Nov. 4, 1969 W. V. EAKINS 3,476,212

COMBINATION STEPLADDER AND VERTICALLY MOVABLE PLATFORM

Filed June 24, 1968

FIG. 1

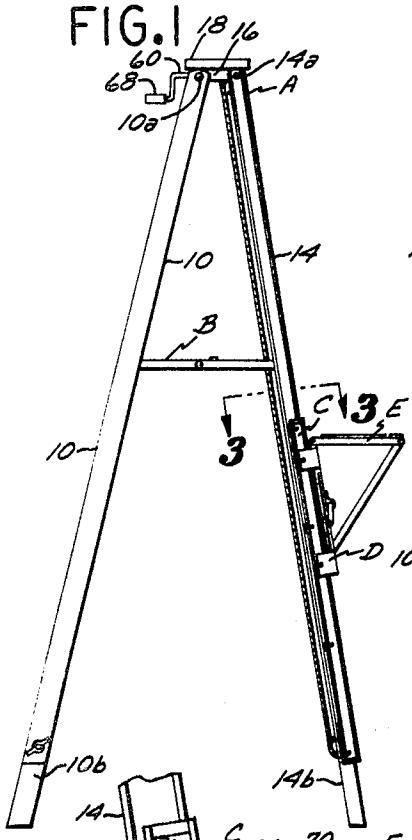


FIG. 2

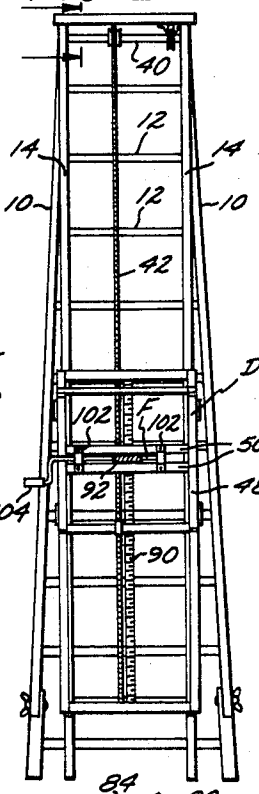
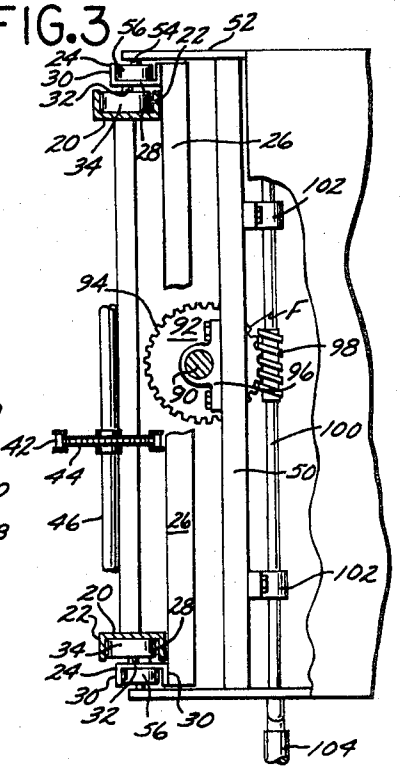


