

June 20, 1961

P. N. HOWARD

2,989,141

LADDER

Filed Nov. 24, 1959

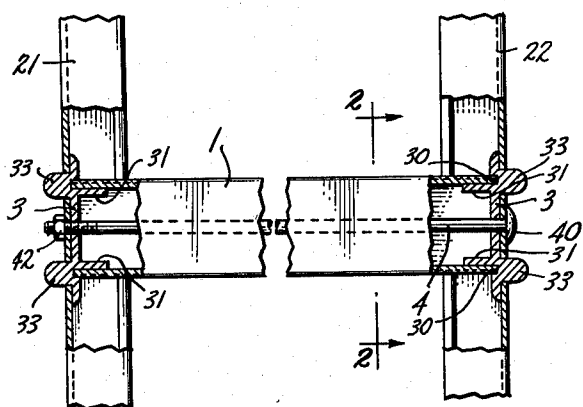


Fig. 1.

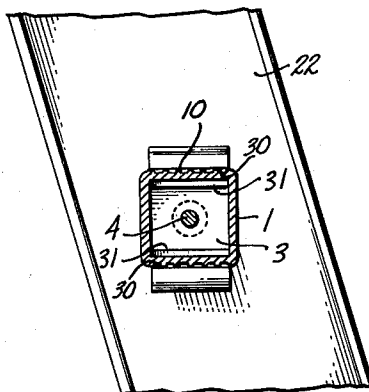


Fig. 2.

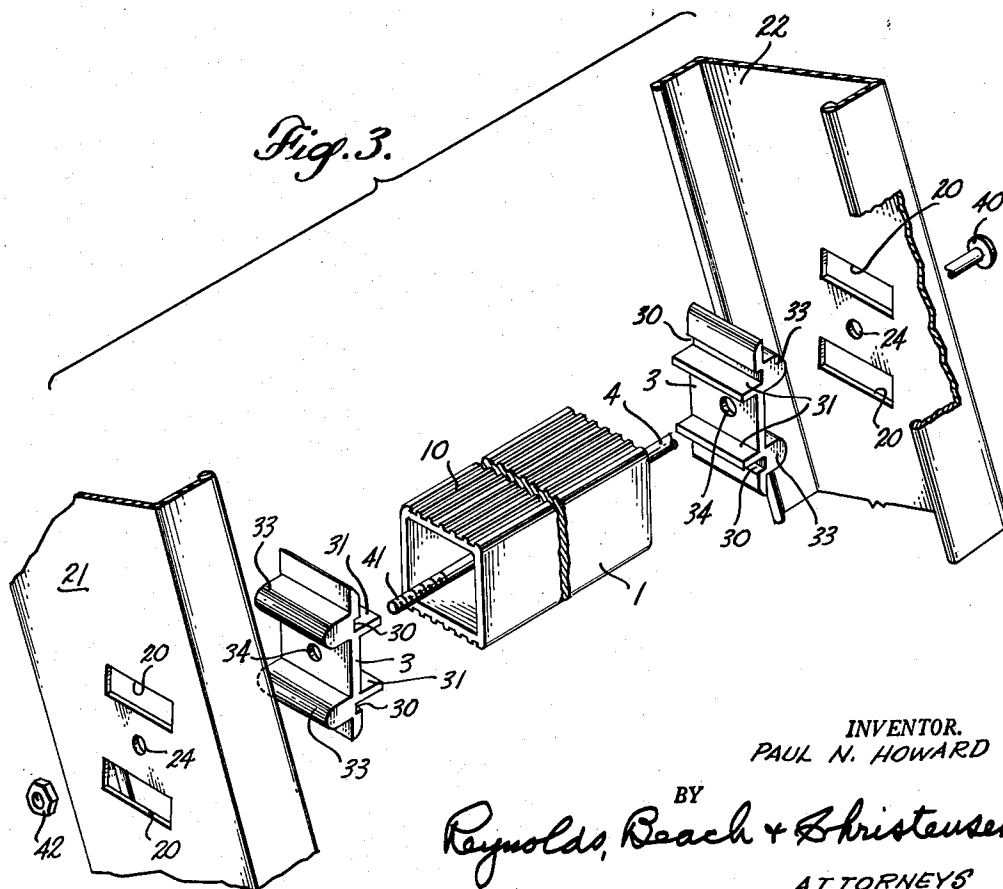


Fig. 3.

