Oct. 17, 1961 H. G. ARNOLD 3,004,625

LADDER

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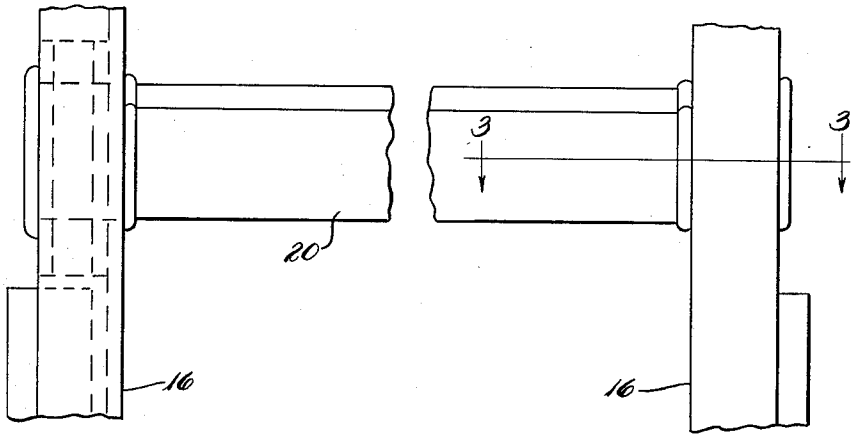
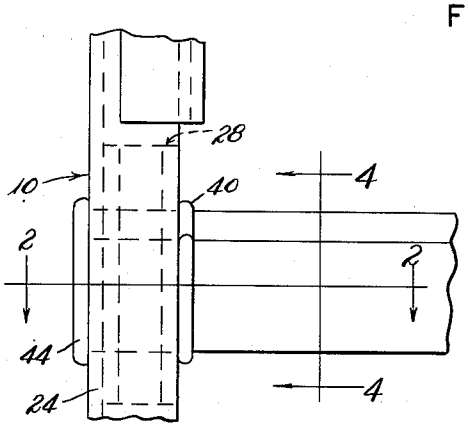
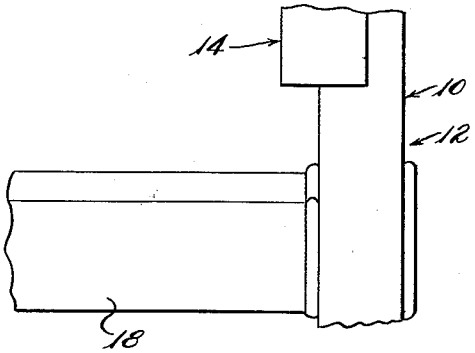