FIG. 3



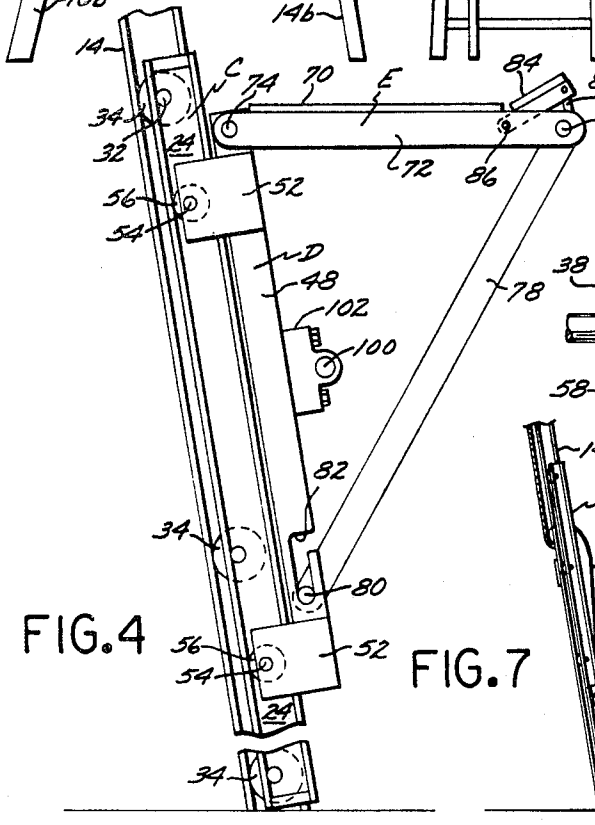
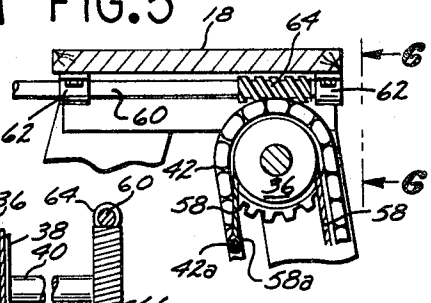


FIG. 4

FIG. 5



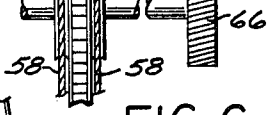


FIG. 6

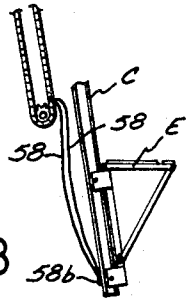
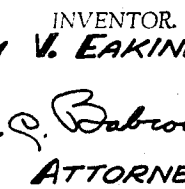


FIG. 7

FIG. 8



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COMBINATION STEPLADDER AND VERTICALLY MOVABLE PLATFORM

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U.S. Cl. 182—103 6 Claims

ABSTRACT OF THE DISCLOSURE

A stepladder incorporating a vertically movable cargo carrying platform so supported thereon that said platform may be raised to a position above the upper extremity of the ladder, as well as lowered below the lower ends thereof when the ladder is supported on extensions.

BACKGROUND OF THE INVENTION

Field of the invention

A stepladder provided with a vertically movable platform which is particularly useful in raising heavy objects relative to the stepladder, to a position thereabove, as well as lowering heavy objects such as a chandelier from a ceiling to a position adjacent a floor.

Description of the prior art

In the building trades, particularly in electrical and plumbing maintenance work, it is highly desirable to support a workman in an elevated position, whereby it is possible for him to control the vertical movement of a heavy object it is desired to raise or lower.

Although hoists and various types of vertically movable platforms and supports have been devised and used in the past for raising or lowering heavy objects, such devices were not adapted for use by a workman when in an elevated position. The present invention overcomes the operational disadvantages of such prior hoists and vertical-movable platforms, by supporting a workman in an elevated position, to permit the workman, when so supported, to handle a heavy object in an easy and convenient manner.

SUMMARY OF THE INVENTION

A combined stepladder and vertically movable platform of relatively simple mechanical structure that is portable, and may be used to not only support a workman in an elevated position, but permits the workman, when so supported, to raise and lower heavy objects in an easy and convenient manner with a minimum of physical exertion.

A major object of the present invention is to provide a combined stepladder and vertically movable platform that is portable, can be fabricated from standard, commercially available materials, requires a minimum of maintenance attention, and may be used by a workman to climb to an elevated position, and easily and conveniently handle a heavy object when so positioned.

