United States Patent [19]

Lauring

[11] **3,722,622**

[45] **Mar. 27, 1973**

[54] FOLDING AND COLLAPSIBLE LADDERS

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[22] Filed: **Mar. 18, 1971**

[21] Appl. No.: **125,689**

[52] **U.S. Cl.**.....**182/159**, 182/178
[51] **Int. Cl.**.....**E06c 1/383**
[58] **Field of Search**.....182/160, 159, 95, 96

[56] **References Cited**

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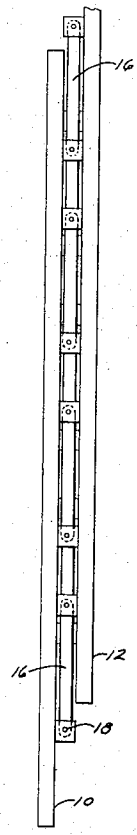
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[57] **ABSTRACT**

A folding and collapsible ladder wherein the rungs are pivotally attached to the side rails and adjacent rungs are attached to the side rails in different planes, i.e., adjacent rungs are offset. To collapse or fold the ladder into a narrow but slightly longer mass, the rungs fold down like a closing parallelogram until the rungs are substantially parallel to the side rails. Rigidity of the ladder is provided by one or more braces pivotally attached at one end to one side rails and the opposed end of the braces provided with fastening means to removable secure the braces to the other side rail.

