STEPLADDERS AND STRUCTURAL COMPONENTS THEREOF

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This invention relates to stepladders and structural components of ladders and is more particularly concerned with stepladders possessing the characteristics of structural and mechanical simplicity, light-weight, economy of manufacture and compactness for storage.

Field of Invention

There exists a real consumer demand for a stepladder providing structural simplicity, stability, minimal weight and compactness for storage and which does not include spreaders because of the attendant hazard of malfunction of spreader elements or collapse of a spreader retained ladder structure. Use of spreaders in ladders are also a problem because they contribute to increased bulk, multiplicity of manufactured units and difficulty in constructing the ladder from a folded to an open position. Further, ladder spreaders present various problems of design and economy in the manufacture of stepladders.

A solution to this situation is provided by the present invention which offers a stepladder without the necessity for spreader means.

Another problem attendant upon the manufacture and use of ladders in general, lies in achieving an attachment between the steps and side rails of ladders which will resist both torsional and direct forces. This problem is pronounced in the fabrication of ladders from extruded light metals wherein the side rails and steps are commonly formed from light weight channel members. A remedy for this situation is offered by the present invention in which a novel tread and uniting arrangement provides a stronger connection and more stable structure.

Still another difficulty encountered in the fabrication of stepladders is that of uniting the front and rear sections by means which will allow pivotal movement between these sections while enduring continuous strain and wear. A novel lug member provided by the present invention provides a solution for this problem.

Objects

A principal object of this invention is to provide new improvements in ladders. Further objects include: the decrease of material requirements for manufacture; provision for a ladder of structural simplicity; a decreased ease of manufacture as the result of the curtailment of the number of necessary structural units and assembly operations required; economic benefits resulting from the diminishing of assembly and material requirements; elimination of the possibility of mechanical malfunction present in stepladders utilizing spreader means; enhancement of stepladder storage characteristics; elimination of the difficulties presented by the setting up and folding of stepladders equipped with spreaders; provision of a strong and stable union between the steps and side rails of ladders in general and between the front and rear sections of stepladders, and enhancement of the tractive and cushioning support of ladders.

Other objects and further scope of applicability of the present invention will become apparent from the detailed description given hereafter. 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 be apparent to those skilled in the art from this detailed description.

General description

These objects are accomplished according to the present invention by forming a stepladder comprising a front section, a rear propping section and uniting means which serves to pivotally attach the front and rear sections in a manner whereby the upper ends of the front and rear section side rails abut upon each other and serve as the sole stop means for limiting the motion of front and rear sections about the point of pivotal attachment. In this fashion, the necessity for a spreader to retain the front and rear section in an angular relation is eliminated.

The pivotal attachment of the front and rear sections provides a stepladder structure which may assume a compact or folded position in which the side rails of the two sections are parallel, or the sections may be spread apart to form an acute angle. When the sections are spread in order to place the ladder in a stable, independent position for use, the upper ends of the rear section side rails, which are angular, abut upon the rear edges of the upper ends of the front section side rails, thereby acting as a stop means to limit the rotation of the front and rear sections about the point of pivotal attachment and eliminating the necessity for manipulation or adjustment of spreader means.

The uniting member by which the front and rear sections are connected is fashioned in the form of a lug with a projecting lateral flange which may be attached to the rear edge of the front section side rails. The upper ends of the rear section side rails are pivotally attached to the lug member which extends rearwardly from the front section side rails and the forward portion of the lug plate is fixed to the lateral surface of the front section side rail.

Brace means are provided for the front and rear sections. In the preferred form the front section is braced by means of elongate elements connecting the front edge of the front section side rails with the front edge of the steps and the rear section is also reinforced by means of two intersecting elongate elements.

Cushioning and traction elements which are provided at the floor engaging surface of each side rail are described in detail hereafter.

In the preferred form, the ladders described herein are formed from light weight metal components such as extruded channel members.

Detailed description

A more complete understanding of the new devices of this invention may be had by reference to the accompanying drawings in which:

FIGURE 1 is a perspective view of a preferred form of stepladder which is set up on position for use;

FIGURE 2 is a side view of the same ladder in a folded position;

FIGURE 3 is a fragmentary, enlarged perspective view of an end portion of a step of the ladder;

FIGURE 4 is an enlarged sectional view of the lug member and side rails taken along line 4—4 of FIGURE 2;

FIGURE 5 is an enlarged, fragmentary perspective view of the step and side rail;

FIGURE 6 is an end view of a lug member of the ladder;

FIGURE 7 is a fragmentary side view of the foot member and side rail, and

FIGURE 8 is a fragmentary, sectional, end view of the bottom of a side rail and the attached foot member.

Referring in detail to the drawings, the stepladder basically comprises a front section 2 which includes two
side rails 4 with a plurality of space apart steps 6 and a top tread or platform 8 fixed between the side rails 4. Attached to the upper ends of the front side rails 4 are lug members 10, described in more detail hereinafter, which are in turn pivotally attached at 12 to the side rails 14 of the rear propelling section. The rear section side rails 14 are provided with angular upper ends 16 which abut upon the rear edge of the upper ends of the front section side rails when the ladder structure is in a horizontal position as illustrated in FIGURE 1.

