Dec. 2, 1969 J. A. MERRITT ET AL 3,481,428

LADDER CONSTRUCTION

Filed Jan. 25, 1968

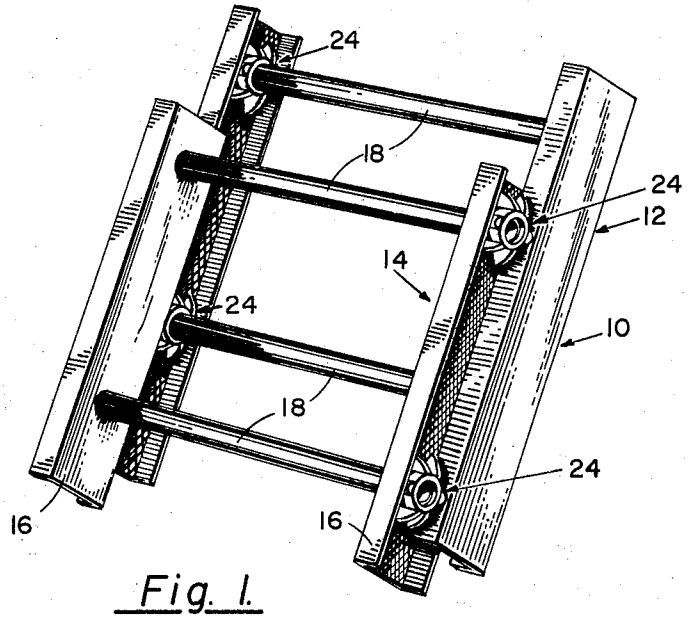

Fig. 1.

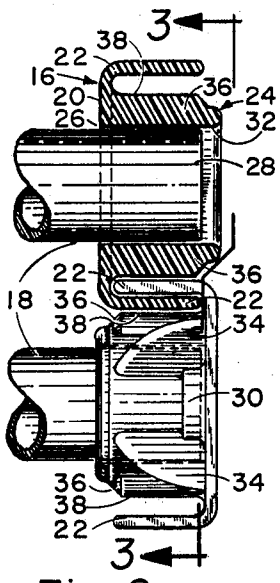

Fig. 2.

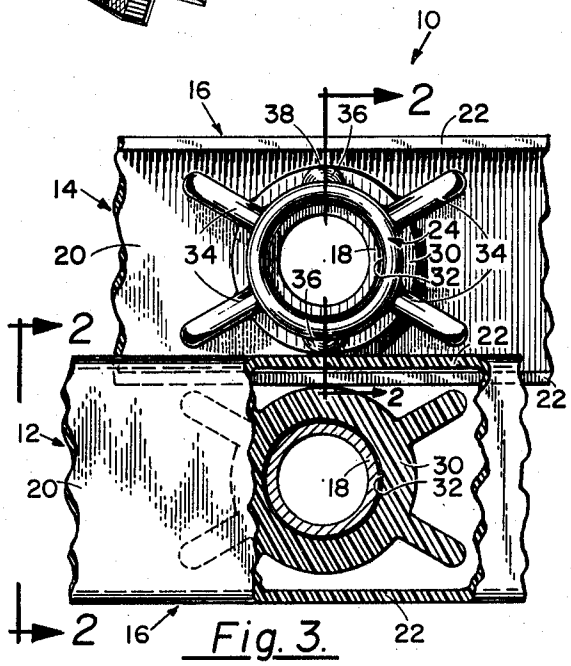

Fig. 3.

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3,481,428
Patented Dec. 2, 1969

3,481,428

LADDER CONSTRUCTION

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Filed Jan. 25, 1968, Ser. No. 700,547
Int. Cl. E06c 7/00, 7/08, 5/04
U.S. Cl. 182—46 9 Claims

ABSTRACT OF THE DISCLOSURE

A ladder construction utilizing a sidepiece having spaced holes therethrough for reeciving proximal ends of spaced, transverse crosspieces. The sidepiece has a boss for each hole, respectively, the bosses being axially aligned with respective holes and extending laterally from and being integral with the sidepiece to form therewith a one-piece construction. The bosses provide reinforcements for the sidepiece near the holes and define bearing surfaces when the construction forms a part of an extension ladder.

