

Feb. 18, 1969

H. C. LYON

3,428,145

ELEVATOR FOR EXTENSION LADDERS

Filed Oct. 2, 1967

Sheet 1 of 2

FIG. 1

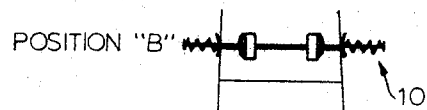
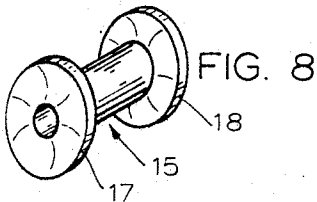
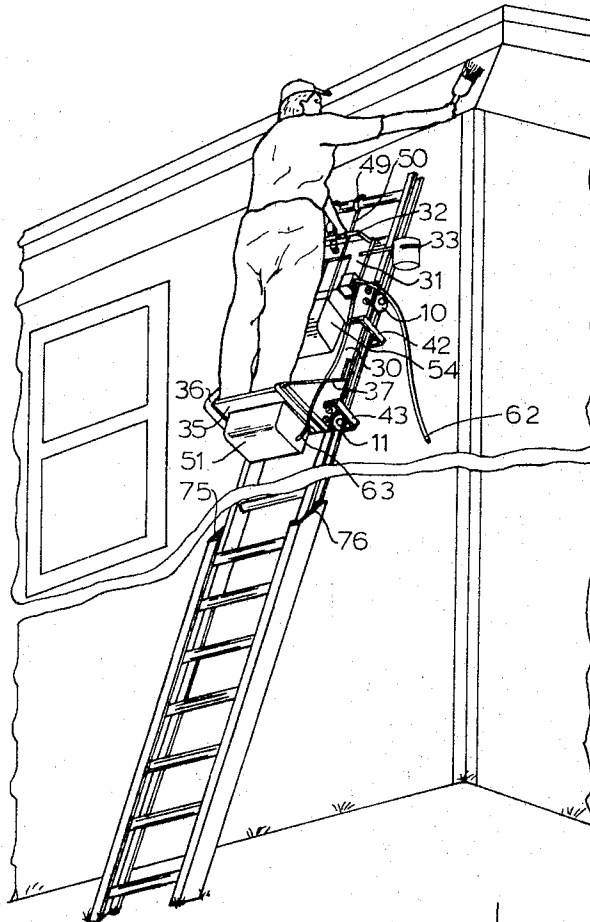