FIG. 1





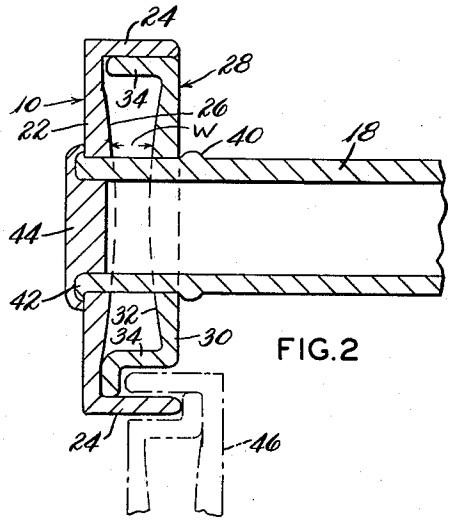


FIG. 2

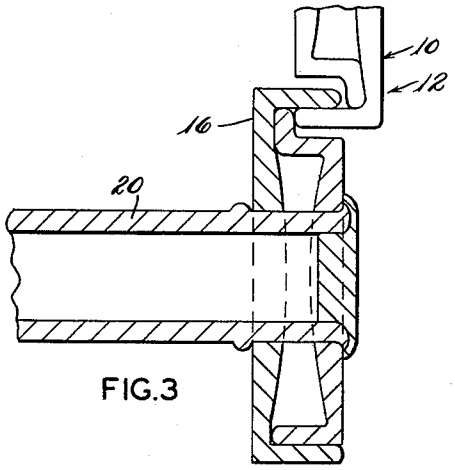


FIG. 3

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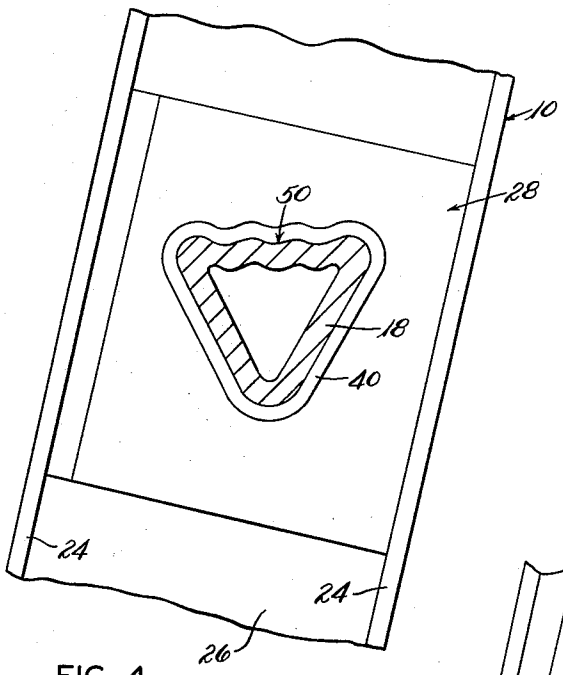


FIG. 4

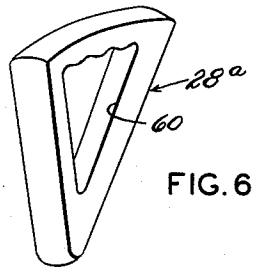


FIG. 6

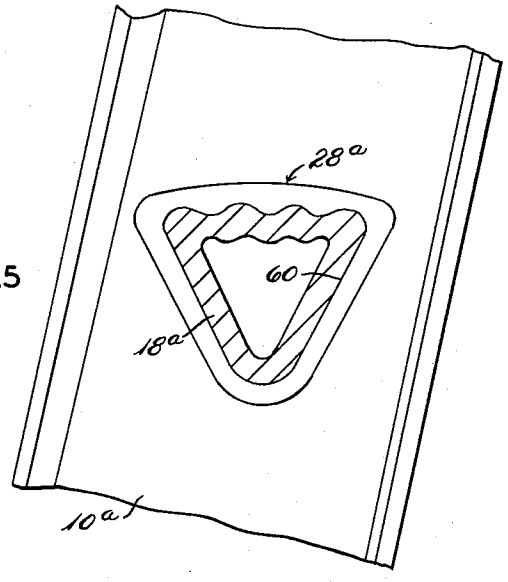


FIG. 5

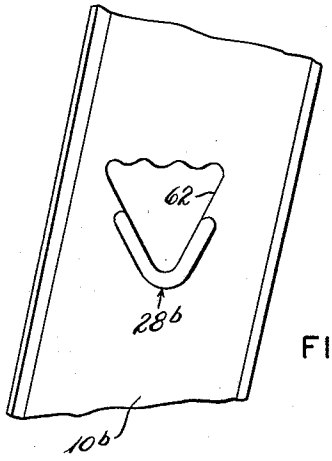


FIG. 7

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LADDER

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2 Claims. (Cl. 182—228)

This invention relates to ladders, and is more particularly concerned with metal or similar ladders and with the construction of and manner of securing rungs to the side rails thereof.

It is the general object of the invention to provide an improved, relatively lightweight but strong and durable ladder made from channel shaped side rails and substantially tubular rungs.

Another object of the invention is to provide a ladder of the character described made from aluminum alloy extrusions.

Another object of the invention is the provision of a tubular rung for a ladder, the rung having at least one flat side which is inclined to the plane of the side rails of the ladder so that the flat side of the rung will be substantially horizontal when the side rails are inclined to normal ladder climbing position.

Another object of the invention is the provision of a ladder formed from tubular rungs and channel-like side rails and wherein improved means are provided for securing the ends of the rungs to the side rails in a particularly strong and load-bearing relation therewith.

Another object of the invention is the provision of a ladder such as already defined but capable of being made in several sections slidable on each other to provide an extension ladder.