BRIEF DESCRIPTION OF THE DRAWING

FIGURE 1 is a side elevational view of the combined stepladder and vertically movable platform;

FIGURE 2 is a front elevational view of the device;

FIGURE 3 is a fragmentary, horizontal, cross-sectional view of the device taken on the line 3—3 of FIGURE 1;

FIGURE 4 is an enlarged, fragmentary, side elevational view of the vertically movable platform portion of the device;

FIGURE 5 is a vertical, fragmentary, cross-sectional view of the upper portion of the device taken on the line 5—5 of FIGURE 2;

FIGURE 6 is an end elevation of the portion of the device shown in FIGURE 5 taken on the line 6—6 thereof;

FIGURE 7 is a side elevational view of the braces and extensions mounted on the lower ends thereof, and with the vertically movable platform being in a position below the lower extremities of the braces; and

FIGURE 8 is a side elevational view of the lower sprocket and a part of the endless link belt, and with a cable extending from the belt and removably connectable to either the first or second movable platform.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The combined stepladder and vertically movable platform A is shown in FIGURES 1 and 2, which includes two laterally spaced, upwardly extending rails **10** that support a number of horizontal rungs **12** therebetween. Two parallel, laterally spaced, upwardly extending braces **14** are oppositely situated from the rails **10**. Pins **10***a* and **14***a* pivotally engage the upper ends of the rails **10** and braces **14** to secure the same to the ends of a rectangular frame **16**. A rectangular, horizontal support **18** is mounted on the upper end of frame **16**, as may best be seen in FIGURE 1, and conventional means B are provided for maintaining the rails **10** and the braces **14** in the spread ladder-defining position.

Each of the braces **14**, as may best be seen in FIGURE 3, is of transverse, channel-shaped cross section and includes a web **20** and two flanges **22** projecting outwardly from edges thereof. A first elongate, rectangular frame C is provided that includes two side pieces **24** which are connected by cross members **26**. Side pieces **24** are of channel-shaped transverse cross section and include webs **28** and flanges **30**. The flanges **30** of the two webs **28** extend outwardly away from one another. A number of longitudinaly spaced stub shafts **32** project inwardly towards one another from the adjacent faces of webs **28**, as shown in FIGURES 3 and 4, and each of these shafts rotatably support a roller **34** situated within the confines of the flanges **22**.

The web **20** and flanges **22** of each of the braces **14** cooperatively provide a longitudinally extending guide for one group of the rollers **32**. At least three laterally spaced stub shafts **32** preferably project inwardly from each web **28** for reasons that will later be explained.

An upper sprocket **36** having pulleys **38** mounted each side thereof as shown in FIGURE 6, is rigidly secured to an upper horizontal shaft **40** (FIGURE 2) at the end of this shaft are journaled in the braces **14**. The upper sprocket **36** is engaged by a downwardly extending endless link belt **42**. Belt **42** engages a second lower sprocket **44** that is best shown in FIGURE 3, and is rigidly secured to a second horizontal shaft **46**, the ends of which are rotatably supported in the braces **14**.

A second rectangular frame D is provided that is outwardly disposed from the first frame C, as may best be seen in FIGURE 4, and is longitudinally movable relative thereto. Frame D includes two parallel, laterally spaced side pieces **48** and cross pieces **50**. Legs **52** extend from the ends of side pieces **48** towards the first frame C. Stub shafts **54** project from legs **52** towards the side pieces **24**, as shown in FIGURE 3. The stub shafts **54** rotatably support rollers **56** which engage the side pieces **24** of the first frame C, as shown in FIGURE 3 and are guided thereby.

Two cables **58** on first ends **58***a* thereof are attached to opposite sides of the belt **42**, as illustrated in FIGURE 5 by pins **42***a*. The second ends **58***b* of the cables **58** are removably attached by conventional means to

either the first frame C or the second frame D adjacent to the lower end thereof (FIGURE 8).

As the first frame C is moved upwardly on braces **14** by use of belt **42**, the cables **58** may engage the pulleys **38**. After the cables **58** are in full engagement with pulleys **38** (FIGURE 5), the portions of the cables adjacent the ends **58***a* thereof move downwardly during continued rotation of the upper sprocket **36** in a counter clockwise direction. Continued movement of the belt **42** after the cables **58** are in full engagement with pulleys **38** causes the first frame C to be raised partially above the support **18**.