This invention relates to improvements in the construction of ladders and, more particularly, to an improved ladder construction utilizing integral bosses on the sidepieces of a ladder.

The present invention is directed to a ladder construction which can be used with a single ladder section comprised of a pair of sidepieces interconnected by a plurality of spaced, transverse crosspieces or the invention can be utilized with an extension ladder wherein one ladder section is capable of moving longitudinally of and being coupled to another ladder section. Specifically, the invention is directed to the one-piece construction formed by a sidepiece and a plurality of tubular bosses which are aligned and communicate with the openings through the sidepiece which receive the proximal ends of the crosspieces. The bosses serve to reinforce the sidepiece in the vicinity of the holes and provide bearing surfaces for the sidepiece of another ladder section when two ladder sections are coupled together to form an extension ladder.

Preferably, each sidepiece and its bosses are molded from a suitable material whereby the bosses are made with the sidepiece. The configuration of the bosses can be selected to provide for optimum reinforcement while at the same time provide the aforesaid bearing surfaces. Moreover, the configuration of the sidepiece with its bosses can be selected so that the same type of sidepiece can be used for both ladder sections of an extension ladder to permit sidepieces of only one configuration to be stocked for extension ladder production.

A number of advantages accrue from the one-piece construction described above, including the elimination of any external bond between each boss and the sidepiece. By virtue of this feature, the sidepiece is effectively reinforced at all times so as to more assuredly withstand the weight applied to the crosspieces when the latter extend into and through the sidepiece. Also, the crosspieces can be made of metal and remain electrically isolated from each other inasmuch as the bosses and the sidepiece can be formed from a moldable, electrically insulating material.

By reinforcing the sidepieces only in the vicinity of the holes therethrough the sidepiece itself can be made relatively thin and with a minimum of material to thereby minimize production costs without sacrificing strength. Moreover, the one-piece construction permits the bosses

to be molded at the same time as the sidepieces to thereby minimize production time while utilizing conventional molding techniques.

The primary object of this invention is, therefore, to provide an improved ladder construction utilizing a number of spaced, tubular bosses integral with a ladder sidepiece and extending laterally therefrom in surrounding relationship to spaced holes through the sidepiece for receiving the ladder crosspieces, whereby the bosses reinforce the sidepiece in the vicinity of the holes and the integral connection eliminates the need for an external bond to secure the bosses to the sidepieces.

Another object of this invention is to provide a ladder construction of the type described wherein the sidepiece and its bosses can be molded to provide for the one-piece construction of the sidepiece and the bosses as well as to permit the practice of conventional molding techniques to minimize production costs.

Still another object of this invention is to provide a ladder construction of the aforesaid character wherein each boss has a configuration permitting the same to define a bearing support for the sidepiece of another ladder section so that a pair of ladder sections having such bosses thereon can be used to form an extension ladder.

Other objects of this invention will become apparent as the following specification progresses, reference being had to the accompanying drawing for an illustration of a preferred embodiment of the invention.

In the drawing:

FIG. 1 is a fragmentary, perspective view of an extension ladder made from a pair of sections each of which has a pair of sidepieces constructed with bosses pursuant to the present invention;

FIG. 2 is a view, partly in section, looking in the direction of line 2—2 of FIG. 3; and

FIG. 3 is a side elevational view, partly in section, of the extension ladder of FIG. 1.

The ladder construction of the present invention is shown, for purposes of illustration only, as utilized with an extension ladder **10** comprised of a pair of ladder sections **12** and **14** which are shiftably coupled together for movement longitudinally of each other. A suitable locking structure, such as cable-actuated hooks or the like (not shown) is coupled to sections **12** and **14** to releasably hold the same in fixed positions relative to each other.

