Nov. 14, 1961 G. G. ROBERTS ET AL 3,008,537

ROPE LADDER

Filed Nov. 14, 1958 2 Sheets-Sheet 1

Fig. 1.

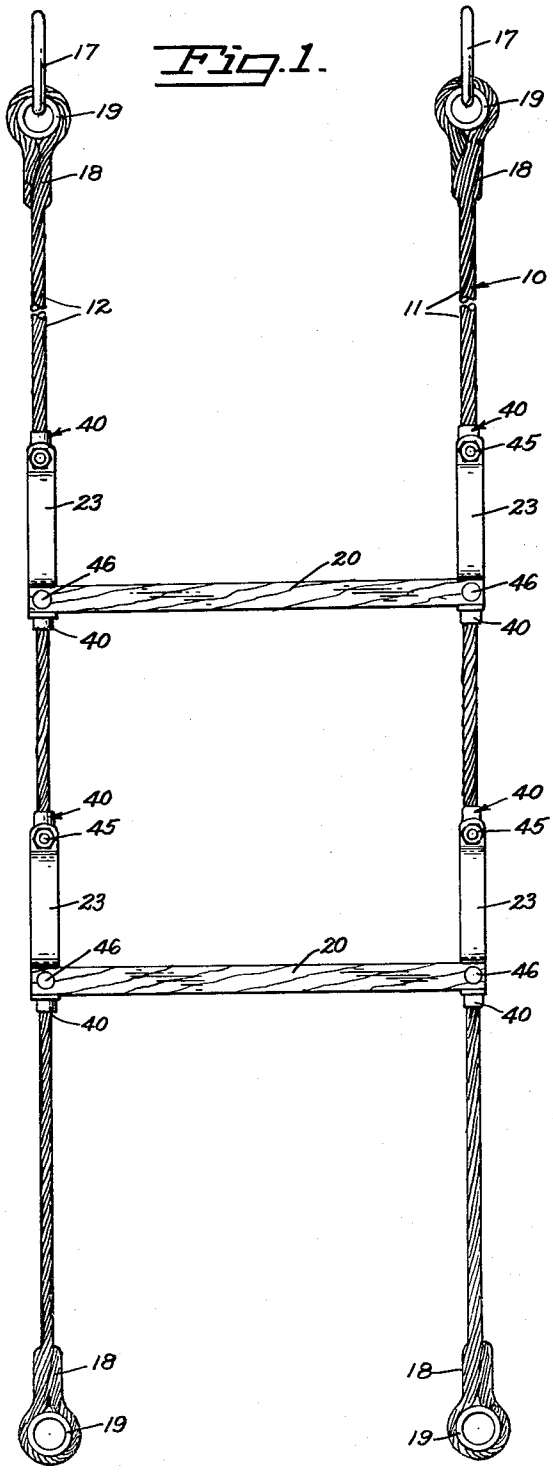
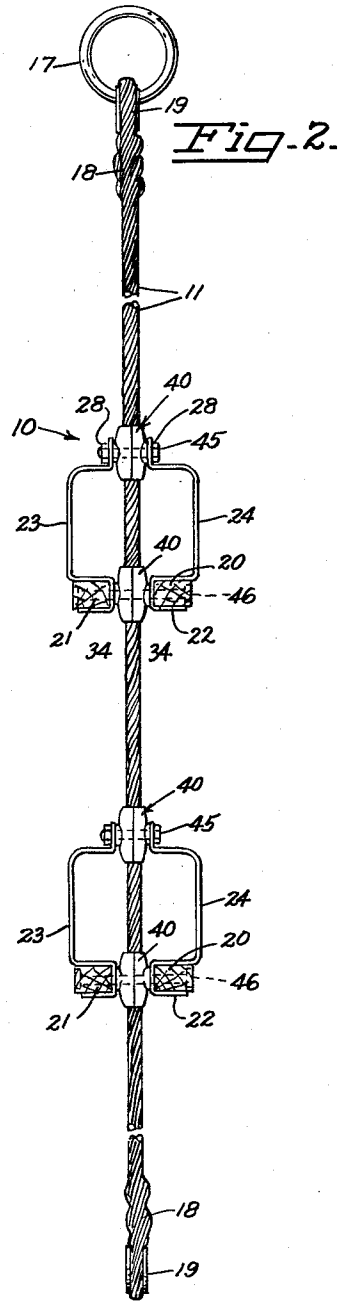


Fig. 2.