The rear section side rails 14 are also provided with two or more brace members 18 which serve to hold the side rails 14 in a spaced-apart relation. In a preferred form wherein the side rails 14 are channel members comprising a central web and two spaced-apart laterally projecting flanges, one of the brace members 18 is attached at one end to the front flange of the left rear section side rail 14 near the top thereof and at the other end to the front flange of the right rear section side rail 14 near the bottom thereof. The second brace member 18 is attached at one end to the front flange of the right section side rail 14 near the top thereof and at the other end to the front flange of the left rear section side rail near the bottom thereof. The two brace elements are then attached, such as by rivets, to one another at their point of intersection. As shown in FIGURE 1, a second pair of brace members 19 may then be similarly attached to the rear flanges of the left and right rear section side rails 14.

Additional brace elements may also be provided in order to enhance the stability of the front section 2. The brace elements 20 may be attached at one end to the front edge of the side rail 4 at a point below the juncture of the side rail 4 and the bottom step 6, and at the other end to the front edge of the step 6 equal to the distance from this juncture to the point of attachment of the other end of the brace element to the side rail 4.

The step ladder may be converted to a compact folded form for storage in which the front and rear sections are parallel as shown in FIGURE 2, by rotating the rear section side rails 14 about their point of pivotal attachment 12, toward the front section side rails 4. A preferred form of step for use in the invention and in ladders in general is illustrated by FIGURES 3 and 5. The step comprises a channel member comprising a central web 22 and spaced-apart lateral projections 24 which are formed integrally with the web 6 and extend at an angle thereto. If desired, portions of the web 22 may be made to project beyond the flanges 24 as shown at 26 in FIGURE 5, by setting off the point of juncture of the flanges 24 with the central web 6. The end portions of the web 22 are provided with recesses 25 as shown in FIGURE 3, whereby the side rails, as shown by phantom lines in FIGURE 3, may be inserted in the recesses 25 and attached to the lateral flanges 24 of the step by rivets 32 which extend through holes 30.

To enhance the tractive qualities of steps 6, their upper surfaces are provided with serrations 38 at the front and rear edges.

The lug member used for pivotally uniting the front and rear ladder sections is illustrated by FIGURES 4 and 6, and comprises a flat plate 10 and a laterally projecting flange 44 formed integrally therewith. In a preferred form the lug member is provided with a groove 42 along the point of juncture of the flange 44 and the plate 10 on the side of the flange which engages the front side rail 4, as shown in FIGURE 4. The front side rail is attached to the plate 10 and the flange 44 by means such as bolts or rivets 34 and 36. The rear end of plate 10 is attached to rear side rail 14 by pivotal means 12.

To prevent marring and provide a tractive support surface for the ladder structure, foot elements illustrated by FIGURES 7 and 8 are provided. For descriptive purposes the foot element is depicted in conjunction with front side rail 4. The foot elements comprise an L-shaped member 46 which is attached to the side rail 4 by rivet 52 and to secure a stronger attachment a groove 54 is provided adjacent to the vertical projection of the foot element. The bottom of the side rail 4.

In the bottom surface of the horizontal projection of member 46, a resilient element 48 made of rubber or a similar substance, is inserted in the recess 56 and secured there by a rivet or similar means 50.

Having provided a complete description of the invention in such manner as to distinguish it from other inventions and from what is old, and having provided a description of the best mode contemplated of carrying out the invention, the scope of patent protection to be granted the invention is defined by the following claims.

1. A step ladder comprising a front section including two side rails each comprising a central web, two spaced-apart lateral projections formed integrally with said web which parallel the longitudinal axis of the web and are normal to the web, means for connecting said two side rails in spaced-apart relation comprising a step including a central web, two spaced apart lateral projections formed integrally with said web which parallel the longitudinal axis of the web and project at an angle to the web, said central web being provided at each end with recesses spaced-apart a distance equal to the distance between said spaced-apart lateral projections of said side rails so that the lateral projections of the side rails may be inserted within the recesses provided in the central web of the step and attached to the lateral projections of the step, additional steps similarly fixed in a spaced-apart relation between said two side rails, a rear propelling section comprising two side rails with angular upper ends, brace means for holding said rear section side rails in spaced-apart relation, means for pivotally attaching said rear section is said front section comprising a lug member carried near the top of one of the side rails of the front section and extending rearwardly from the top of the front and rear section side rails so that the rear section side rails may be moved about the point of pivotal attachment to engage the angular upper ends of the rear section side rails with the rear edges of the front section side rails throughout a substantially extent of the angular surface and collinearly as the sole step means for the rear propelling section.

2. In a ladder having side rails comprising a central web and spaced-apart lateral projections formed integrally with the web, a step comprising a central web, two spaced-apart lateral projections formed integrally with said web which parallel the longitudinal axis of the web and project at an angle to the web, said central web being provided at each end with recesses spaced-apart a distance equal to the distance between said spaced-apart lateral projections of said side rails so that the lateral projections of the side rails may be inserted within the recesses provided in the end of the central web of the step and attached to the lateral projections of the step.

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CERTIFICATION OF CORRECTION

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It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 36, for "is" read -- to --.

Signed and sealed this 24th day of April 1962.

(SEAL)
Attest:

ESTON G. JOHNSON
Attesting Officer

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Commissioner of Patents