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R. L. WERNER ET AL

3,354,987

LADDERS

Filed Sept. 16, 1965

2 Sheets-Sheet 1

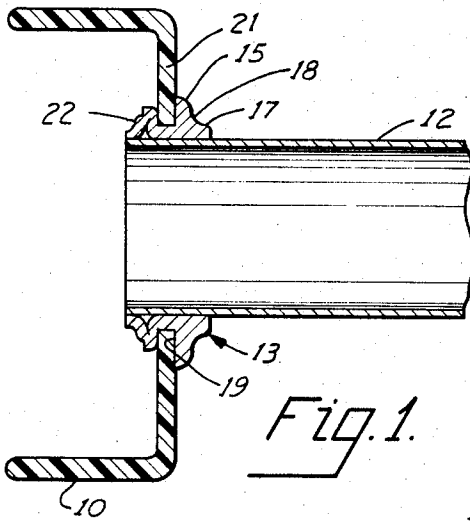


Fig. 1.

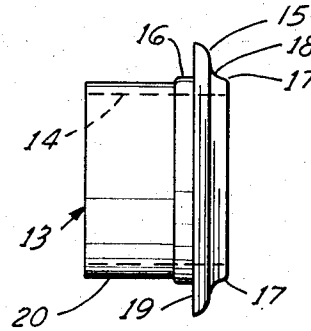


Fig. 2.

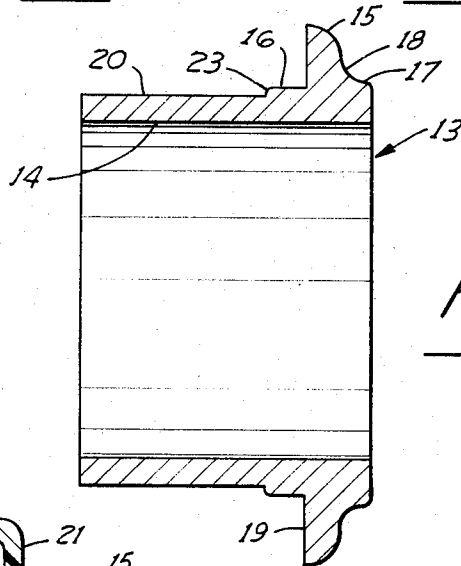


Fig. 3.

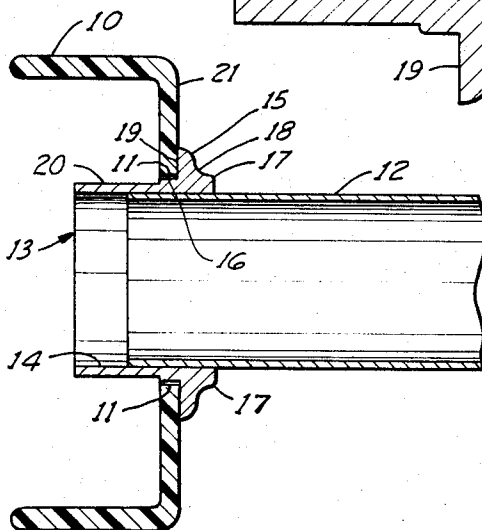


Fig. 4

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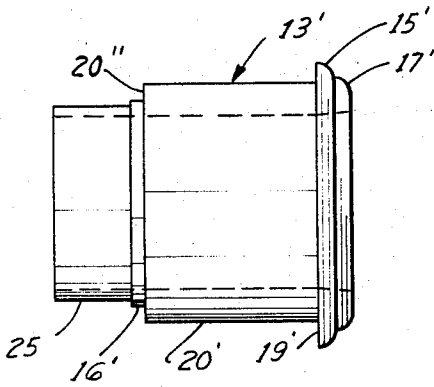


Fig. 5.

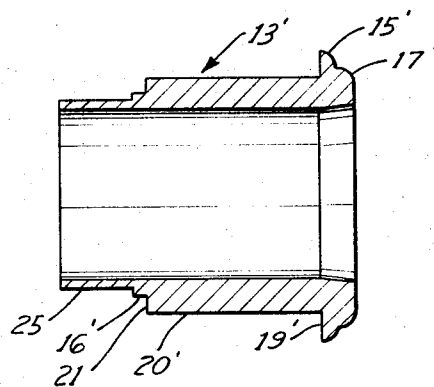


Fig. 6.