3 Claims, 10 Drawing Figures



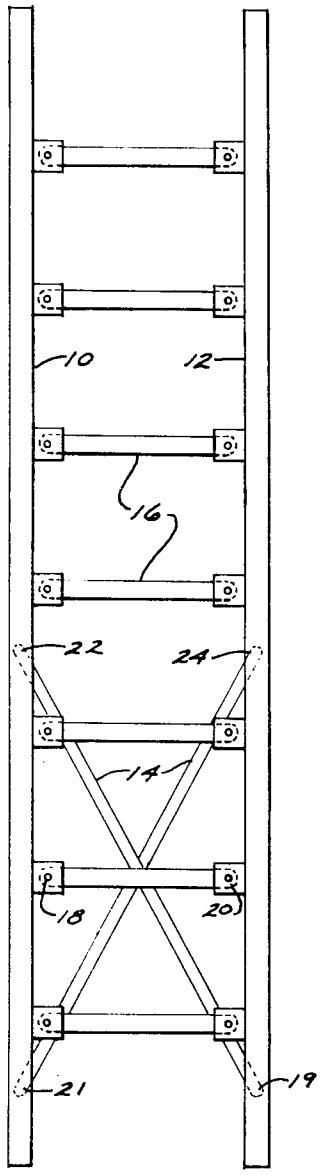


FIG 1

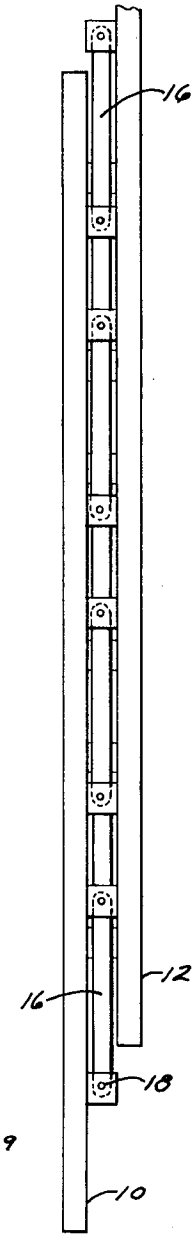


FIG 2

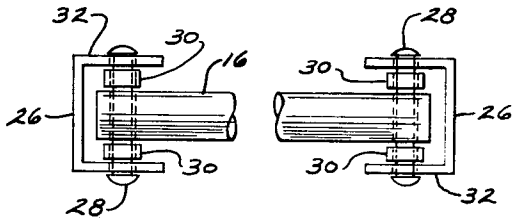


FIG 3

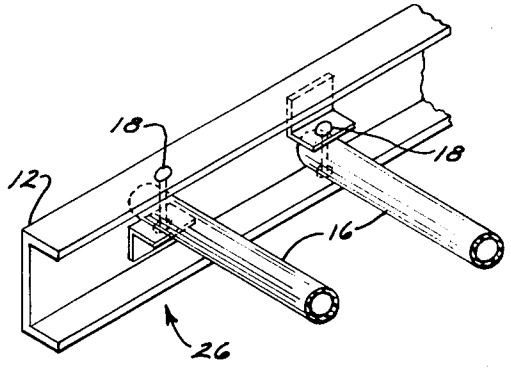


FIG 4

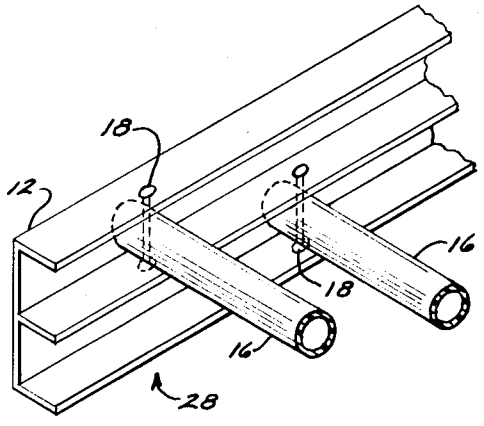


FIG 5

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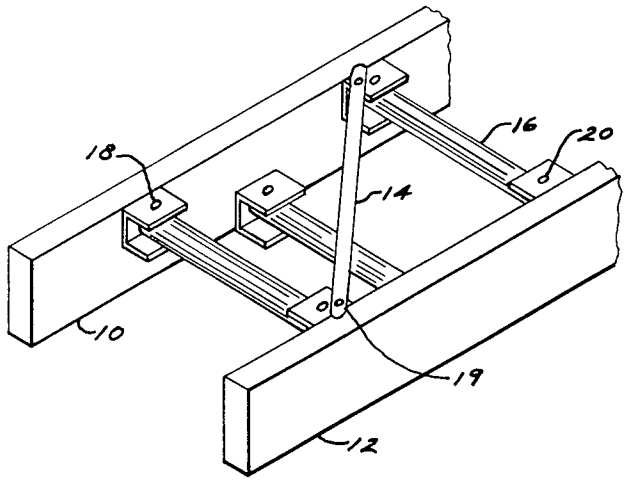


