LADDER CONSTRUCTION AND METHOD OF MAKING SAME

EXTRUDE → SPLIT TO FORM STRUT → FORM STRUT → ASSEMBLE STEPS BETWEEN SIDE RAILS → PEELED RIBS THROUGH SIDERSLAWS

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LADDER CONSTRUCTION AND METHOD OF MAKING SAME

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9 Claims

ABSTRACT OF THE DISCLOSURE

A ladder construction and method of making same wherein the construction comprises a pair of side rails connected at spaced intervals therealong by T-shaped steps. Each of the steps includes a tread extending between the side rails and horizontally oriented when the ladder construction is in an operative position. A web extends along the underside of the tread and is integral therewith. A strut extends along the lower edge of the web and has a central portion integral with the web. Each end portion of the strut is bent downwardly away from the web and is attached to the side rails to form the step.

The method includes the steps of extruding an endless T-shaped member having a tread with an integral lip depending from each of the side edges of the tread, with an integral web depending from the tread between the lips, and with connecting ribs integrally formed along the length of the tread and the web; severing the T-shaped member into determinate lengths to form steps with the connecting ribs extending beyond the tread and web to form attaching studs; splitting a portion of the web along its length adjacent the connecting rib therein to form a strut; bending the strut so that the end portions thereof are spaced away from the web; and assembling the resulting steps between the side rails to form a ladder.

BACKGROUND OF THE INVENTION

Field of invention

This invention relates generally to a ladder construction and a method of making same. More particularly, the invention relates to a ladder construction having a pair of spaced apart side rails with T-shaped steps extending therebetween, and the method of making same.

Discussion of the prior art

There are many different ladder constructions on the market today. At one time most ladders were of wood construction but today more and more ladders are being made of metal due to the strength versus weight advantage of metal construction. Various configurations have been utilized in an attempt to achieve the lightest possible ladder construction; however, most of these configurations have been relatively heavy and also expensive to manufacture.

SUMMARY OF THE INVENTION

These and other problems and disadvantages with prior art ladder constructions are overcome by the invention disclosed herein in that the ladder construction has a high strength versus weight ratio and is therefore light in overall weight while the method of producing the ladder construction is efficient and inexpensive.

The crux of the invention lies in the use of a T-shaped step connected between the side rails of the ladder construction. The T-shaped step may have a portion of the web thereof split at each end to form a strut integral with the web at its central portion and bent away from the web at its end for connection to the side rails. This serves to strengthen the ladder construction while at the same time reducing the weight thereof to a minimum.

The method of the invention includes the steps of extruding a continuous T-shaped member, severing the T-shaped member into ladder steps, splitting a portion of the web of the T-shaped member to form a strut; bending the ends of the strut thus formed so that the ends thereof are spaced from the web; and subsequently attaching the ladder step between the side rails to complete the ladder construction.

These and other features and advantages of the invention will become apparent upon consideration of the following specification and accompanying drawings wherein like characters of reference designate corresponding parts throughout and in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partial perspective view of a ladder construction using the two embodiments of the invention;
FIG. 2 is a cross-sectional view taken along line 2—2 in FIG. 1;
FIG. 3 is a partial perspective view showing one embodiment of the method of the invention after it has been extruded and severed to length;
FIG. 4 is a partial perspective view of the step as shown in FIG. 3 after the web has been split to form the strut; and
FIG. 5 is a partial perspective view of the step shown in FIG. 4 after the web has been bent into shape;
FIG. 6 is a partial cross-sectional view showing the connecting ribs being positioned in the side rails of the invention;
FIG. 7 is a partial cross-sectional view as seen in FIG. 6 after the connecting ribs have been enlarged to lock the step in place on the side rail; and
FIG. 8 is a flow chart illustrating the method of the invention.

These figures and the following detailed description disclose specific embodiments of the invention; however, the invention is not limited thereto, since it may be embodied in other forms.

DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

Referring to FIG. 1, the ladder construction includes a pair of side rails 10 spaced apart by a plurality of steps 11 or 12. The steps 11 disclose a first embodiment of the invention and the steps 12 disclose a second embodiment of the invention; however, only one of each has been shown in FIG. 1 for illustration.

The side rails 10 are T-shaped members having a central web portion 14 and a pair of side flanges 15 integral therewith. The side rails 10 are positioned so that the flanges 15 of one side rail 10 face the flanges 15 of the other side rail 10. The central web portion 14 of each side rail 10 is provided with appropriately arranged holes 16 as best seen in FIGS. 6 and 7 for mounting the steps 11 and 12, as will be more fully explained hereinafter.