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Fig. 3.

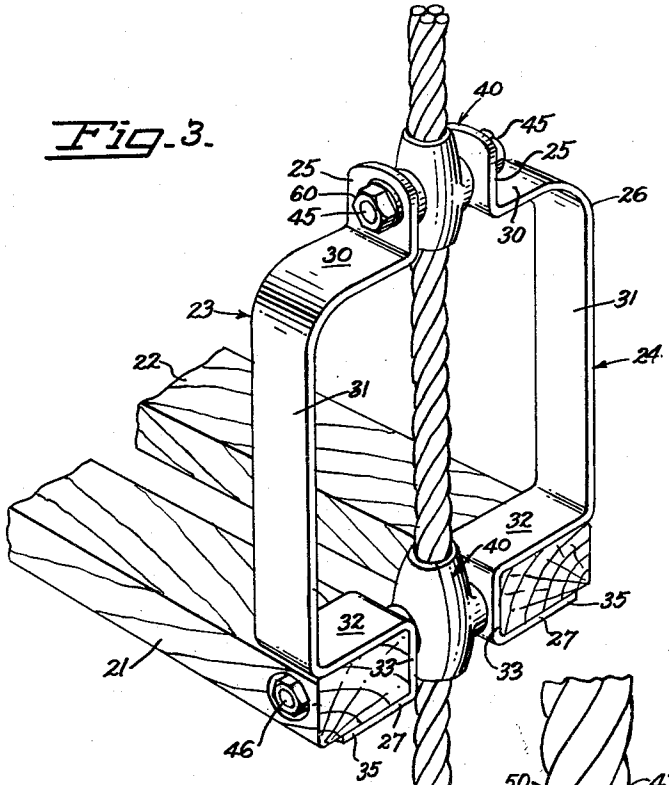


Fig. 9.

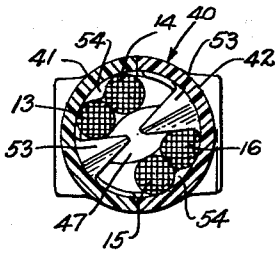
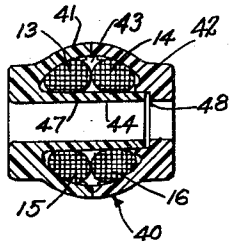
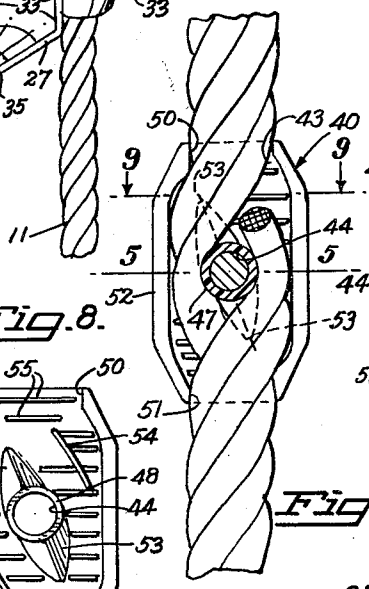


Fig. 5.





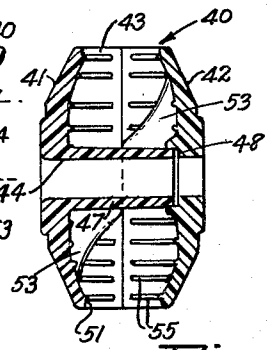


Fig. 6.

Fig. 7.

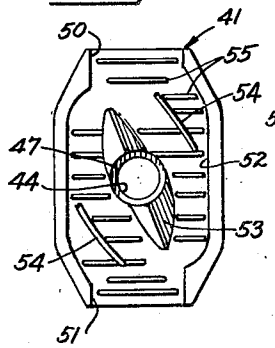


Fig. 8.

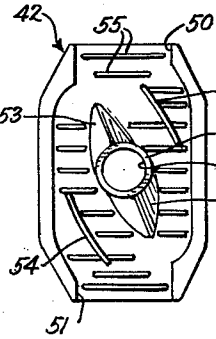


Fig. 4.

