

Aug. 11, 1959

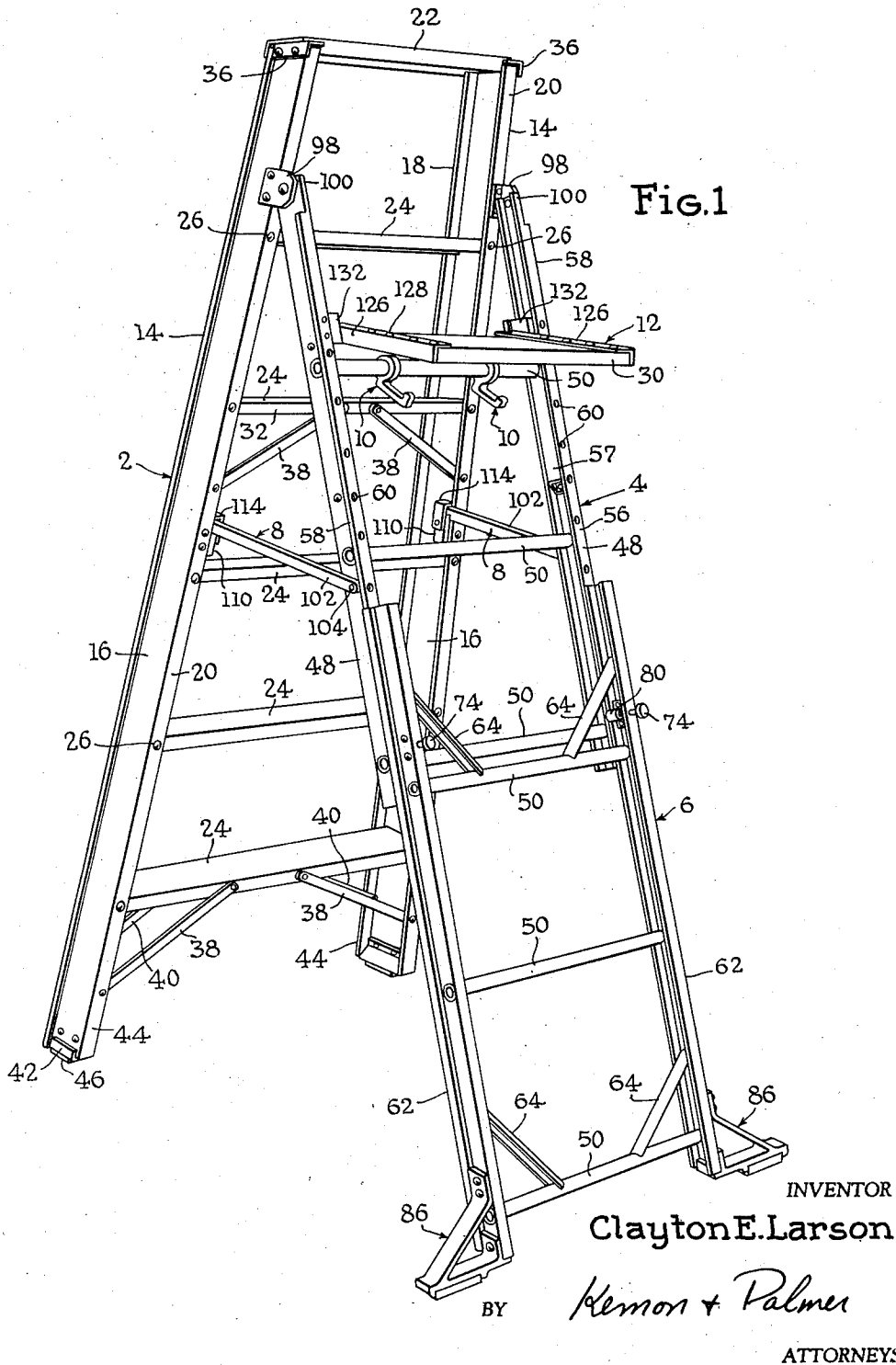
C. E. LARSON

2,899,008

MULTI-WAY LADDER

Filed Sept. 21, 1955