The step 11 is a member having a T-shaped cross-section. The step 11 includes a tread 18, depending front and rear reinforcing lips 19 integral with the tread 18 at each lengthwise extending edge thereof, and a reinforcing web 20 integral with the tread 18 and depending perpendicularly therefrom between the lips 19. The web 20 and lips 19 extend along the entire length of the tread 18 and serve to strengthen same. Since the web 20 is the member which primarily strengthens the tread 18, it is substantially wider than the lips 19. The web 20 is located nearer the front lip 19, since most of the weight is carried by that portion of the tread 18.

A first connecting rib 21 is integral with the underside of the tread 18 and extends longitudinally along the
length thereof adjacent the front lip 19. A second connecting rib 22 is integral with the underside of the web 18 and extends longitudinally along the length thereof adjacent the rear lip 19. A third connecting rib 24 is integral with the web 18 and extends longitudinally along the length of the web 20 and is depending edge 25 thereof. The ribs 21, 22 and 24 are longer than the tread 18 and the web 20 and extend beyond the ends thereof to form attaching studs 26 to attach the step 11 to the side rails 10.

The studs 26 extend through the holes 16 in the web portion 14 of the side rails 10 to position the tread 18 substantially horizontal when the side rails 10 are in operative position. Those portions of the studs 26 extending through the holes 16 are enlarged at their extending ends as indicated by the reference numeral 28 to secure the step 11 in place. It will be seen that the tread 18 is just sufficiently wide to fit between the flanges 15 and the lips 19 depend from the tread 18 at an appropriate angle to lie in juxtaposition with the inside of the flanges 19. This forms a stable, lightweight structure.

The step 12 is similar in construction to the step 11 and includes a tread 118 having front and rear depending lips 119 and a reinforcing web 120 depending therefrom as does the tread 11. The tread 118 also includes connecting ribs 121, 122 and 124 defining attaching studs 126 as do the ribs 21, 22 and 24. In this embodiment of the invention, the web 120 is split along a portion of its length from each end thereof toward its center and adjacent the connecting rib 124 to define a strut 129. The strut 129 is integral with the web 120 at its center but separated therefrom at each end 130 thereof. While the web 120 may be split various amounts, it is shown here as being split from each end thereof for approximately one-third of its length.

The studs 126 and the connecting rib 124 integral therewith are bent downwardly away from the web 20. This spaces the ends 130 of the strut 129 in a spaced relationship below and parallel to the lower edge of the web 120. The studs 126 extend through the holes 16 in the side rails 10 and are enlarged as at 128 to secure the step 12 to the side rails 10.

METHOD OF CONSTRUCTION

The side rails 10 are manufactured by extruding a continuous member having a U-shaped cross-section defined by the central web portion 14 and the side flanges 15. The member is then severed into determined lengths to define the side rails 10 and the holes 16 punched or otherwise formed through the web portion 14.

The step 11 is manufactured by extruding a continuous member having a T-shaped cross-section defined by the tread 18, the web 20, the lips 19 and the ribs 21, 22 and 24. The web 20 is extruded perpendicular to the tread 18 and the lips 19 extruded at the appropriate angle to lie in juxtaposition with the flanges 19 when mounted therebetween. The member is then severed in conventional manner into determined lengths to form the step 11. It will be noted that the step 11 is severed so that the connecting ribs 21, 22 and 24 extend beyond each end of the tread 18, lips 19 and web 20 to form the attaching studs 26 at each end thereof. The steps 11 may also be severed at constantly decreasing lengths for each ladder construction if it is desired that the side rails 10 are to be closer together at one end than at the other.

The step 11 is installed between the side rails 10 by inserting the attaching studs 26 through the appropriate holes 61 and enlarging the ends of the studs 26 by peening or swaging as referenced at 28 to secure the side rails 10 to the step 11. A plurality of these steps 11 are secured between the side rails 10 to complete the ladder construction.

The method of making a ladder construction using the steps 12 is shown in FIGS. 3-8. The side rails 10 are made in the same way for the step 12 as for the step 11. The only difference is that the holes 16 are arranged to accommodate the rib 124 forming the stud 126 which is spaced from the web 120.

The step 12 is made by first extruding a continuous member having a T-shaped cross-section identical to the member extruded for the step 11 set forth hereinafter. Then the member is cut or severed into lengths just as the step 11. FIG. 3 shows the step 12 at this stage of construction.

Then the web 120 is split as indicated at S from each end thereof along a portion of its length adjacent the connecting rib 124 to form the strut 129. This operation may be performed by sawing, shearing or any number of conventional splitting operations. The splits S are formed from the end of the web 120 toward the center thereof for approximately one-third of its length. This leaves the strut 129 integral with the web 120 at its middle or center third and separated from the web 120 at its two end thirds. The step 12 at this stage of construction is shown in FIG. 4.

The ends of the strut 129 are then bent away from the web 120 while the centerline of the attaching stud 126 formed by the ends of the rib 124 is maintained parallel to the tread 118. The end of the strut 126 formed by the rib 124 is in vertical alignment with the studs 126 formed by the ribs 121 and 122. The step 12 is now completed and is shown at FIG. 5.