Each of the ladder sections **12** and **14** is comprised of a pair of generally parallel sidepieces **16** and a number of spaced crosspieces or rungs **18** which span the distance between and interconnect respective sidepieces **16**. Crosspieces **18** are connected to sidepieces **16** in a manner to be described and the crosspieces are preferably transversely circular as shown in FIG. 2 and can be tubular if desired.

Each sidepiece **16** is channel shaped as shown in FIG. 2 and includes a central portion **20**, a pair of spaced, generally parallel side flanges **22** and a number of longitudinally spaced tubular bosses broadly denoted by the numeral **24** which are in surrounding relationship to and communicate with the openings **26** which receive the proximal ends **28** of corresponding crosspiece **18**.

Each sidepiece **16** is of a one-piece construction wherein side flanges **22** and bosses **24** are integral with central portion **20**. To this end, each sidepiece **16** is preferably formed from a moldable material, such as Fiberglass or the like, using conventional molding techniques wherein the sidepiece will be molded with a definite length. The molded sidepiece can then be cut into segments and then used to form ladded sections of the type shown in FIG. 1.

Each boss **24** includes a main or cylindrical body **30** whose inner surface **32** at least partially receives end **28** of the corresponding crosspiece **18**. The body **30** has a number of quadrant-shaped webs or ribs **34** which also are integral with both central portion **20** of sidepiece **16** and body **30**. The webs effectively reinforce body **30** as well as increase the strength at the junction of body **30** and central portion **20**. For purposes of illustration only, webs **34** define an X-shaped configuration but it is clear that other configurations can be used as well.

Body **30** of each boss **24** is provided with a pair of longitudinally extending, generally semi-circular ribs **36** which are diametrically opposed relative to each other as shown in FIGS. 2 and 3. Each rib **36** have a convex outer surface **38** which faces the adjacent side flange **22** and is spaced therefrom. Also, each pair of ribs **36** extends longitudinally of the corresponding body **30**.

Each boss **24** extends laterally from central portion **20** and is disposed between side flanges **22**. The inner surface **32** is preferably cylindrical to accommodate the cylindrical outer surface of a corresponding crosspiece **18**.

In forming each ladder section, a pair of crosspieces **16** are provided, along with a number of sidepieces **18** corresponding to the number of openings **26** through the sidepieces. As shown in FIG. 1, the sidepieces **16** of ladder section **12** have bosses **24** thereof facing each other and crosspieces **18** are inserted into the bosses. Thus, the outwardly facing surfaces of the sidepieces are flat inasmuch as the crosspieces generally will not project completely through openings **26** in these sidepieces.

On the other hand, section **14** has its sidepieces arranged oppositely from that of section **12**, i.e., with bosses **24** facing outwardly and away from each other. The crosspieces of this ladder section are then first inserted into respective openings **26** in the sidepieces and then at least partially into the adjacent bosses in the manner shown in FIG. 2. The crosspieces of ladder section **14** can be essentially of the same length as those of section **12** if desired and this is to be preferred since the crosspieces can be supplied in a stock length to minimize costs.

The crosspieces are secured to bosses **24** in any suitable manner, such as by press fitting or the like. The crosspieces can be formed of metal and a suitable adhesive can be utilized within surfaces **32** of bosses **24** to bond the crosspieces to the bosses. When this has been accomplished, each ladder section is complete and can be used by itself or in conjunction with the other ladder section to form extension ladder **10**.

To form ladder **10**, one end of ladder section **14** is brought adjacent to an end of ladder section **12** and the sections are arranged so that the side flanges **22** of section **14** are aligned with the space between the one pair of side flanges **22** and the adjacent ribs **36**. The ladder sections are then moved longitudinally of each other so that adjacent side flanges **22** of sections **12** and **14** are moved into overlapping relationship as shown in FIG. 2. To facilitate this movement, the side flanges of the upper section (assuming that the ladder sections will be essentially horizontally disposed when they are coupled together) will be supported on and move along the ribs **36** on the bosses of the lower ladder section. The ribs thus serve as bearings as the ladder sections move relative to each other and the convex outer surfaces **38** minimize friction effects so that the ladder sections move easily in either direction. The locking means can be actuated when the ladder sections are in the desired relative positions.