INVENTOR.
PAUL N. HOWARD

BY
Reynolds, Beach & Christensen
ATTORNEYS

1

2,989,141
LADDER

Paul N. Howard, 1227 38th Ave. N., Seattle, Wash.
Filed Nov. 24, 1959, Ser. No. 855,203
4 Claims. (Cl. 182-216)

This application relates to a metal ladder made, for instance, of elements of aluminum or magnesium, and in particular is concerned with the means for interconnecting the side rails and the rungs in such a ladder. The particular style of ladder, that is, whether it be a step-ladder, a straight ladder or an extension ladder, is immaterial, and the same principles will apply to each thereof.

Metal ladders as heretofore made have usually had the rungs securely and permanently connected to the side rails, both for the sake of safety and rigidity. When a rung bends or breaks, as occasionally it does, for the working of the relatively brittle metal to effect its securement to the side rails sometimes causes imperceptible fractures that give way under loading, it is virtually impossible to replace the broken or damaged rung, and an expensive ladder, because of a single broken rung, becomes unusable. It is the primary object of this invention to provide a ladder construction for ladders of the nature indicated in which the several rungs are not permanently connected but are capable of being disconnected and removed, and a sound one substituted for a broken one, yet without any impairment of the rigidity nor the safety of the ladder before or after the replacement.

Rungs, in straight or extension ladders in particular, have often been of round tubular cross-section, and hence not comfortable to the user if he must stand for an extended period upon the rungs. A flat tread is preferable and is intended to be used in the ladder of this invention. However, a flat tread is only comfortable if, when used, the tread portion is disposed level, although the ladder itself is inclined. Moreover, a ladder has a minimum safe inclination, and its maximum safe inclination is not greatly different, approximately one foot away from the bottom of a wall for each four feet it extends up the wall. It is a further object of this invention to provide a rung in which the tread surface is planar and so constructed that at the minimum safe angle of inclination the tread surface will be level. This will tend to discourage use of the ladder at any lesser inclination, and so contribute to the safeness of its use.

It is, of course, an object of the invention to provide a ladder construction of the character indicated which shall be relatively inexpensive as compared with other metal ladders, and of simple construction. More particularly, it is an object to employ metal plates which can be cut off from extruded metal lengths, as the supporting and locating elements intermediate the side rails and the rungs, and serving to hold the rungs against rotation, to the end of simplifying the construction and assembly of the ladder, and reducing its cost.

In the drawings the invention is shown incorporated in a ladder made in accordance with the principles of this invention, and according to a construction now preferred by me.

FIGURE 1 is an elevational view of a rung and portions of two side rails of the ladder, with parts broken away and shown in section, with parts in the assembled relationship, and FIGURE 2 is a transverse sectional view substantially at the line 2-2 of FIGURE 1, showing the rung and its connection to one side rail.

FIGURE 3 is an exploded isometric view of the several components associated with each rung and the side rails.

The ladder includes two side rails, 21 and 22, which may be of any suitable cross-section, and are shown as of shallow channel section. They may be formed as

2

extrusions of aluminum or magnesium, and so will be inexpensive, yet strong and light. The rungs 1 are preferably of rectangular tubular construction, one corrugated surface of which, designated 10, is intended to be the tread surface, and which should be horizontal when the ladder is at the proper angle of inclination, as shown best in FIGURE 2. While the rung is described as tubular, it will be clear that it might be of solid cross-section intermediate its ends, but its ends at least should be socketed for a purpose which will appear shortly, and each socket should have upper and lower straight side walls.

The rungs are not directly connected to the side rails 21, 22. Instead, they are supported through the intermediate of an adapter plate 3. Such adapter plates are conveniently short linear lengths of metal extrusions, hence they too are inexpensive. This adapter plate, on one of its surfaces, by virtue of its straight-line shape fit snugly within the socket at the end of the rung, and against the straight-line interior wall of the socket, and as a convenient means of so doing, in the preferred form the adapter plate is formed with two straight outstanding flanges 31 spaced apart to fit, the one just beneath the inner face of the upper tread surface 10, and the other within the lower straight side of the rectangular-section rung. Each flange is of a length to engage the opposite side rail surfaces at the ends of the side which it engages fully. Desirably the adapter plates are also grooved along straight lines, as indicated at 30, in the same face, and at the outer base of each flange 31, these grooves 30 being of a depth to permit the ends of the rungs to contact the inner surfaces of the side rails 21, 22 when the adapter plate is in place on each such side rail.