3 Sheets-Sheet 1



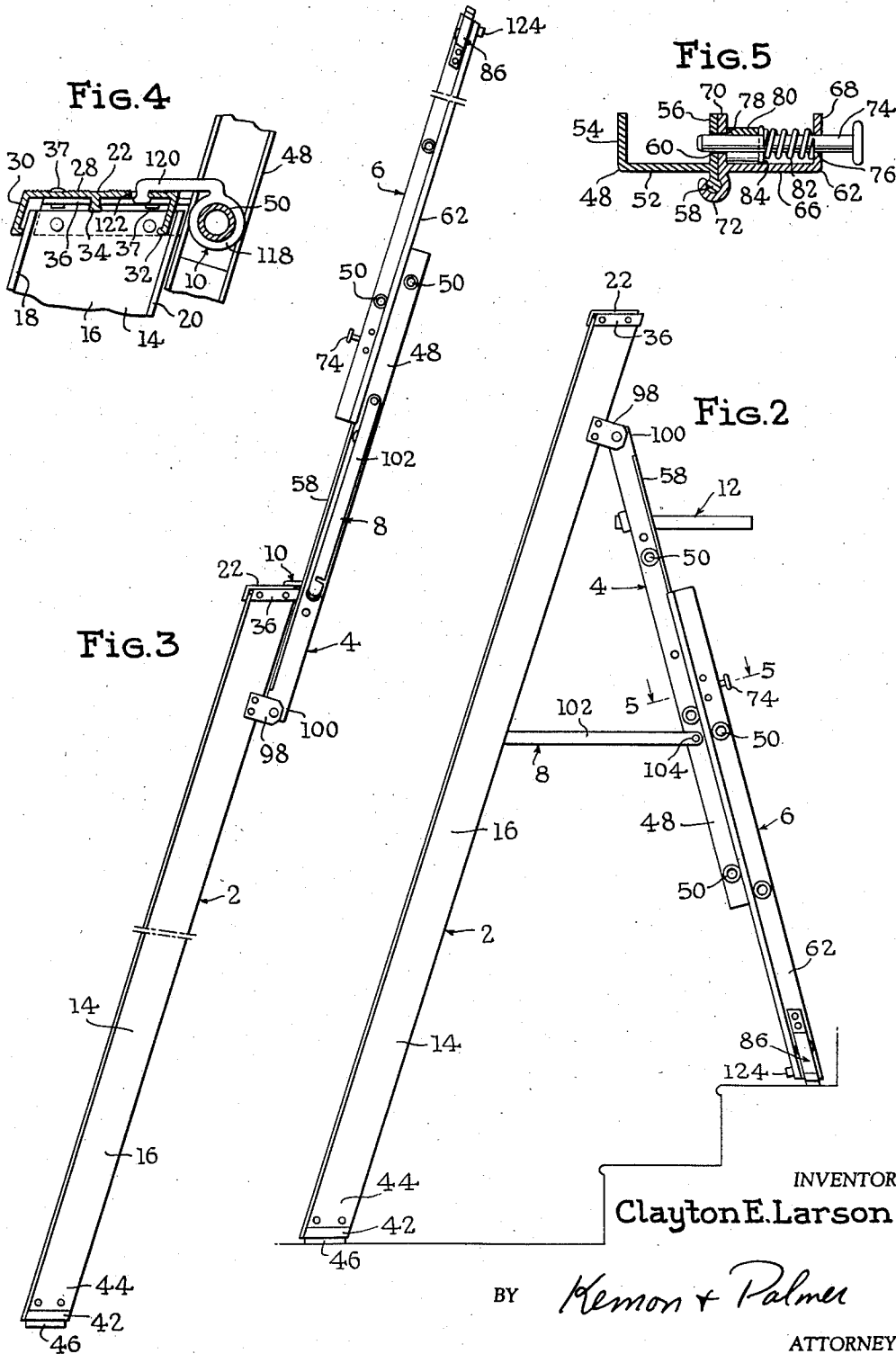
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3 Sheets-Sheet 2