Extensions **10***b* and **14***b* respectively may be affixed by conventional means to the lower ends of rails **10** and braces **14** (FIGURE 1) when the ladder A is of insufficient height to dispose the support **18** at a desired elevation. The cables **58** permit the first frame C to be lowered to a position, such as shown in FIGURE 7, where the frame is partially below the lower extremities of the rails **10** and braces **14**. When the first frame C is to be disposed partially above the support **18** or partially below the extremities of the rails and braces, a sufficient number of pairs of rollers **34** must be provided on first frame C that at least two pairs thereof remain in engagement with the braces **14**. Such engagement of the rollers **34** is required to maintain the first frame C in an aligned stable position relative to the braces **14**.

A transversely positioned shaft **60** is rotatably supported under support **18** by bearings **62**, as best seen in FIGURE 5. Shaft **60** includes a worm gear **64** that engages a gear **66** rigidly secured to upper shaft **40** as illustrated in FIGURE 6. The transverse shaft **60** is provided with a handle **68** or other means for rotating the same as shown in FIGURE 1. Second frame D serves to support a cargo carrying platform E, as shown in FIGURES 1, 4 and 7. Platform E is preferably defined by a rectangular plate **70** that is transversely positioned relative to second frame D and outwardly positioned therefrom. Two spaced rigid first members **72** are secured to the underside of plate **70**, and are pivotally connected on their inner ends by pins **74** to side pieces **48**, as illustrated in FIGURE 4. The outer ends of members **72** are pivotally connected by pins **76** to second elongate members **78**, as shown in FIGURE 4.

The lower ends of members **78** are provided with pins **80** that may be removably positionable in J-slots **82** formed in side pieces **48** to maintain the platform E in the cargo carrying position (FIGURE 4). When the platform E is not in use, pins **80** may be disengaged from slots **82** to permit the platform to depend along the outer portion of second frame D. When the platform E occupies this depending position, the ladder A occupies less space, which is particularly desirable in the storage of the ladder.

To prevent inadvertent displacement of a heavy object or other cargo (not shown) from the platform E, a transverse member **84** is pivotally supported by pins **86** from the outer portions of the members **72**, as shown in FIGURE 4. The member **84** may be held in an upwardly and outwardly extending position relative to plates **70** by a conventional latch mechanism **88**.

Second frame D may be moved longitudinally relative to the first frame C by the mechanism F shown in FIGURES 2 and 3. Frame C supports a longitudinally extending threaded rod **90** that is engaged by a circular nut **92** provided with teeth **94** on the outer portion thereof. Rod **90** extends upwardly through two spaced guides **96** that are secured to two of the cross pieces **50** which form a part of the second frame D (FIGURE 2).

Nut **92** is disposed between the two guides **96**. Teeth **94** are engaged by a worm gear **98** on a transverse shaft **100**, and this shaft is rotatably supported in two transversely spaced bearings **102** (FIGURES 2 and 3) that are secured to the two cross pieces **50** that support guides **96**. A handle **104** or like means is provided on the outer end of shaft **100** for ease in rotating the same.

Operation of the invention is quite simple. When it is desired to use the ladder A, it is transported to a desired location, preferably with the rails **10** and braces **14** disposed in substantially parallel relationship, and the platform E positioned substantially parallel to the second frame D. The rails **10** and braces **14** are then placed in the expanded stepladder-defining position illustrated in FIGURE 1. If the ladder A is not of the correct height to hold the support **18** in the desired relationship with a ceiling or the like (not shown), the extensions **10***b* and **14***b* may be secured to the lower extremities of the rails **10** and braces **14**. Irrespective of whether the extensions **10***b* and **14***b* are secured to the rails **10** and braces **14**, the operation of the ladder is the same.

In the event a heavy object (not shown) is to be raised on the platform E, the handle **68** is rotated to move the first frame C downwardly on the braces **14**, to a position adjacent the floor. Thereafter, the handle **104** is rotated to move the second frame D downwardly relative to the first frame C to dispose the platform E in a position where the heavy object may be conveniently placed on plate **70**, shown in FIGURE 4.