To engage each adapter plate 3 with its side rail, the side rails are formed with apertures 20 and the adapter plate with straight-line flanges 33 outstanding near the top and bottom of its face opposite that which carries the flanges 31, the flanges 33 being of a size and shape and the apertures 20 being so oriented, that the flanges 33 will fit snugly within the apertures 20, and when so fitted will orient the tread surface 10 correctly, having in mind the minimum safe angle of inclination of the ladder. It will be observed that when the plates 3 are in this position and the ends of the rungs 1 are received within the grooves 30, the ends of the rungs contact the inner surface of the side rails. If the ladder side rails should spread outwardly at the bottom the ends of the rungs may be similarly cut, so that such contact is maintained.

It is necessary of course to retain all parts in the relationship described. To do this a tie rod 4 is employed, which is headed at 40 at one end and threaded at 41 at its opposite end. Each tie rod is of a length to extend through small apertures 24 in the side rails intermediate the apertures 20, and so through the hollow rungs and through the adapter plates, the latter of which have apertures 34, and out at the opposite side rail. A nut 42 of suitable nature threads upon the threaded end 41 of the tie rod as it protrudes from the side rail opposite that which the head 40 engages, and so when the nut 42 is tightened the side rails are held securely against spreading and the rungs are fully supported upon the adapter plates 3, specifically upon one of their flanges 31, and the adapter plates, in turn, are well supported by the engagement of their flanges 33 in the apertures 20 of the side rails.

Should a rung bend or break it is only necessary to release the nut of that rung and of a few rungs at each side of the same, above and below, and so to spring the side rails sufficiently to enable removal of the bent or broken rung. A new rung can be inserted in the same way and readily secured in place by passing the rod 40 through it and again securing the nut 42. Nevertheless,

3

rungs above and below a defective rung will usually hold the defective one properly assembled and safe, with the weight on the rung transmitted through the projections 31, 33 to the side rails, even if the corresponding tie rod were broken.

I claim as my invention:

1. A ladder comprising spaced metal side rails, metal rungs of a length to extend between the inner surfaces of said side rails, and having sockets within each end formed with straight-upper and lower walls, linear adapter plates applied to the inner surface of each side rail at rung intervals, and each having straight-line flanges projecting from their rail-contacting faces, the side rails being linearly apertured to snugly receive said flanges, and thereby to support the adapter plates, and each adapter plate having straight-line flanges at its opposite face of a shape to fit snugly within the socket at the end of a corresponding rung, in contact with the straight upper and lower walls thereof, for support of the rung, and tension means extending between the side rails in the vicinity of the several rungs, and removably secured in place, to maintain the adapter plates, side rails, and rungs in engagement.

2. A ladder as in claim 1, wherein the rungs are planar upon their tread surfaces, and the adapter plates are so oriented with respect to the side rails and such tread surfaces as to present the tread surfaces in level disposition when the side rails are at a safe angle of inclination, in use.

3. A ladder comprising spaced metal side rails, tubular

4

metal rungs of substantially square cross-section, one side whereof constitutes a tread surface, and of a length to extend between the inner surfaces of said side rails, linear adapter plates applied to the inner surface of each side rail at rung intervals, each adapter plate having integral straight-line flanges adjacent its upper and lower edges, at its rail-contacting face, and the side rails being apertured to snugly receive said flanges, and thus to support the adapter plates, each adapter plate also having integral straight-line flanges projecting adjacent its upper and lower edges, from its opposite face, spaced to engage snugly within the tread surface of a rung and the rung's lower surface, respectively, to support the rung, a tie-rod extending through each rung, its adapter plates, and the side rails, and headed at one end, and a nut threaded on its opposite end, cooperating with its head to maintain the several parts in engagement.

4. A ladder as in claim 3, wherein each adapter plate is grooved, outwardly of the flanges at its rung-engaging face, to a depth equal to its thickness, to receive the upper and lower end edges of the rung and to enable the other two end edges thereof to contact the inner surface of the side rail.

References Cited in the file of this patent

UNITED STATES PATENTS

1,649,206	Yawman	Nov. 15, 1927
2,727,672	De Luca	Dec. 20, 1955