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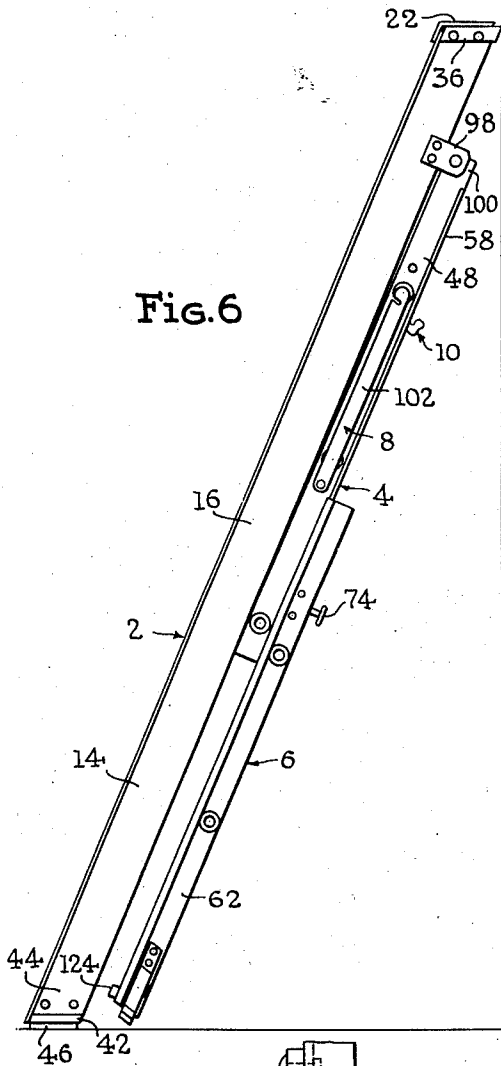


Fig. 6

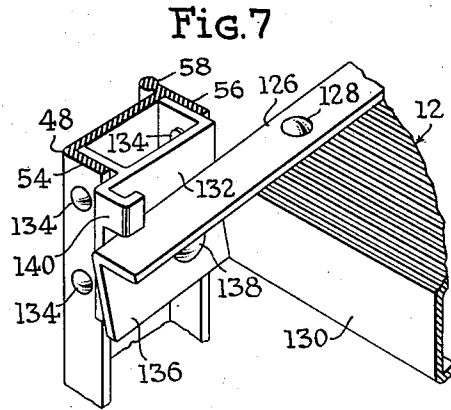


Fig. 7

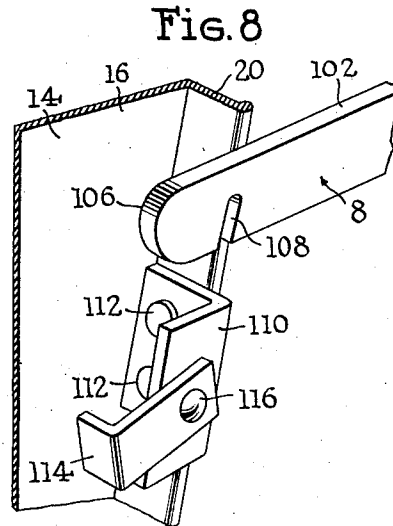


Fig. 8

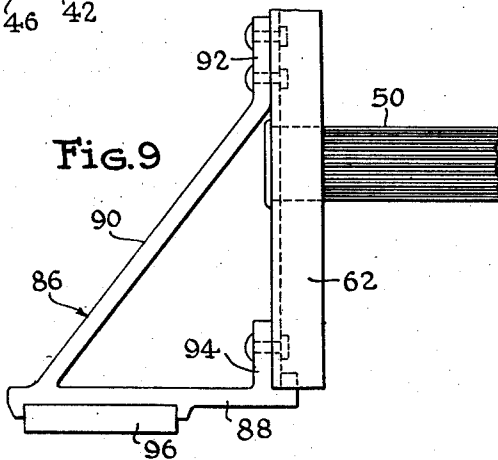


Fig. 9

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2,899,008

MULTI-WAY LADDER

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5 Claims. (Cl. 182—25)

This invention relates to multi-way ladders, i.e., combination ladders which may be used to do the work of a number of basic type ladders, e.g., step, stair well and extension ladders.