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3,008,537

ROPE LADDER

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8 Claims. (Cl. 182—196)

This invention relates to improvements in rope ladders and also to a novel clamp member for use in fastening ladder rungs or other parts to stranded ropes.

Rope ladders are very old but heretofore they have been considered dangerous, and no rope ladder was approved by the United States Coast Guard for ships' pilots' uses. The ladder of this invention is the first rope ladder to receive approval from the Coast Guard, and it obtained this approval by solving many problems heretofore unsolved with rope ladders.

An important object of the invention is to provide a safe rope ladder. This safety is achieved not merely by using strong enough materials, but by uniting them in a novel manner, using some novel elements in the combination. The rope is protected from chafing; steel ears provide handholds and connect the steps or rungs to the rope stiles while lying flush against the side of a ship or building to hold the steps steady, to give climbing stability, and to protect the hands from being banged against a wall.

Another object of the invention is to provide a rope ladder which is easy to inspect and to detect wear or faults in the ladder.

Another object of the invention is to provide a fully adjustable rope ladder, by providing ears that can be used as lashing rings for safe, easy adjustment of the length of the ladder.

Another object of the invention is to provide a rope ladder in which all the parts are separately replaceable and to enable quick, economical insertion of new parts for old ones.

Another object of the invention is to provide a rope ladder that folds together and stows compactly so as to save space.

Another object of the invention is to provide a relatively lightweight rope ladder with an open design that gives superior strength while reducing the weight.

Another object of the invention is to provide a novel clamp means for providing a hole through a rope or, in other words, a clamp that can be used for securing rungs or other kinds of members to a rope. It protects the rope from being chafed by the threads of the bolts or securing members and at the same time is readily removable, instead of having to be molded in place. Moreover, it is easily applied to fiber ropes as well as wire ropes.

Another object of the invention is to provide a rope ladder wherein a broad (double) step is attached to a pair of single ropes.

Other objects and advantages of the invention will appear from the following description of a preferred embodiment thereof.

In the drawings:

FIG. 1 is a view in front elevation of a rope ladder embodying the principles of the present invention. To save space, the ladder has been broken and only two steps shown.

FIG. 2 is a view in side elevation of the ladder of FIG. 1 with an additional portion broken to conserve space.

FIG. 3 is an enlarged perspective view of a portion of one end of one step of the ladder showing the attachment of the rung to the ears and of the ears and rung to the rope.

FIG. 4 is a further enlarged view in elevation and in

section through one of the clamps showing how the rope fits into the clamp.

FIG. 5 is a view taken along the line 5—5 of FIG. 4.

FIG. 6 is a view in elevation and in section taken along the line 6—6 in FIG. 5 but showing only the clamp and omitting the rope strands.

FIG. 7 is an elevation view looking at the interior of the male half of the clamp of FIGS. 4–6.

FIG. 8 is an elevation view looking at the interior of the female half of the clamp of FIGS. 4–6.

FIG. 9 is a view in section taken along the line 9—9 in FIG. 4.

The ladder 10 shown in FIGS. 1 and 2 has two rope stiles 11 and 12. Wire rope may be used sometimes, but generally fiber rope or its equivalent is employed. For example, first grade four-strand ¾" manila rope is a preferred material, and is shown in FIG. 5 with four strands 13, 14, 15, 16. However, the rope 11, 12 may have more or fewer strands. At its upper end each rope 11, 12 is fastened to lashing rings 17 by any suitable means, such as that illustrated, which is conventional in the art and employs a three-tuck splice 18 with a galvanized thimble 19. The lower ends of the ropes 17 and 18 may be terminated similarly in accordance with the best practice.

Each ladder step 20 comprises a pair of rungs 21, 22 secured to a pair of ears 23, 24 that lie opposite and symmetric to each other. Each ear 23, 24 (as shown in FIG. 3) comprises an uppermost portion 25 that extends parallel to the axis of the rope 11 or 12, a U-shaped handhold portion 26, and a lowermost reverse-U portion 27. The uppermost portion 25 has a bolt opening 28 therethrough. The U-shaped handhold and rope-spacing portion 26 may be made in various configurations but preferably comprises an upper generally horizontally extending portion 30, a generally vertical portion 31 high enough to serve as a hand grasp and spacer, and a lower horizontal portion 32 that extends in toward the rope 11 or 12. The lowermost reverse-U portion 27 includes the portion 32, an axially extending portion 33 with a bolt opening 34 therethrough and a bottom portion 35 which extends horizontally outward from the lower end of the axial portion 33.