FIG. 7

FIG. 5

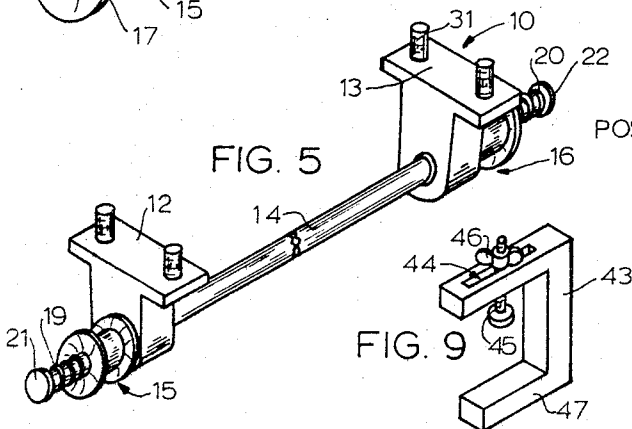


FIG. 9

INVENTOR.
Harry C. Lyon

BY

B. B. Olbre
ATTORNEY

Feb. 18, 1969

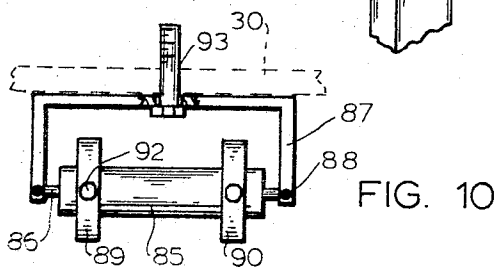
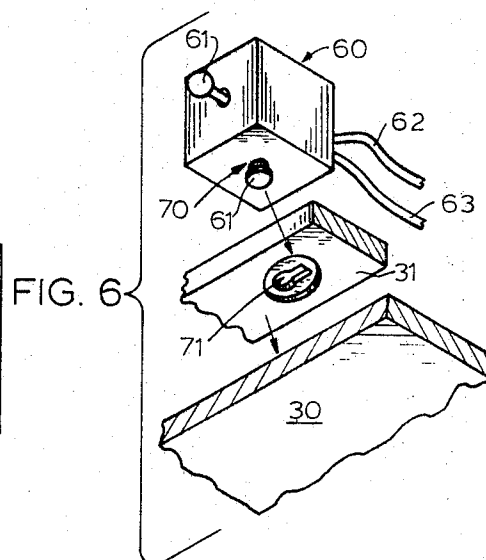
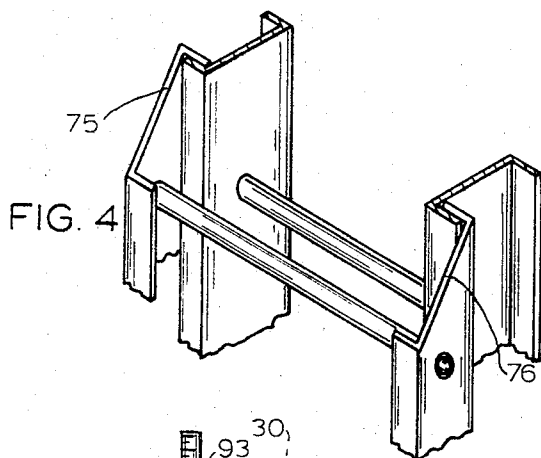
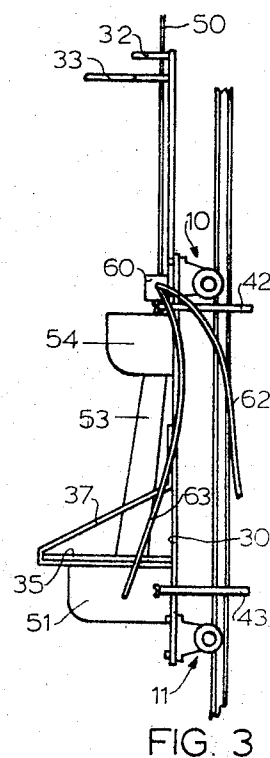
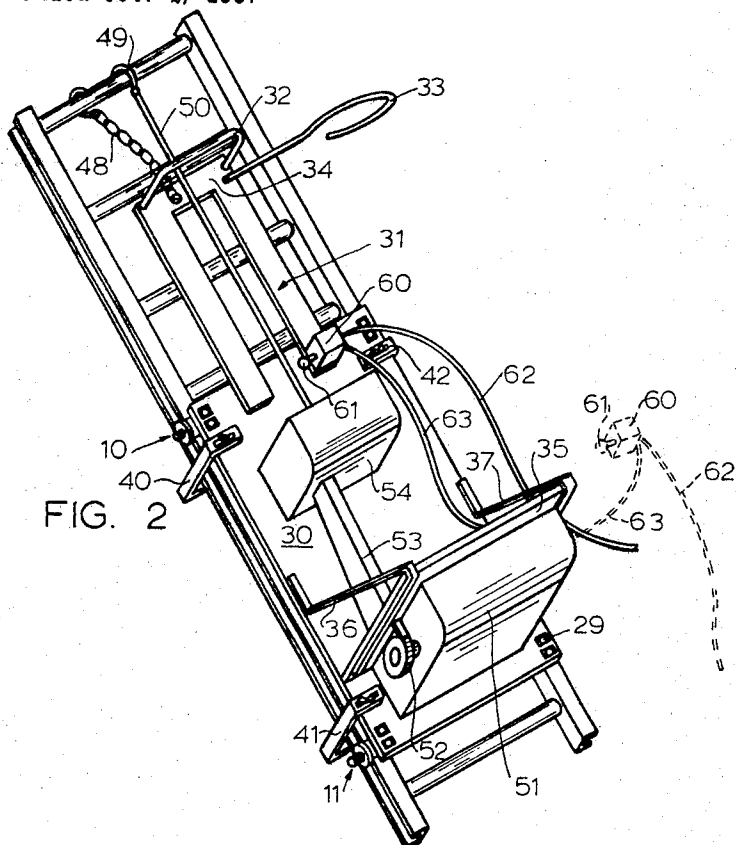
H. C. LYON

3,428,145

ELEVATOR FOR EXTENSION LADDERS

Filed Oct. 2, 1967

Sheet 2 of 2



INVENTOR.
Harry C. Lyon

BY

B. B. Olson

ATTORNEY

1

3,428,145

ELEVATOR FOR EXTENSION LADDERS

Harry C. Lyon, 3712 Buffaloe Road,
Raleigh, N.C. 27604

Filed Oct. 2, 1967, Ser. No. 672,134

U.S. Cl. 182-103

Int. Cl. E06c 7/16

6 Claims

ABSTRACT OF THE DISCLOSURE

A removable self-powered elevator attaches to extension or fixed section ladders and adapts to tapered or uniform width ladders and includes a control which can be operated while standing on the elevator or removed for remote control.