Field of invention

The general idea of making ladders in such form that they may be changed by rather simple manipulation from one standard form to another, e.g., from a step ladder into an extension ladder, has been known for many years. As a matter of fact, numerous forms of such combination ladders have been developed and marketed from time to time. For example, U.S. Patent 758,659 discloses an early development of a ladder having telescoping legs so that it can be converted from a regular step ladder into a so-called "stair well" ladder. However, the ladder of this early patent cannot be transformed into an extension ladder, but the general idea of providing a step ladder which may be changed into an extension ladder is shown in other patents, e.g., U.S. 2,152,846.

As the art of ladder manufacture has progressed, designers and manufacturers have attempted to improve upon the early ideas of constructing combination ladders to make the new ladders of the simplest construction, and yet to serve as many different purposes and to be convertible into as many different forms of ladders as possible. At the same time, it has also been the desire of the trade to create combination ladders which are convertible from one basic form to another in the easiest way and without detracting from the use of the ladder by the conversion from, for example, a step ladder into a stair well ladder.

Historically, wood has been the basic material from which ladders of all types have been made. However, in view of the gradual improvements in metallurgy and the production of stronger and lighter alloys, there has been a demand created for metal ladders, since the metal ladders can usually be made lighter in weight than wooden ladders, provided a stable and durable type of construction can be devised for the fabrication of the metal ladders.

A recent development in combination step ladders made of wood is disclosed in U.S. 2,675,155, but the ladders of this patent are defective because of the difficulty in rearranging the ladder sections so as to convert from one ladder form to another. Also, portions of the prop section of the ladder protrude in the way of the climber when the ladder is employed in its stair well arrangement.

A recent development in the formation of metal combination ladders is disclosed in U.S. 2,313,469. This metal ladder is capable of quick and easy conversion from a step ladder to an extension ladder, but in order to obtain stability and durability in the product, it was necessary to sacrifice possible use of the ladder in a stair well arrangement. Furthermore, in neither of these two recent ladders was it possible to include a bucket rack,

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although such racks are generally demanded by purchasers of step ladders.

Objects

It is a principal object of this invention to provide a new type of ladder which may be used in a number of different ways, i.e., a combination ladder usable as a step ladder, as a stair well ladder or as an extension ladder.

Further objects include:

(1) The provision of multi-way combination ladders which may be more easily converted from one form of ladder to another than prior known combination ladders.

(2) The provision of a combination ladder which does not require some part to extend over or across the ladder steps in order to arrange it for use in any of its possible forms, i.e., obstructions to free use of the step area are not created when it is set-up in any arrangement.

(3) The provision of a multi-way combination ladder construction which enables a sturdy and durable ladder to be made almost completely from magnesium metal.

(4) The creation of a combination ladder which is extremely strong, sturdy and free of sway, danger of collapse or the like when in use.

(5) The provision of a single, very light weight, sturdy ladder which fulfills all the ladder needs of the general home-owner or handyman.

(6) The construction of a ladder which may be placed against a wall, floor or the like in any one of its numerous possible ways or positions without damage to the supporting surface by the ladder.

(7) The provision of a combination ladder which affords the user with the maximum degree of safety and freedom from injury during use.

Other objects and further scope of the applicability of the present invention will become apparent from the detailed description given hereinafter; it should be understood, however, that the detailed description, while indicating preferred embodiments of the invention, is given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

General description

These objects are accomplished according to the present invention by constructing a multi-way ladder to comprise a front step section which preferably tapers outwardly from the top to the bottom, an upper rear section hinged at its top end to brackets carried upon the top portion of the front section, a lower rear section telescopically carried upon the upper rear section, means for locking the two telescoping rear sections in position relative to one another so as to adjust the length of combined rear section, spreader members pivoted to the ladder sides to hold the rear section in a front section propping position forming a step ladder arrangement, and hook means carried by the upper rear section for fastening the combined upper and lower rear sections in an upwardly extending position to form an extension ladder arrangement.