The foregoing objects of the invention, and other objects which will become apparent as the description proceeds, are achieved by the provision of the combination in a ladder of side rails of a channel shape in cross section, a plurality of rungs each having a hollow tubular shape in cross section with at least one flat side, a pad assisting in securing each rung end to a side rail, each pad being a short section of channel shape secured to and fitting between the side flanges of each channel-shaped side rail in oppositely facing positions so that the bases of the channel sections of each side rail and pad are spaced apart, each rung end extending through aligned mating holes in the side rail and pad, means on each rung to abut against one side of the combined pad and side rail, the extreme end of each rung being pressed over against the other side of the combined pad and side rail, each rung being positioned with its flat side uppermost and horizontal to provide a step surface when the side rails are in a normal inclined position of use. A plug may be provided to close the end of each rung, and each pad may have one of its side flanges offset from the adjacent side flange of the side rail to allow sliding fit with a similarly formed portion of another ladder section.

For a better understanding of the invention reference should be had to the accompanying drawings wherein

FIG. 1 is a front elevation, partly broken away, of a two-section, extension-type ladder incorporating the principles of the invention;

FIG. 2 is a cross sectional view, taken substantially on line 2—2 of FIG. 1 and better illustrating the manner of securing the rungs to the side rails;

FIG. 3 is a cross sectional view taken substantially on line 3—3 of FIG. 1, again illustrating the manner of securing a rung end to the side rail, and also illustrating the sliding interfit between the ladder sections;

FIG. 4 is a sectional view taken substantially on line 4—4 of FIG. 1 and better illustrating the cross sectional shape of a rung and specifically showing the horizontal

positioning of a flat surface of the rung when the side rails of the ladder are inclined to normal ladder use position;

FIG. 5 is a view, similar to FIG. 4, of a modification of the ladder of the invention;

FIG. 6 is a perspective view of the pad shown in FIG. 5; and

FIG. 7 is a view, similar to FIG. 4, of a further modification of the invention.

Referring to the drawings, the numeral 10 indicates generally a pair of side rails of a lower section 12 of an extension type ladder having an upper section 14 slidably mounted upon the lower section 12, the upper section 14 having side rails 16. The side rails 10 are joined with rungs 18, and the side rails 16 by rungs 20.

Looking now at FIG. 2 for a better understanding of the details of the invention, each side rail 10 is made of channel shape as illustrated including a base portion 22 and side flanges 24. The outside of the base 22 is generally made flat in the manner shown whereas the inside of the base 26 is preferably crowned, to be thickest at its center to thereby increase the strength and load bearing characteristics of the side rail.

Each side rail 10 is preferably made in the form of an aluminum or an aluminum alloy extrusion. However, the side rails 10 can be made from combinations of fiberglass and resin, and it is likewise possible to utilize combinations of an aluminum alloy extrusion with a fiberglass and resin cover therefor.

Cooperating with each side rail 10 are a plurality of pads 28 each formed of a relatively short, substantially square section of channel shape having a flat base portion 30, the inside of the base being preferably crowned as at 32 for increased strength, and having side flanges 34. Each pad 28 has its flanges 34 of a dimension to fit between the flanges 24 of the side rail 10, but with the bases of the oppositely facing channel sections being spaced apart a distance W to give a particularly excellent, spaced, double bearing load distribution between the rung 18 and the side rail 10.

Each pad 28 is suitably secured in the position shown in FIG. 2, and this can be accomplished by brazing or welding the pad 28 in position, usually between the flanges 24 and 34.

The pad 28 and side rail 10 are provided with aligned holes therethrough for the reception of the end of the rung 18, the holes being complementary to or in mating relation with the cross sectional contour of the rung 18 in a manner that will be understood. If the rung 18 is formed with a triangular cross section, as best seen in FIG. 4, the holes in the pad 28 and side rail 10 will be similarly shaped and will slidably receive the end of the rung 18.

Each rung 18 is formed with suitable means, such as a rib 40 spaced from the end of the rung which rib engages with the flat base of the pad 28, and the extreme end of each rung 18 is pressed, rolled, or otherwise deformed over against the flat base 22 of the side rail 10 to draw the rib 40 tightly against the pad 28 and to very effectively secure the end of the rung 18 to the side rail and pad. If desired, although not normally necessary, the rung can be brazed or welded in position. A plug 44 is generally employed to close the end of the rung, this plug 44 being suitably pressed, rolled, brazed, or welded in position around the roller over end 42 of the rung 18.

Before leaving the showing of FIG. 2 will be recognized that one of the flanges 34 is offset from the flange 24 along one edge of the side rail 10, if the ladder is to be made as a section of an extension ladder, so as to be able to receive the other similarly formed but oppositely turned section of the extension portion of the ladder,

and indicated at 46 in chain dotted lines. If the ladder is not an extension ladder but is a single section ladder, then the flanges 34 and 24 are not offset as shown at the bottom of FIG. 2, but are made the same at the bottom as at the top of FIG. 2.