The step 12 is then secured between the side rails 10 by inserting the studs 126 at one end thereof through apertures of the ribs 10, as shown in FIG. 6, and then the studs 126 enlarged as at 128 shown in FIG. 7. Then the opposite side rail 10 is secured to the step 12 in like manner. The ladder construction is complete as soon as the desired number of steps 12 have been secured between the side rails 10.

While specific embodiments of the invention have been disclosed herein, it is understood that modifications, substitutions, and equivalents may be utilized without departing from the scope of the invention as set forth by the appended claims.

1. A ladder construction comprising:
   a. A pair of spaced apart side rails; and,
   b. A plurality of steps having T-shaped cross section extending between and secured to said side rails at spaced intervals therealong, each of said steps including a central web portion and a second flange integral with and extending from said central web portion and a second flange integral with and extending from said central web portion.

2. A ladder construction as set forth in claim 1 wherein said central web portion and second flange is integral with and extending from said central web portion.

3. A ladder construction as set forth in claim 2 wherein said central web portion is integral with and extending from said central web portion.
5 portion opposite said one longitudinal edge, said first and second flanges aligned with and parallel to each other, said central web portion defining a plurality of holes therethrough, and said side rails face the flanges of the other of said side rails; and a plurality of steps having a U-shaped cross-section secured between said side rails at spaced intervals, each of said steps including a horizontally positioned tread, a first lip integral with and extending downwardly from one longitudinally extending edge of said tread, a second lip integral with and extending downwardly from the longitudinally extending edge of said tread opposite said one longitudinally extending edge, a reinforcing web integral with and extending downwardly from said tread between said lips, said web positioned substantially perpendicular to said tread and nearer to said second lip than said first lip, a first longitudinally extending connecting rib integral with said tread and extending along the length thereof adjacent said first lip, said first rib having a length greater than said tread and extending beyond each end thereof to form attaching studs, a second longitudinally extending connecting rib integral with said tread and extending along the length thereof adjacent said second lip, said second rib having a length greater than said tread and extending beyond each end thereof to form attaching studs, a strut integral with said web along the center one-third of its length and separated from said web at each end one-third of its length, each end of said strut bent away from said web, and a third connecting rib extending along the length of said strut and integral therewith, said third rib having a length greater than said strut and extending beyond each end thereof to form attaching studs, and said attaching studs extending through said holes in said side rails and arranged to secure each of said steps to said side rails.

6. A method of making a ladder construction comprising the steps of:
   (a) forming a ladder step having a T-shaped cross-section with a tread and a web integral with said tread and extending along the length of said tread perpendicular thereto; and
   (b) forming a part of said web into a strut having portions thereof spaced from said web.

7. A method of making a ladder construction as set forth in claim 6 wherein said step of forming said strut includes splitting said web along a portion thereof to separate a portion of said strut to space the end of said strut away from said web.

8. A method of making a ladder construction as set forth in claim 7 wherein said step of forming said ladder step includes extruding a continuous member having a T-shaped cross-section defined by said tread and said web, and severing said member into predetermined lengths.

9. A method of making a ladder construction comprising the steps of:
   extruding a first continuous member having a U-shaped cross-section with a central web portion, a first flange integral with and extending along one longitudinal edge of said central web portion, and a second flange integral with and extending along the longitudinal edge of central web portion opposite said one longitudinal edge, said first and second flanges positioned perpendicular to said central web portion and aligned with each other; severing said first member into predetermined lengths to form side rails; forming holes through said central web portion in a predetermined arrangement; extruding a second continuous member having a T-shaped cross-section with a tread, a first lip integral with and extending along one longitudinal edge of said tread and a second lip integral with and extending along the opposite longitudinal edge of said tread, a web perpendicular to said tread integral therewith and extending longitudinally along said tread between said lips, a first connecting rib integral with and extending longitudinally along said tread adjacent said first lip, a second connecting rib integral with and extending longitudinally along said web adjacent its depending longitudinal edge; severing said second member into predetermined lengths to form steps, said severing forming portions of said ribs into attaching studs extending beyond the ends of said tread and said web; longitudinally splitting said web each step thus formed from each end thereof toward its center of approximately one-third of the length of said web to form a strut having its central portion integral with said web and its end portions separated from said web with said third rib integral with said strut; bending the separated end portions of said strut into a configuration wherein the ends of said strut are spaced from said web; and subsequently completing the ladder construction by selectively inserting said attaching studs at one end of said steps through said holes in one of said side rails and enlarging the end of each of said studs to secure said steps to said side rail, and by selectively inserting said attaching studs at the opposite ends of said steps attached to one of said side rails through said holes in another of said side rails and enlarging the end of each of said studs to secure said steps to another of said side rails.

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