BACKGROUND OF THE INVENTION

(1) *Field of the invention.*—This invention relates broadly to electrically powered elevators and more specifically to elevators which operate on ladders. The invention also relates to extension ladder constructions modified to receive elevator apparatus.

(2) *Description of the prior art.*—It has been known to provide rather complex powered elevators for fire escape ladders. Typical of such art are those ladder-elevator combinations found in United States Patents 1,924,751 and 2,376,875. Other prior patents show elevator-ladder constructions which depend on various forms of hand operated windlass mechanisms for raising and lowering the elevators.

A study of the prior art reveals generally that the elevators in the prior art elevator-ladder combinations are constructed for permanent association with a particular ladder and the ladders are generally of complex construction and are useful only with a particular elevator. Further, those powered elevators taught by the prior art are powered by extremely heavy and complex motors, gear drives and the like which because of their weight and complexity are arranged to remain at the base of the ladder during operation and which inherently require several strands of cable running lengthwise of the ladder for raising and lowering the elevator and its multi-passenger load.

The prior art has thus failed to provide an inexpensive single passenger, elevator apparatus that can be quickly attached to and detached from any conventional tapered or uniform width, fixed section or extension type ladder with essentially no or minor modification of the conventional construction of such ladders and with a minimum of cable strands to interfere with use of the ladder. The art has not provided a light weight and portable elevator apparatus useful to house painters, building maintenance personnel and the like that can be easily moved from job to job and that does not require permanent installation on a particular ladder. Under present circumstances painters, roofers and similar workmen whose daily toil requires use of ladders have no practical means for relieving themselves of having to climb up and down ladders and the burden of having to do so grows increasingly intolerable as the workman grows older. In comparison, the painter is much more able to accommodate himself to the physical task of wielding his brush than he is to climbing his ladder.

SUMMARY OF THE INVENTION

The apparatus of the invention includes a lightweight platform which mounts on rollers adapted to ride the side rails of conventional ladders such that the platform can be moved like an elevator up and down the ladder. A reversible electric motor drive is mounted on the plat-

2

form and moves with it on the ladder rails. The drive operates a drum which is utilized to wind and unwind a strand of cable which is hooked at one end to the upper rung of the ladder. The platform has a step on which the operator can stand and a hand hold to secure himself and with the cable hooked and the drive energized can cause himself to be safely lifted up the ladder with no physical effort on his part. Means are provided such that the elevator apparatus of the invention can be quickly attached and detached from conventional ladders and can be made to ride the rails of both fixed section, uniform width, as well as variable width, multi-section extension and tapered ladders.

The primary object of the invention is to relieve the fatigue experienced by painters, roofers, caulkers and the like because of having to continuously climb up and down ladders during the course of their work by providing an economical, lightweight, detachable elevator which can be easily transported from job to job and attached as required to any one of many and varied kinds of ladders.

Another object is to provide a ladder elevator which can be adapted to the typical extension ladder with only a minor modification and one that can be quickly accomplished with a simple hand tool operation.

Another object is to provide a ladder elevator with a single control that can be operated either while riding the elevator or remotely from ground level thereby adapting the elevator to lift either an operator passenger or a comparable load of work material.

The foregoing and other objects will become apparent from the later description and drawings.

DESCRIPTIONS OF THE DRAWINGS

FIGURE 1 is a perspective view illustrating the ladder elevator of the invention in use on a typical extension ladder.

FIGURE 2 is an enlarged perspective view of the elevator on a section of uniform width ladder.

FIGURE 3 is a side view of the elevator on a section of ladder.

FIGURE 4 is a perspective fragmentary view showing typical extension ladder sections slightly modified for purposes of the invention.

FIGURE 5 is an enlarged perspective view of one of the roller assemblies.

FIGURE 6 is a perspective exploded view of the control mounting.

FIGURE 7 is a schematic drawing illustrating how the FIGURE 5 roller assembly accommodates to a tapered ladder.

FIGURE 8 is an enlargement of one of the rollers.

FIGURE 9 is an enlargement of one of the adjustable mounting guides, and FIGURE 10 is an alternate roller.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As mentioned above, the elevator of the invention is intended to ride the side rails of a ladder and for such purpose includes forward and rearward roller assemblies 10, 11. Each assembly, as best shown in FIGURE 5, includes a pair of opposed axle supports 12, 13, an axle 14 and a pair of rotatable and axially slidable rollers 15, 16. Each roller has an inner and outer dish shaped, flange such as flanges 17, 18 in FIGURE 8. Compression springs 19, 20 encircle axle 14 and are mounted between respective end pieces 21, 22 and the rollers 15, 16. The described arrangement of dish shaped flanges, axially movable and spring tensioned rollers allows the rollers to effect a transition between ladder sections of varying width such as the typical metal extension ladder

and to follow both tapered and uniform width ladders as more fully described later in the description.

