and roller **104,** as seen in FIG. **12.**

What is claimed is:

1. In combination, a ladder elevated above its supporting surface, an arm pivotally mounted on the lower end portion of the ladder, which is yieldably biased in one angular direction thereof, into a stopped position on the ladder, and which has a surface engaging wheel thereon, which is rotatably mounted about an axis that is spaced apart from the pivotal axis of the arm, at a point on the arm at which the wheel supports the ladder above the surface in response to the bias on the arm, means for restraining the wheel against rotation when the user's weight is added to the ladder, including an element which is disposed on the ladder so as to engage the wheel when the arm and the ladder are pivoted in relation to one another in the direction opposed to the bias on the arm, and means on the ladder whereby the restrainer element can be disengaged from the wheel when the element and the arm are displaced in relation to one another in the direction opposed to the bias on the arm, so that the wheel can be released for rotation even while the user remains on the ladder.

2. The combination according to claim **1** wherein the wheel has a series of recesses therein which are relatively angularly disposed about the rotational axis of the wheel, and there is a lug which is disposed on the ladder so as to engage one of the recesses when the arm and the ladder are pivoted in relation to one another in the direction opposed to the bias on the arm.

3. The combination according to claim **2** wherein the lug is disposed on a dog which is pivotally mounted on the lower end portion of the ladder in a plane parallel to that of the arm, and yieldably biased in the same angular direction as the arm, into a stopped position on the ladder.

4. The combination according to claim **3** wherein the dog has an actuator connected therewith, which extends lengthwise of the ladder, to points on the upper end portion thereof, and is manually operable at any one of the aforesaid points to pivot the dog in the direction opposed to the bias thereon.

5. The combination according to claim **3** wherein the dog and the arm are pivotally mounted on one standard of the ladder.

6. The combination according to claim **5** wherein the axes of the dog, the arm, and the wheel are all parallel to one another.

7. The combination according to claim **3** wherein the recesses with which the lug is engageable are defined by a ratchet on one side of the wheel.

8. The combination according to claim **1** wherein the ladder is movably suspended from a track.

9. The combination according to claim **8** wherein the track is elongated, V-shaped, and has a longitudinally extending slot in the bottom thereof, between the angularly related surfaces thereof, and there is a carriage on the track including a pair of relatively inner and outer rotationably engaged members which are disposed above the track, and the outer of which has a device suspended therefrom in the slot, on which the ladder is hung, the inner member being elongated on a parallel to the track, and having longitudinal spaced recesses therein, which are disposed at relatively angularly spaced points thereabout, and a plurality of track engaging wheels thereon, in the recesses, which are rotatably mounted about axes that extend substantially parallel to alternate surfaces of the track, as the wheels are considered from one recess to the next, lengthwise of the inner member.

10. In combination, a standard elevated above its supporting surface, an arm pivotally mounted on the lower end portion of the standard, which is yieldably biased in one angular direction thereof, into a stopped position on the standard, and has a surface engaging wheel thereon, which is rotatably mounted about an axis that is spaced apart from the pivotal axis of the arm, at a point on the arm at which the wheel supports the standard above the surface in response to the bias on the arm, means for restraining the wheel against rotation when a weight is added to the standard, including an element which is disposed on the standard so as to engage the wheel when the arm and the standard are pivoted in relation to one another in the direction opposed to the bias on the arm, and means on the standard whereby the restrainer element can be disengaged from the wheel when the element and the arm are displaced in relation to one another in the direction opposed to the bias on the arm, so that the wheel can be released for rotation even while the weight remains on the standard.

11. In combination, a track which is elongated, V-shaped, and has a longitudinally extending slot in the bottom thereof, between the angularly related surfaces thereof, and a carriage for supporting a body on the track, including a pair of relatively inner and outer rotatably engaged members which are disposed above the track, and the outer of which has a device suspended therefrom in the slot, on which the body is hung, the inner member being elongated on a parallel to the track, and having longitudinally spaced recesses therein, which are disposed at relatively angularly spaced points thereabout, and a plurality of track engaging wheels thereon, in the recesses, which are rotatably mounted about axes which extend substantially parallel to alternate surfaces of the track, as the wheels are considered from one recess to the next, lengthwise of the inner member.

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