FIG 6

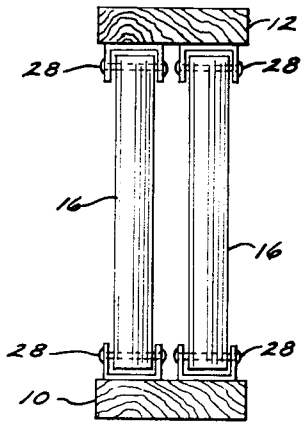


FIG 7

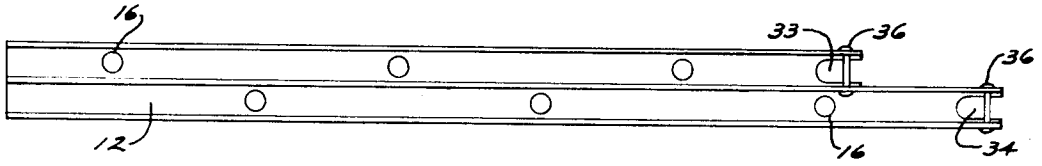


FIG 8

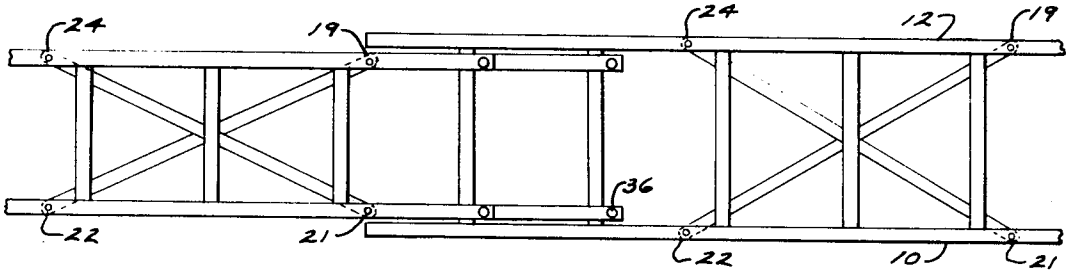


FIG 9

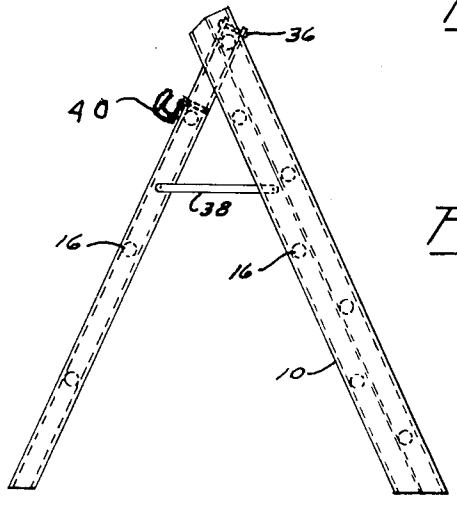


FIG 10

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FOLDING AND COLLAPSIBLE LADDERS

This invention relates to a folding ladder of the type of having a pair of side rails, collapsibly secured together and in which the side rails pivotally supports a series of spaced-apart rungs adapted to be secured in an operative position.

It is an object of the present invention to make a collapsible ladder construction in which the adjacent rungs are in different planes, i.e., offset from each other, and means being provided for locking or bracing the rungs in a parallel spaced-apart position, and which can be easily disengaged when desirable to fold or collapse the ladder by closing the rails upon one another.

These and other objects and novel features will be more fully appreciated from the following description of preferred embodiments of the invention selected for purposes of illustrations and shown in the accompanying drawings in which:

FIG. 1 is a front elevational view of the novel folding or collapsible ladder:

FIG. 2 is a fragmentary view of the ladder fully collapsed condition:

FIG. 3 is an end view showing brackets for pivotally attaching ladder rungs to the side rails:

FIG. 4 is a view of the ladder, with parts broken away, showing use of opposed channel bars for the side rails:

FIG. 5 is a view similar to FIG. 4 in which the side rails are channel bars with middle web or two channel bars secured together for side rails:

FIG. 6 is a view of the folding ladder, with parts broken away, showing solid material as side rails:

FIG. 7 is an end view of solid side rails showing two rows of rungs in different plan or offset each other:

FIG. 8 is a side view of an extension to be used with the folding ladder:

FIG. 9 is a front view, with parts broken away, showing folding ladder with folding extension: and

FIG. 10 is a side view showing the folding extension used with folding ladder to provide a self supporting ladder.

In the structures shown in the drawings numerals **10** and **12** denote side rails of wood, magnesium, aluminum, or any suitable material. The side rails **10** and **12** may be of any desired dimensions, and may be solid material as shown in FIGS. **1**, **2**, **6** and **7**, or may be in the form of channel bars as generally indicated at **26** and shown in FIG. **4**, or modified channel bars as indicated at **28** and shown in FIG. **5**. Braces **14** are provided between side rails as shown in FIGS. **1** and **9**. It being understood that any suitable bracing means may be used, for example, brace shown in FIG. **8** of U.S. Pat. No. 2,727,671 and as shown in FIG. **1** of U.S. Pat. No. 1,341,707.

The novel arrangement of parts which provide a way to fold or collapse a ladder so that it occupies a minimum of space. The folding is accomplished by offsetting or positioning in different planes, every other rung **16** so that they fold by each other. The rungs **16** are in a plurality of rows and are pivotally at **18** and **20** where they are attached to the ladder side rails **10** and **12**. The rungs can fold down like a closing parallelogram until the rungs become substantially parallel to the side rails.