The ladder sections can be used independently of each other since each section forms a complete ladder in itself. Regardless of the way in which either ladder section is used, the sections are effectively strengthened by the presence of bosses **24** notwithstanding the relatively thin central portions **20** of sidepieces **16**.

While one embodiment of this invention has been shown and described, it will be apparent that other adaptations and modifications can be made without departing from the true spirit and scope of the invention.

What is claimed is:

1. In a ladder construction: an elongated sidepiece having a plurality of longitudinally spaced holes therethrough for receiving respective crosspieces when the sidepiece and the crosspiece are to form parts of a ladder; and a tubular boss for each hole respectively, each boss being in substantial axial alignment and communication with the respective hole and being integral with and extending laterally from said sidepiece to form therewith a one-piece construction, each sidepiece and the corresponding bosses being formed from a moldable material and being molded together to define said one-piece construction.

2. In a ladder unit comprising: a pair of generally parallel sidepieces and a number of spaced crosspieces spanning the distance between said sidepieces, each sidepiece having an opening therethrough for receiving the corresponding crosspiece; and a tubular boss for each opening respectively, each boss being with and extending laterally from the corresponding sidepiece to form therewith a one-piece construction with the boss being in axial alignment with the respective openings to receive the end of the corresponding crosspiece, each boss further including a number of webs, the webs being integral with the boss and projecting outwardly therefrom, said webs being further integral with the corresponding sidepiece to thereby form parts of said one-piece construction.

3. A ladder unit comprising: a pair of generally parallel sidepieces and a number of spaced crosspieces spanning the distance between said sidepieces, each sidepiece being comprised of a channel having a pair of generally parallel side flanges, each sidepiece having an opening therethrough for receiving the corresponding crosspiece; and a tubular boss for each opening respectively, each boss being integral with and extending laterally from the corresponding sidepiece to form therewith a one-piece construction with the boss being in axial alignment with the respective openings to receive the end of the corresponding crosspiece, each boss further having a rib for each side flange respectively, the rib extending outwardly from the boss and toward the respective side flange, said ribs being spaced from respective side flanges and providing a bearing surface for the side flange of another sidepiece when the sidepieces are coupled together to form an extension ladder.

4. A ladder unit as set forth in claim **3**, wherein each rib has a convex outer surface with the rib extending longitudinally of the boss and being integral therewith to form a part of said one-piece construction.

5. In an extension ladder: a pair of ladder sections, each section including a pair of generally parallel sidepieces and a number of spaced crosspieces spanning the distance between the sidepieces, each sidepiece of each ladder section having a pair of longitudinally spaced side flanges and a number of spaced openings therethrough for receiving the proximal ends of respective crosspieces, there being a tubular boss for each opening respectively, each boss extending laterally from the corresponding sidepiece and being integral therewith to form a one-piece construction with the boss being aligned and communicating with the respective opening for receiving the proximal end of a corresponding crosspiece, the bosses of each sidepiece of each ladder section being between respective side flanges and spaced therefrom to present a region therebetween for receiving the side flange of a sidepiece of the other ladder section, whereby the sections may be shiftably coupled together.

6. In an extension ladder as set forth in claim **5**, wherein each boss is provided with bearing means extending into said region for engaging the side flange of the other ladder section when the sections are coupled together.

7. In an extension ladder as set forth in claim **6**, wherein said bearing means includes a pair of ribs extending longitudinally of the corresponding boss and being inte-

gral therewith, the ribs being diametrically opposed to each other and disposed adjacent to respective side flanges.

8. In an extension ladder as set forth in claim 7, wherein each rib has a convex outer surface which is disposed to tangentially engage the side flange of the other ladder section when the sections are coupled together.

9. In an extension ladder as set forth in claim 5, wherein each sidepiece and its bosses are formed from a moldable material and are molded together as a unit.

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