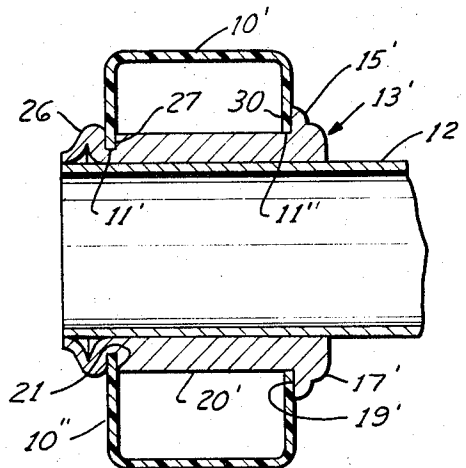


Fig. 7.

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3,354,987
LADDERS

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4 Claims. (Cl. 182-228)

This invention relates to ladders and relates more particularly to an improved method of making the same.

The particular improvement in this invention is the provision of ferrules for use in ladders with aluminum rungs and channel-type or tubular side rails, preferably rails made of fiber glass or like material, which ferrule is adapted to have a portion or portions adapted to reinforce the plastic side rails when compressive force is exerted on the ferrules and associated rungs in securing the rungs to the side rails or in use and said ferrules according to the invention are preformed with an annulus, according to the invention.

An object of this invention is therefore to provide a ladder of novel construction which permits the use of lightweight materials such as fiber glass for the rails of a ladder without any weakening of the same in assembly or in use.

Another object of our invention is to provide an improved ladder joint construction and method of manufacture.

A still further object of our invention is to provide a ladder joint construction for use with fiber glass and the like ladders having an ease of assembly and improved strength in use.

These and other objects of our invention will become more readily apparent from a preview of the appended description in which reference will be made to the accompanying drawings, in which:

FIGURE 1 is a fragmentary view, partly in section, showing a portion of an open type channel side ladder rail with the improved rung and ferrule construction of our invention in assembled relation therewith;

FIGURE 2 is a plan view of the improved preformed ferrule of our invention;

FIGURE 3 is an enlarged sectional view of the ferrule of FIGURE 2;

FIGURE 4 is a view similar to FIGURE 1 showing the preformed ferrule of FIGURES 2 and 3 disposed on a rung portion overhanging the rung prior to forming an outer annulus on the ferrule;

FIGURE 5 is a plan view of a modification of the ferrule of our invention, said ferrule adapted to be used in a joint construction joining the ladder rungs to box like or tubular ladder rails;

FIGURE 6 is a sectional view of the ferrule of FIGURE 5;

FIGURE 7 is a fragmentary view, partly in section, showing the ferrule of FIGURES 5 and 6 in assembled relation with a tubular ladder rail and a ladder rung, the assembly being rotated 90° from normal use for clarification.

To produce the completed joint assembly for ladders shown in FIGURE 1, channel shaped ladder side rails 10 of aluminum, molded fiber glass, or other lightweight material are first provided with spaced openings 11 in the web thereof conformed in shape to the ladder rungs 12 and end ferrules 13 to be received thereby. As shown herein, the openings 11 are circular in form, the rungs 12 are tubular, circular in cross-section, preferably serrated and of aluminum or other metallic material. The ferrules 13 are also tubular having a bore 14 of slightly greater diameter than the rungs wherefor the same may be

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tightly press fitted or telescoped thereover, and are of aluminum or other metallic material.

The ferrules 13 are provided, prior to their assembly with the rung, with an outwardly curved annulus 15 of greatest depth intermediate a stepped portion 16 and an end annulus 17 of lesser depth. The upwardly curved annulus 17 merges with the annulus 15 by means of a curved outwardly extending portion 18. The annulus 15 is provided with a straight vertically disposed inner face 19 which is disposed perpendicular to the upper face of the step 16. The annular step 16 is of greater radial cross section than the remaining tubular portion 20 of the ferrule, and portion 20 is the portion of the least cross-section; the step is adapted to be of the same width as the cross-section of the web 21 of the rail being adapted to be disposed within the opening to strengthen and reinforce the same during assembly and in use.

As shown in FIGURES 1 and 4, each of the ferrules with its preformed annulus 15 is telescoped over an end of its associated rung 12 and preferably overhangs the same, the end 20 protruding outwardly therefrom; the shoulder or stepped portion 16 is peripherally enclosed by those portions of the web 21 surrounding the openings 11 in the rails 10 and the protruding portions 20 and telescoped end of the rung 12 projects outwardly of the said rail webs. The protruding portions are adapted by mechanical devices or punch press operations, as for example, set forth in co-pending application for U.S. Letters Patent, Ser. No. 571,249 filed Aug. 9, 1966, to be formed by compression into an outer annulus 22 which, as shown in FIGURE 1, surrounds the outer walls of the rail web 20 surrounding the opening 11.

As noted in FIGURES 1 to 4 of drawings, the annulus 15 is, as shown, of greater diameter than the annulus 22 formed as above described wherefor considerable support is provided the web 21 of the fiber glass or other lightweight material rail sides during compressive stress exerted in forming the annulus 22 and securing the ferrule to the rail. Said annulus 22 further reduces radial stress and bearing stress in said side rail.