Drawings

A more complete understanding of the new multi-way ladders of this invention and their manner of use may be had by reference to the following drawings and detailed description in which:

Figure 1 is a perspective rear view of the new multi-way ladders;

Figure 2 is a side view of the ladder of Figure 1, with the upper and lower rear ladder sections positioned to form a step well arrangement;

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Figure 3 is a side view of the ladder of Figure 1, showing the combined upper and lower rear ladder sections raised and fastened into an extension ladder arrangement;

Figure 4 is a sectional fragmentary enlarged view, showing the hooks and related elements provided for fastening the ladder in an extension arrangement such as shown in Figure 3;

Figure 5 is an enlarged sectional view of the locking device for fixing the position of the upper and lower rear sections relative to one another taken along the line 5-5 of Figure 2;

Figure 6 is a side view showing the use of the ladder of Figure 1 as a plain, single length ladder;

Figure 7 is a fragmentary enlarged perspective view of the pivot portion of the ladder bucket rack showing the manner of mounting the bucket rack upon the upper rear ladder section;

Figure 8 is an enlarged fragmentary perspective view of the spreader lock portion of the new ladders; and

Figure 9 is a fragmentary enlarged rear view of one of the feet portions of the lower rear ladder section.

Detailed description

Referring in detail to the drawings, the new multi-way ladder basically comprises a front step section 2, an upper rear rung section 4, a lower rear rung section 6, spreader means 8, extension arrangement locking means 10 and bucket rack 12.

The front step section 2 comprises a pair of rails 14 of channel form, preferably made from extruded magnesium, defined by a side 16, front portion 18 and rear portion 20. A plurality of flat steps consisting of a top step 22 and a plurality of lower steps 24 are carried between the side rails 14 such as being fastened to the front and rear portions 18 and 20 thereof, e.g., by rivets 26.

Each succeeding step 24 is made slightly wider than the one above it so that the front ladder section 2 tapers outwardly from top to bottom, such as about one inch per foot of height. The steps 22 and 24, as can be seen in more detail by referring to Figure 4, consists of an extruded magnesium metal channel having a longitudinally serrated top surface 28, depending front side 30, depending rear side 32 and a depending central reinforcing rib 34. All of the steps, including the top step, are preferably set at a slight angle, such as about 17°, to the side rail so that when the ladder is arranged in step ladder fashion, the top surfaces of the steps will be completely horizontal.

In contrast to the lower steps 24, the top step 22 is not riveted directly to the side rails 14. Instead, an angle piece 36 is riveted at the top of each side rail 14 and top step 22 is in turn fastened to these angle members 36 by rivets 37 which extend through the step plate 22 and top portion of the angle members 36.

Resistance against further sway during use and rigidity is created in the front ladder section 2 by braces 38, which are riveted to the rear portions 32 of the steps 24 and the rear portions 20 of the side rails 14. Also, on the bottom step of the front section, braces 40 are riveted to the front portion 30 of the step 24 and front portion 18 of the side rail 14.

Non-marring feet for the front ladder section consists of triangular shape members 42, which are riveted to the lower end 44 of the side rails 14. Rubber pads 46 are fastened, such as by cement or rivets, to the triangular feet members 42, forming a stable, non-slipping and non-marring resting or supporting unit for the front ladder section.

The upper rear section 4 of the ladder comprises a pair of side channels 48 between which there are fastened at spaced intervals serrated rungs 50. The rungs are preferably made of extruded magnesium metal tubing, and this is fastened to the side channels 48 by drill-

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ing or punching proper sized holes at suitable positions in the side channels, inserting the extruded metal rungs 50 into these holes and then welding or braising the rungs in place.

As can be seen by reference to Figure 5, the upper section side channels 48 are formed of extruded magnesium metal with a side portion 52, a front portion 54, a rear portion 56 and a side extending lug portion 58. A line of holes 60 are punched or drilled spaced apart from one another in the rear portion 56 of the channel members 48.

Added rigidity and stability in the upper rear ladder section can be obtained by fastening a rectangular tubular brace member 57, such as by rivets, to the inside of each of the side channels 48 near the center part thereof.