The folded length of the ladder becomes longer by approximately the length of a rung. The thickness of the folded ladder may be as low as the thickness of the side rails.

Rigidity of the ladder is provided by suitable brace or braces **14**. In FIGS. **6** and **9** diagonally cross members form the bracing effect. One end of braces **14** is hinged at **19** and **21** where they are attached to the side rails **10** and **12**, and the other ends of the braces **14** are provided with suitable fastening devices **22** and **24** for remobile attaching them to side rails **10** and **12**. The fastening devices in a simple form may be a self-locking snap-in pin in a hole in the side rails. When the ladder is in the folded position the diagonal braces **14** are folded down along the edge of the side rail to which it is attached. It is to be understood that a locking mechanism may be placed on the end or ends of each rung for providing rigidity to the folding ladder. The rungs may be made of wood, metal, composition, solid or hollow and in suitable geometric shape to provide strength.

The ladder may be of any practicable length and extra sections may be attached to give the desired length. The ladder sections may vary in width whereby the equivalent of a tapered ladder is provided.

In FIG. **3** are shown one means of pivotally attaching rungs **16** to the side rails **10** and **12**. This means includes generally U-shaped cross-section and having their bottoms sections **26** solidly secured to the side rails **10** and **12**. If desired U-shaped means may be constructed as an integral part of the side rails of the types shown in FIGS. **4** and **5**. The rungs **16** have their end portions journaled on the shafts **28**. Spacers **30** between the rungs **16** and the flanges **32**.

As shown in FIGS. **4** and **5** the channel-like members have bottoms, side walls extending outwardly from the bottoms and rib-like members extending longitudinal of each channel and parallel to the side walls. The rib does not extend outwardly a distance greater than the side walls. The ribs may be interrupted between areas of rung attachments (See FIG. **4**).

If additional section are to be employed to make a longer ladder, one of the extensions as shown in FIG. **8** is made as shown and is narrower than the first section. Aperatures or openings **33** and **34** are provided in one end of the extensions side rails. If desirable locking devices or pins **36** may be used to secure the sections of the ladder together. In use the extension, in the most extended position, the bottom part thereof should have the top rung of the ladder fit into the openings **33** and the first rung positioned in a different plane fit into opening **34**.

As shown in FIGS. **8** and **9**, the side rail channels have one wall, part of channel bottom and the rib extending in length more than the other part of channel bottom and other side wall. The length of the longer extension of side walls, part of bottom and rib is substantially equal to distance between adjacent rungs in the first section of the ladder.

In FIG. **10** is shown the novel ladder and an extension used as a self supporting ladder. When the ladder is used in this manner a removable braces **38** are used and a modified rung receiving means **40** is provided. In this use and some other uses the extension section only may not have the rungs off-set, but in casses the rung spacing must be greater than the length of the rungs to

permit substantially parallel folding of the rungs to the side rails.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed:

1. A folding and collapsible ladder comprising two sections; each section having oppositely facing channel-like members side rails; each of said rails having bottom, outwardly extending side walls and longitudinal extending rib-like member projecting from the bottom and being substantially parallel to side walls; one section of said ladder having one end of each channel-like side rails provided with one wall, part of bottom and rib, extending the distance between adjacent rungs in the other section, beyond the remainder of bottom and other sidewall, the bottoms of unequal length having rung receiving openings therein; rungs pivotally attached to side walls and ribs, adjacent rungs at least in one section attached to side walls and ribs in different planes whereby on collapsing the rungs fold down between side walls and ribs and means for maintaining ladder in uncollapsed position.

2. A collapsible ladder according to claim 1, in which said channel-like members are braced in opened position by brace pivotally attached at one end to said channels and opposed end of said brace detachable secured to another channels.

3. A collapsible ladder in accordance with claim 1, in which said means for maintaining ladder in uncollapsed position are cross members.

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