If the extensions **10***b* and **14***b* are secured to ladder A, portions of the first frame C may be positioned below the lower extremities of the legs **10** and braces **14**. However, two of the pairs of rollers **34** must at all times be in engagement with the braces **14** to maintain the first frame C in an aligned and supported position on the braces. After the cargo has been loaded on platform E, the handle **68** is rotated in such a direction as to cause the frame C to move upwardly on braces **14** until the cargo and platform E are at a desired elevation. When a heavy object such as a chandelier (not shown) is being removed from a ceiling, the first frame C may be moved to a position where it extends partially above the support **18**. Platform E may then be moved upwardly relative to first frame C to a position where plate **70** is above support **18**, and the chandelier or other heavy object may rest on the plate. The first frame C, second frame D, and platform E may thereafter be lowered as a unit to position the heavy object adjacent the floor on which ladder A rests. From the above description it will be seen that the cargo supporting plate **70** may be raised above the support **18**, as well as moved below the lower extremities of rails **10** and braces **14** when the latter have extensions **10***b* and **14***b* attached thereto.

I claim:

1. In combination with a stepladder of the type that includes two spaced upwardly extending rung-supporting rails, two parallel, laterally spaced, upwardly extending braces having longitudinal guides thereon, pivotal means connecting the upper ends of said rails and braces, and means for maintaining said rails and braces in a stepladder-defining position, the improvement for lifting an object on said ladder to a position thereabove, comprising:

(a) a first elongate rectangular frame positioned parallel to the exterior surface of said braces;

(b) first means on said frame for movably engaging said guides to support said frame from said braces and permit said frame to be moved to a position partially above said pivotal means;

(c) upper and lower sprockets rotatably supported between said braces;

(d) pulley means supported in the upper portion of said braces;

(e) a second frame positioned parallel to the exterior surface of said first frame;

(f) second means for movably supporting said second frame on said first frame;

(g) third means for longitudinally moving said second frame relative to said first frame and supporting said second frame at a desired position on said first frame;

(h) an endless link belt supported on said first and second sprockets;

(i) fourth means for rotating said first and second sprockets to move said belt;

(j) a cable removably connected on a first end either to the bottom of said second frame or to said first frame intermediate the top and bottom thereof in such a manner that said cable can engage said pulley means and when connected to said first frame raise said first frame partially above said pivotal means; and

(k) a substantially horizontal platform supported from said second frame for vertically moving said object where supported thereon when either said first frame is moved relative to said braces or when said second frame is moved longitudinally relative to said first frame.

2. A stepladder as defined in claim 1 which further includes:

(l) a plurality of extensions disposed below the lower ends of said rails and braces, with said cable permitting said first frame to be lowered partially below said lower ends, and said platform when said first frame is so disposed being adapted to be moved to a position adjacent the surface on which said extensions rest to permit a heavy object to be placed on or removed from said platform.

3. A stepladder as defined in claim 1 wherein said guides comprise longitudinally extending recesses defined in said braces and said first means comprise a plurality of pairs of longitudinally spaced rollers supported from said first frame that movably engage said recesses.

4. A stepladder as defined in claim 1 wherein said first frame includes two side pieces of channel-shaped transverse cross section, and said second means comprise a plurality of pairs of rollers rotatably supported on said second frame that movably engage said side pieces.

5. A stepladder as defined in claim 1 wherein said third means further includes:

(l) a threaded rod supported in a fixed longitudinally extending position on said first frame;

(m) a circular nut rotatably supported at a fixed longitudinal position on said second frame, with said nut

threadedly engaging said rod, and said nut having teeth on the external surface thereof;

(n) a worm gear rotatably supported from said second frame, which worm gear is in engagement with said teeth; and

(o) handle means for manually rotating said worm gear to move said second frame and platform longitudinally relative to said first frame.

6. A stepladder as defined in claim 1 wherein said fourth means further includes:

(l) a horizontal shaft rotatably supported from said braces, which shaft has said upper sprocket rigidly secured thereto;

(m) a gear rigidly secured to said shaft;

(n) a second shaft rotatably supported from said stepladder adjacent said gear;

(o) a worm gear rigidly secured to said second shaft, which worm gear is in engagement with said gear; and

(p) means for rotating said second shaft.

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U.S. Cl. X.R.

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