The lower rear ladder section 6 is formed with two side channel members 62, to which there are fastened at spaced intervals therebetween, serrated rungs 50. The rungs for the lower section 6 may be fastened to the side channel 62 in the same fashion as the rungs in the upper section 4.

Rigidity is created in the lower section 6 by welding the arcuate braces 64 at one end to the rungs 50 and at the other end to the inside of the channel member 62.

Referring to Figure 5, it can be seen that side members 62 of the lower rear section 6 are formed of extruded magnesium metal with a side portion 66, a rear portion 68, a front portion 70, and a hook extension 72. As shown in Figure 5, the lower rear ladder section 6 telescopes upon the upper section 4 by having the hook extension 72 of the lower side channel 62 slidably enclose the lug portion 58 of the upper side channel 48. This telescoping arrangement of the parts is simple in construction and yet affords the high mechanical strength necessary to permit the ladder to be used without fear of structural failure either in a step ladder arrangement or in an extension arrangement.

The length of the combined upper and lower rear sections is controlled by telescoping the lower section 6 upon the upper section 4, and fixing the relative positions by the fastening means shown in Figure 5. This includes a lock pin 74 which passes through a hole 76 in the rear portion 68 of the channel member 62, and a similar hole 78 in the front portion 70 of the channel member. A flanged, tubular guide member 80 is riveted to the side 66 of the channel 62 to maintain the lock pin 74 in proper alignment. A coil spring 82 is compressed between the cotter pin 84, which passes through a hole in the lock pin 74, and the inside surface of the back portion 68 of the channel 62.

The lower end of each of the two channel members 62 of the lower ladder section 6 are provided with enlarged feet for added stability. These feet consist of a magnesium metal extruded outrigger 86 defined by a base portion 88, an upwardly sloping side portion 90, a top extension 92, and an upwardly extending base lug 94. The outrigger is fastened by rivets extending through portions 92 and 94 to the channel member 62. Rubber pads 96 are fixed, such as by rivets or cement, to the base 88 of the outrigger 86.

The combined upper and lower rear ladder sections are pivoted to the front step section upon T-shaped brackets 98, which are riveted both to the side 16 and rear 20 of the side rails 14, between the upper step 22 and next to the top step 24. The pivoting of the combined rear section upon the brackets 98 is upon rivets or suitable other fastening means which pass through the very top end 100 of the upper rear section, enabling the entire combined rear section to be pivoted a complete 180°.

The spreader portions 8 of the new ladders designed to hold the ladders in step ladder arrangement are best understood by reference to Figures 2 and 8. These units consist of spreader straps 102 pivoted at their rear end by rivets 104 to the side 52 of upper side channels 48.

This enables the spreader straps to be rotated in a propping position, such as shown in Figure 2, or into a non-use position, such as shown in Figures 3 and 6.

The unfastened end 106 of the spreader strap 102 contains a downwardly extending slot 108. A spreader lock bracket 110, over which the spreader strap slot 108 fits, is fastened by rivets 112 to the inner surface of the back portion 20 of the side rail 14. An L-shaped spreader lock toggle 114 is hinged by the rivet 116 to the spreader lock bracket 110. When the spreader strap 102 is positioned with the slot 108 over the spreader bracket 110, the lock toggle 114 can be raised so that its free end covers the end 106 of the spreader strap and locks it in position such as shown in Figure 1.

The spreader unit 8 is employed to fix the ladder sections in position for use as a step or stair well ladder. When the ladder is used in extension arrangement, the locking unit 10 is employed. This unit is made up of a pair of rings 118, which slide along the top rung of the upper rear section 4, and which carry an integral hook 120. When the ladder is used in extension arrangement, such as shown in Figure 3, the hook ends 120 of locking elements 10 are inserted through holes 122 suitably punched or drilled through the top surface 28 of top step 22.

Small rubber bumpers 124 are fastened by cement or rivets to the lower front face 70 of the channel member 62 of the lower ladder section 6. These rubber bumpers prevent the ladder from marring wall portions or the like against which the ladder is propped when it is used in extension arrangement.