FIG. 3 is like FIG. 2, but illustrates the connection of the end of rung 20 into the side rail 16 of the other ladder section, and hence will not be described in detail. Suffice it to say with respect to FIG. 3 that each side rail channel is turned in the opposite direction so that the open channel side faces outwardly rather than inwardly. This figure also illustrates in solid lines the manner of slidably interlocking the sections 12 and 16 of the complete ladder.

Having reference now to FIG. 4 of the drawings, this specifically shows that each rung 18 is made as a hollow tube, with at least one side of the tube being flat, and with this flat side, indicated by the numeral 50 being positioned uppwermost and substantially horizontal when the side rail 10 is positioned at an incline to the vertical in what might be called normal ladder climbing position. This means that a flat horizontal upper surface is provided on each rung 18 providing a step surface. This relatively flat surface 50 may be formed corrugated in the manner illustrated in FIG. 4 if desired.

Each rung 18 is preferably made of hollow triangular shape as illustrated which gives great strength of inverted arch form to the rung, and each rung is preferably made as an aluminum alloy extrusion in the form illustrated, the ribs or other shoulder means 40 being upset into the rung prior to assembly with the side rail 10 and the pad 28.

A modified pad or reinforcing member 28*a* is shown secured to a side rail 10*a* in FIG. 5. The pad 28*a* is of triangular shape and has an open center 60 contoured complementary to the periphery of a ladder rung 18*a*. The pad 28*a* may be made from any suitable material, such as plastic, fiberglass and resin, metal, or wood and it may cemented, welded or brazed or otherwise secured to the side rail 10*a* for reinforcing thereof.

A further pad 28*b* in the shape of a V or U is suitably secured to the ladder side rail 10*b* in FIG. 7 immediately below a ladder rung opening 62 formed in the side rail. The pad 28*b* is made from any material as suggested for manufacture of the pad 28*a*. Both pads 28*a* and 28*b* are, of course, provided for reinforcing the ladder side rail at the ladder rung.

While in accord with the patent statutes certain best known embodiments of the invention have been illustrated and described in detail, it is to be specifically understood that the invention is not to be limited thereto or thereby, but that its scope is defined in the appended claims.

What is claimed is:

1. The combination in a ladder of a pair of channel-shaped side rails, rungs joining the side rails, a plurality of channel-shaped pad means, each pad means assisting in joining a rung end to the side rail, each pad means having the flanges of its channel fitting between the flanges of the channel of the side rail but oppositely facing so that the bases of the channels of each side rail and pad apertured to receive the end of the rung engage with spaced portions of the rung, the pad means having at least one of the side flanges offset from the adjacent side flange of the side rail to allow sliding fit with a similarly formed portion of another ladder section and also having the end of said offset side flange of each pad formed with an additional flange to engage with the base of the side rail channel and the adjacent side flange of the side rail channel, and means for holding the side rail and pad together and the rung affixed thereto.

2. The combination in a ladder of side rails each formed of an aluminum alloy extrusion and each having a channel shape in cross section, the outside of the base of the channel being flat and the inside being crowned to be thickest at the center, a plurality of rungs each formed of an aluminum alloy extrusion having a hollow triangular shape in cross section with one side of the triangle being longitudinally corrugated, a pad assisting in securing each rung end to the side rail, each pad being a short section of an aluminum alloy extrusion of channel shape secured and fitting between the side flanges of each channel shaped side rail in oppositely facing position so that the bases of the channel sections of each side rail and pad are spaced apart, the outside of the base of the channel of the pad being flat and the inside of the base being crowned to be thickest at the center, each rung end extending through aligned triangulare holes in the side rail and pad, a rib around each rung to abut against one side of the combined pad and side rail, the end of each rung being pressed over against the other side of the combined pad and side rail, a plug closing the end of each rung, each rung being positioned with its corrugated surface uppermost and horizontal to provide a step surface when the side rails are in a normal inclined position against a wall, each pad having one of its side flanges offset from the adjacent side flange of the side rail to allow sliding fit with a similarly formed portion of another ladder section, but with the end of the offset side flange of each pad being formed to engage with the base of the side rail and the adjacent side flange of the side rail.

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