Forward and rearward roller assemblies 10, 11 are secured to a rectangular plate base member 30 by means of studs 28 shown in FIGURE 5 and nuts 29 shown in FIGURE 2. One of the objectives of the invention is to provide a lightweight elevator that can be easily transported to and on the job and it has been found that structural aluminum plate and bar fabrication lends itself to the structure and various members being described. Thus, member 30 is preferably an aluminum or other lightweight metal plate. Secured to the upper or forward portion of member 30 is an inverted U-shaped plate member 31 to which is secured a hand hold rod 32 and a paint bucket support 33 for use by painters, caulkers and the like. It will be observed that member 31 provides both a suitably located as well as lightweight support for hand hold 32. It may also be seen that the apex portion of member 31 provides a guiding surface 34 for cable 50 and the combination of the usually taut cable acting against surface 34 assists in reducing any tendency of the elevator to tip rearwardly when loaded with a passenger and in use as in FIGURE 1.

A step platform 35 is secured to base member 30 and is supported by brackets 36, 37. Platform 35 as shown in FIGURE 1 supports the workman when on the elevator and while not shown in such use also provides a platform for raising materials such as roofing when the elevator is under remote control as later explained. It will be also be noticed that base member 30 mounts four laterally adjustable mounting guides 40, 41, 42 and 43 which comprise laterally adjustable bars bent so that they extend on the outside of and partially around the ladder rails. As best shown in FIGURE 9 each guide has a slot 44 and is secured by a bolt 45 which is secured in base member 30 and extends through slot 44 to receive a tightening wing nut 46. This arrangement allows the entire elevator assembly to be installed on any width ladder within the range of lateral adjustment simply by placing the ladder structure within the respective guides 40, 41, 42 and 43 and by laterally adjusting both the guides and rollers to the particular width of the ladder on which the elevator is being mounted. Further, the guides are designed so that the lower, inwardly turned portions of the guides, such as indicated at 47 in FIGURE 9, stay out of actual contact with the ladder rail but otherwise prevent the elevator from becoming separated from the ladder in the event the ladder or elevator is inadvertently tipped rearwardly or in the event it is desired to move the elevator and ladder together in a vertical or rearwardly tipped position. The guides furthermore limit lateral motion of the elevator on the ladder.

The elevator is lifted by means of a single strand of cable 50 having a hook 49 which mounts over the top-most rung of the ladder. Power is provided by a fractional horsepower motor secured beneath and to step 35 and generally shown at 51 and which through a belt drive 52 running through a belt guard 53 drives a gear reduction box 54 and a capstan or drum, not shown, on which the cable is wound. Motor 51 may of course vary in size but it should preferably be of a reversible type and adapted to be reversed by a suitable reversing control box generally shown at 60 and having a control handle 61 and which connects an external power supply cord 62 and motor supply cord 63. It will of course be understood that with the elevator installed, with cable hook 49 in place, cable 50 unrolled and extending down the length of the ladder to the ground, and supply cord 62 energized, the operator merely steps on platform 35, moves the control handle in an appropriate direction and is pulled up by the elevator to the desired elevation at which point a safety chain 48 may be installed. The motor speed and gear reduction are preferably selected so that the elevator speed on the ladder is relatively slow in the order of only a few feet per minute so as to in-

sure maximum safety as well as smooth transitions between ladder sections of varying width.

Referring particularly to FIGURES 2 and 6, it will be noted that control box 60 is preferably removably mounted so that it can be operated on the elevator itself or remotely as indicated by the dashed line position in FIGURE 2. In FIGURE 6, the underside of the control box 60 is shown fitted with a fixed locking stud 70 having an enlarged head 61 which is adapted for removable engagement with the slot 71 provided in the end portion of plate member 31 immediately below the locked position of control box 60. Thus, when the elevator is to be used by a workman who wants to lift himself and his material such as paint up the ladder, control box 60 is secured in place on the elevator by means of securing locking stud 70 in slot 71. However, if the elevator is desired to be used primarily for lifting materials, the same control box 60 is simply removed from the elevator by removing stud 70 from slot 71 which frees control box 60 for the remote ground control position previously referred to by the dashed line position of FIGURE 2.