The bucket rack portion 12 of the new ladders are best viewed in Figures 1 and 7. This ladder portion consists of a pair of side angle pieces 126, to which there is fastened, such as by rivets 128 the rack planking 130. A U-shaped rack mounting bracket 132 is fastened by rivets 134 to both the front portion 54 and rear portion 56 of the side channels 48 and the inner end 136 of the angle pieces 126 are hinged by rivets 138 to the brackets 132. A lug 140 is provided at the top of the brackets 132 to limit the upward movement of the inner end 136 of the bucket rack, and thus to hold the rack in a horizontal position when the ladder is used in step ladder arrangement.

Method of use

To use the new multi-way ladder as a step ladder, the lower rear section 6 is moved down on the upper section 4, so that the lock pins 74 are securely inserted in the lowest holes 60 of the upper back section 4. Then the two spreader straps 102 are swung toward the front section 2 and the combined rear section 4 and 6 is moved backward enough so that the notch 108 on the spreader straps 102 may be inserted over the spreader brackets 110. After the notched ends are fully inserted over the edge of these brackets, the lock toggles 114 are swung over the top of the straps 102 and locked in position. Finally, the bucket rack 12 is pushed down into a horizontal position until the ends 136 of the bucket rack about the lugs 140 of the bracket 132. The assembled ladder can now be used on an even surface as a step ladder, as illustrated in Figure 1.

To employ the new combination ladder as a stair well ladder, the unit is arranged by first placing it in the open position of a regular step ladder, as explained above, with the front section 2 faced downward on the floor. Then the lock pins 74 in the lower section 6 are pulled outwardly to disengage them from the top layer section 4, so that the lower rear section 6 may be moved along the upper section to the desired hole location, as required by the steepness of the stairs on which the ladder is to be placed. After it has been made certain that the lock pins 74 are fully engaged in the required holes 60 of the upper section 4, the ladder is set upright in the

desired position on the stairs, making sure that the front steps 24 of the front section 2 are horizontal. When so used, the ladder has the appearance shown in Figure 2.

To use the new unit as an extension ladder, the bucket rack 12 is folded into line with the upper rear section channel members 48. Then the spreader straps 102 are disengaged from the lock brackets 110 and the straps are folded either up or down into line with the upper rear section channel members 48. Next, the combined rear sections 4 and 6 are swung outward until the ladder can be laid horizontally on the ground. In this position, the hook ends 120 of the lock means 10 are inserted in the holes 122 of the top step 22. With the ladder sections locked in this extension arrangement, the ladder is adjusted in length by pulling out lock pin 74 and moving the lower section 6 along the upper section 4 until the desired length is obtained. Care should be taken to make sure that the lock pins 74 are then fully inserted into the mating holes 60 of the upper channel members 48.

With the ladder section so arranged and the length properly adjusted, the ladder is positioned against an upright surface, as shown in Fig. 3, with the front of front section 2 facing the climber.

The new unit can also be employed as a simple single section ladder by folding in the spreader means 8 and bucket rack 12, as explained above, and then swinging back the rear sections 4 and 6 against the front section, as shown in Figure 6. Because of the arrangement of the hinge brackets 98 on the front section 2, the new multi-way ladder can be employed, as shown in Figure 6, without danger of marring the surface against which the ladder is placed, since when so used the brackets 98 and the attached channel members 48 do not contact the wall or other surface against which the top step 22 rests. The ladder may be stored in a folded position such as shown in Figure 6, or in a step ladder arrangement such as shown in Figure 1.