The step 16 is further preferably joined to the body portion 20 as best illustrated in FIGURES 2 and 3, by a rounded or tapered edge 23 wherefor the material of the ferrule portion 20 upon compression readily flows over the same to form the annulus 22 and secures the ferrule to the rails 10.

In the form of our invention shown in FIGURES 5 to 7 inclusive, adapted for use with tubular or box-like rail members, the tubular ferrule 13', preferably formed of aluminum or other metallic material, is provided with a preformed annulus 15', a preformed annulus 17' joined thereto and surrounding the same and of relatively lesser diameter than the annulus 15'; the said pair of annuli are disposed at the inner edge of the ferrule and said annuli are of relatively greater radial cross-section than other portions of the tubular ferrule 13'. The annulus 15' is provided, similarly to annulus 15 in the form of FIGURES 1 to 4 inclusive, with a flat outer face 19'; disposed at right angles to the tubular body portion 20' of the ferrule and adapted to abut the outer wall portions 30 surrounding the openings 11' in the inner wall of the box like and, as illustrated rectangular, tubular rails 10' through which the body portion 20' of the ferrule, enclosing an outer end of the rung 12', projects. It will be noted that an annulus forming a step or shoulder 16' is provided intermediate an outermost portion 25 of the ferrule of reduced diameter, which, when the ferrule is protruded through an opening 11'' in the opposite side of the tubular rail lies beneath the wall portions of the rail surrounding such opening and the body portion 20' acts as a spacer disposed between the rail side 10'' and the annulus 15'.

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The shoulder or annulus 16' is thus circumscribed by the walls of the rail side surrounding the opening 11' in the tubular rail and the said annulus 16' strengthens the perforated fiber glass side 10' during the compressive stress exerted on the protruding end 25 of the ferrule in pressing the same against the outer surfaces surrounding said opening and forming the annulus 26 thereabout, as shown in FIGURE 7. The tubular end 25 of the ferrule preferably overhangs the rung prior to its assembly with the rail, in a similar manner to the body portion 20 in the form of FIGURES 1 to 5. It will be noted that the forward edge 20'' of the portion 20 in this later embodiment abuts the inner wall surfaces 27 surrounding the opening 11' and, together with annulus 15', acts as back up reinforcement means during the securing of the ferrule and rung to the rails.

It will further be noted that the opening 11'' is preferably larger than the opening 11' and that the annulus 15' is greater than the annulus 26.

Although we have claimed our invention in connection with certain preferred embodiments, we are aware that numerous and extensive departures may be made herein, as for example, by using oval rather than circular forms, etc., without however, departing from the spirit of this invention or the scope of the appended claims.

What we claim is:

1. A joint for a ladder rail having a rung opening in said rail, comprising a rung, a tubular ferrule, said ferrule having a tubular body portion including a substantially peripherally disposed preformed annulus of predetermined relatively greater radial extent than the remainder of said body portion and extending radially outwardly thereof, a shoulder portion, an end portion of lesser diameter than said shoulder portion projecting outwardly of said rail opening, the said preformed annulus abutting substantial portions of one side of the said rail surrounding the rung opening, the said shoulder portion of the ferrule closely fitted within the said opening and reinforcing portions of the rail surrounding the same, the end portion formed into a second annulus of relatively lesser circumference than said preformed annulus compressively engaging portions peripherally surrounding the rung opening on an opposite side of said rail, the said preformed annulus and shoulder affording support both axially and radially.

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2. A ladder as claimed in claim 1 wherein the side rail is formed of fiber glass and the ferrule of lightweight metal.

3. A ladder construction comprising a tubular side rail provided with opposed coaxial openings, one of said openings being of greater diameter than said other opening, a rung having an end extending through said openings and projecting beyond the outer said opening, a rail reinforcing tubular ferrule having a radially extending peripheral flange of greater diameter than the larger of said openings engaging side walls of the rail surrounding said larger opening, a body portion of relatively lesser radial extent than said peripheral flange in surface engagement with the rung end projected through the larger of said openings and having an end in abutting relation with the inner surfaces of the side walls of the rail surrounding said smaller opening, said body portion having an intermediate annular portion lying within said second opening flush with and reinforcing the rail edge-ports surrounding said opening and having an annulus compressively engaged with portions of the outer surface of the rail surrounding said smaller opening.

4. A ladder construction according to claim 3 characterized by the rails being formed of fiber glass and the flange reinforcing the walls of one side of the tubular rail and the body portion of the ferrule abutting walls on an opposite side of the rail reinforcing said walls, wherefor the sides of each of the opposite walls of the tubular rail are reinforced in use.

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