It has been mentioned before that the roller assemblies 10, 11 are axially movable and such axial movement assists in transferring the elevator between the upper and lower sections of an extension ladder and also in operating on tapered ladders. However, unless the individual rollers are of exceptionally large diameter a problem is encountered on certain types of extension ladders where the lower section rail cross section is misaligned with the upper and usually narrower rail section. The invention however adapts itself to this problem by slightly modifying the typical extension ladder lower section ends in that the same are cut at a taper such as depicted by the sloped surfaces 75, 76 in FIGURES 1 and 4. This tapering operation on the typical and highly popular aluminum extension ladder is accomplished simply by cutting such tapers at the desired angle with a hack saw. The transition between sections is further assisted by making the roller flanges such as flanges 17, 18 in an inwardly concave or dish shape. Thus, as the elevator ascends or descends the rollers, such as rollers 15, 16 of FIGURE 5, either ride down or ride up the tapered surfaces such as surfaces 75, 76 and as the ladder section width changes from wide to narrow or vice versa, in moving up or down the ladder the rollers move axially and the flanges of the rollers gradually engage the sides of the ladder rails accordingly. Particularly in the case of tapered wooden ladders as schematically represented by tapered ladder 80 in FIGURE 7, once the rollers are properly engaged either at the narrow or wide end of the ladder and as the elevator moves on the ladder, the roller flanges by acting against the ladder side rails gradually force the rollers to a corresponding outward position A or inward position B.

While not shown it is recognized that the electrical gear drive unit may be mounted for quick attachment and removal and may be a self-contained gear drive unit such as the "Lectro-Loader" power winch sold for boat trailer application by Seibert and Sons, Inc. of Chenoa, Illinois. It may also be noted that because of the variety of ladder constructions and particularly in those which taper and change in width from section to section it may be desirable to mount each roller individually on a short axle and so that it may swivel and have adjustable width flanges.

FIGURE 10 illustrates one such construction in which the roller body 85 is supported on a short axle 86 mounted in an inverted U-shaped frame 87 and secured by set screws 88. The flanges 89, 90 are adjustably secured to the roller body 85 by means of set screws 92 and the frame 87 is mounted to swivel on a stud member 93. It will of course be understood that when this roller embodiment is employed a similar stud 93 for each roller is mounted on plate 30, shown in dashed lines, and acts to both support the respective rollers and provide an axis around which swivelling may take place.

Having described the invention what is claimed is:

1. In combination, a ladder having side rails and rungs spaced between and securing the said rails, and elevator structure comprising:

- (a) a rectangular plate member providing a mounting base plate designed to span and be moved adjacent one side of said ladder;
- (b) forward and rearward adjustable roller assemblies secured to one side of said base plate, each assembly including a pair of rollers each having roller bodies and terminal flanges adapted to engage and ride on the surfaces of said rails proximate said base plate;
- (c) a step plate secured to said base plate and extending outwardly and substantially perpendicularly therefrom at one end thereof;
- (d) guide mounting means secured to said base plate and providing forward and rearward guide surfaces extending partially around, beneath and proximate said rails and effective to limit lateral movement and outward separation of said base plate from said ladder when mounted thereon;
- (e) a cable approximating the length of said ladder and including attachment means for removably securing one end of said cable to an upper rung of said ladder;
- (f) a reversible electrical gear drive including a cable drum driven thereby, said gear drive being mounted on and movable on said ladder with said base plate and the other end of said cable being arranged to be wound on said drum; and
- (g) a reversing control connected to control energization of said drive for forward and reverse rotation of said drum, such that when said attachment means

is secured said control enables said drum to reversibly wind said cable and thereby effect reversible elevator movement of said step plate.

2. The combination of claim 1 wherein said control is removably mounted on said elevator structure thereby enabling reversing of said structure to be effected both remotely and while riding on said structure.

3. The combination of claim 2 wherein said flanges are concave inwardly toward said roller body, said ladder includes upper and lower sections and the connecting structure of said sections is adapted to receive said rollers and effect transitional movement between said sections.

4. The combination of claim 3 wherein said rollers are axially mounted, and adapted to automatically adjust to tapered, non-uniform width ladders and the like.

5. The combination of claim 4 including compression springs arranged coaxially with said rollers and adapted to force said rollers inwardly and against the sides of said rails.

6. The combination of claim 5 including plate means secured to and effecting a planar extension of said base plate, and a hand hold bar secured to the end of said plate means.

References Cited

UNITED STATES PATENTS

683,890	10/1901	Wolfe	182—103
2,394,148	2/1946	Campbell	182—103
2,438,791	3/1948	Russell	182—103
3,115,211	12/1963	Ostrander	182—103

REINALDO P. MACHADO, *Primary Examiner*.