I claim:

1. A combination step, stair well and extension ladder comprising a front step section which tapers outwardly from top to bottom, formed by a plurality of flat steps carried between two vertically extending side rails, an upper rear section formed by two side channel members with serrated cylindrical rungs fixed at spaced intervals between the members, a lower rear section formed by two side channel members which telescope with the channel members of said upper rear section with serrated cylindrical rungs fixed at spaced intervals therebetween, a bucket rack hinged upon the upper rear section near the top end thereof, a pair of brackets extending rearwardly from said front section between the top and next-to-top step, said upper rear section being pivoted at its top end to said brackets, a line of spaced-apart holes through the rear surface of each of said upper rear section channel members, spring-biased lock pins carried upon the top end of each of said lower rear section channel members which may be inserted through any one of said aligned holes to lock the lower rear section on said upper rear section to give a telescoped rear unit of desired length, spreader straps pivoted upon the side channels of said upper rear section, latch means carried upon said front section side rails for fastening said spreader straps to hold the ladder sections in a step ladder arrangement, a pair of hooks carried on the top rung of said upper rear section, and a pair of holes in the top step of said front section to receive the end of said hooks and fasten the ladder section in an extension ladder arrangement.

2. A combination step, stair well and extension ladder comprising a front step section which tapers outwardly from top to bottom, formed by a plurality of flat steps and a pair of side rails made of extruded U-shaped channels having front, side and back portions, with the open portion of said rails facing inwardly of the front ladder section, said flat steps being fixed by rivets to the front and rear portions of said side rails, a pair of rearwardly ex-

tending brackets carried upon said front section side rails at the back thereof between the top step and the next-to-top step, an upper rear ladder section formed by two side channel members with serrated cylindrical rungs fixed at spaced intervals therebetween, said upper rear section being pivoted by its upper ends to said brackets, a lower rear section formed by two side channel members with serrated cylindrical rungs fixed at spaced intervals therebetween, the side channels of said upper rear section having longitudinal lugs extending outwardly from the sides thereof and the side channel members of said lower rear section having outwardly extending semi-circular channel extensions thereon, the lower rear section telescoping onto the upper rear section by having said semi-circular extensions slidably enclose said lugs.

3. A combination ladder as claimed in claim 2 wherein the side channels of said upper rear section have a line of spaced apart holes through the rear surface thereof and said lower rear section carries spring-biased lock pins upon the top end, which may be inserted through any one of said aligned holes of the upper rear section to lock the lower rear section on said upper rear section to give a telescoped combined upper and lower rear section of desired length.

4. A combination step, stair well and extension ladder comprising a front step section formed by a plurality of flat steps carried between two vertically extending side rail members, an upper rear section formed by two side channel members with rungs fixed at spaced intervals between the members, a lower rear unit formed by two side channel members which telescope with the channel members of said upper rear section with rungs fixed at spaced intervals therebetween, a pair of brackets extending rearwardly from said front section below the top step thereof, said upper rear section being pivoted at the top end to said brackets, a line of spaced-apart holes through the rear surface of each of said upper rear section channel members, spring-biased lock pins carried upon the top end of each of said lower rear unit channel members which may be inserted through any one of said aligned holes to lock the lower rear unit on said upper rear section to give a telescoped rear assembly of desired length, spreader straps pivoted upon the side members of one of said ladder sections, latch means carried upon side members of the other of said ladder sections for fastening said spreader straps to hold the ladder sections in a step ladder arrangement, a pair of hooks carried on the top rung of said upper rear section, and a pair of holes in the top step of said front section to receive the ends of said hooks and fasten the ladder sections in an extension ladder arrangement.

5. A combination step, stair well and extension ladder comprising a front step section formed by a plurality of flat steps carried between two vertically extending side rail members, an upper rear section formed by two side channel members with rungs fixed at spaced intervals between the members, a lower rear unit formed by two side channel members which telescope with the channel members of said upper rear section with rungs fixed at spaced intervals therebetween, a pair of brackets extending rearwardly from said front section below the top step thereof, said upper rear section being pivoted at the top end to said brackets, a line of spaced-apart holes through the rear surface of each of said upper rear section channel members, spring-biased lock pins carried upon the top end of each of said lower rear unit channel members which may be inserted through any one of said aligned holes to lock the lower rear unit on said upper rear section to give a telescoped rear assembly of desired length, spreader straps pivoted upon the side members of one of said ladder sections, latch means carried upon side members of the other of said ladder sections for fastening said spreader straps to hold the ladder sections in a step ladder arrangement and hook means carried by said upper rear section for fixing said ladder sections in an extension ladder arrangement.

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