When hardwood rungs 21, 22 are used, it is preferable to proportion them to fit into the nest provided by the lower portion 27, with a lower supporting portion 35 helping to prevent splintering. However, in particular if metal rungs are to be employed, this lower horizontal portion 35 may be omitted.

A vitally important part of this invention is the clamp 40 by which the attachment to the ropes 11 and 12 is made. Each clamp 40 (see FIGS. 4–6) comprises two similar pieces 41 and 42, the piece 41 being male and the piece 42 female. The clamp 40 provides a rope passage 43, through which the rope 11 or 12 extends, and a bolt passage 44 through which a bolt 45 or 46 extends. In this clamp 40 the bolt 45 or 46 is isolated from the rope 11 or 12 by a sleeve-like portion 47, which comprises a tubular stud formed as part of the male member 41. In accordance with this preferred construction, the female member is provided with a socket 48 in which the tubular stud 47 fits, the socket 48 being tubular and completing the bolt opening 44 when the two pieces are joined together. Thus, the stud 47 comprises, in effect, a tubular member separating the threaded bolt 45 or 46 from the rope passage 43 and from the rope 11 or 12.

The two end portions 50, 51 of the rope passage 43 are narrower than the central portion 52, so that the rope 11 or 12 is securely clamped at the ends 50, 51 and space is provided for the rope strands to pass around the stud 47. In the four-strand rope 11, for example,

two strands **13**, **14** pass on one side of the stud **47** and two strands **15**, **16** pass on the other side.

The interior surface of the rope passage **43** is preferably provided with projections **53**, **54** which serve as guiding means for the strands A particularly large projection **53** lies adjacent the stud **47** to guide the strands around the stud, and the projection **54** fills in the void between each pair of strands **13**, **14** and **15**, **16** and thereby prevents collection of water, etc., within the clamp **40**. The interior surface of the rope passage **43** is also preferably provided with a series of parallel generally horizontal ribs **55** which provide a grasping or clamping surface for concentrating clamping force and thereby holding the clamp **40** to the rope securely against sliding action.

In assembly, the short bolt **45** is used at the upper end and the long bolt **46** at the lower end of each pair of ears **23**, **24**. The short bolt **45** passes through the opening **28** in the ear **24**, the bolt passage **44** of the clamp **40**, and thereby through the rope **11** between its strand pairs **13**, **14** and **15**, **16** but isolated from them by the stud **47**, and through the opening **28** of the ear **23**. A nut **60** is then used and tightened into place. A vertical planar exterior portion **61** of the clamp **40** around the bolt opening **44** forms bearing surfaces that engage against the uppermost axial portions **25**. The long bolt **46** passes through a rung **22**, opening **34** of ear **24**, bolt opening **47** of clamp **40**, opening **34** of ear **23**, and rung **21** and is secured by a nut **62**. The bearing portion **61** engages the axial ear portion **33**.

The clamps **40** are put in place first on the ropes **11**, **12** at spaced intervals and are then fastened to the ears **23**, **24**. In attaching the clamp **40** to the rope, the strands are separated and laid into the male member **41** and then the female member **42** is fitted therearound. Preferably, the male stud **47** fits into the socket **48** in a tight pressed fit to help hold the clamp together even before the bolt **45** is inserted.

It will be noted that four bolts **45**, **46** suffice to carry each step **20**, two on each stile **11**, **12**, and that the bottom bolts **46** not only hold the rungs **21**, **22** to the stile **11**, **12** and to the ears **23**, **24** but also hold the ears **23**, **24** to the stile **11**, **12**. By this combination the minimum number of parts can be used.

It will be apparent from the foregoing that it is easy to replace any part that may be damaged or worn out, for all that need be done is to take off the appropriate nuts and withdraw the needed bolts.

The ladder parts are readily standardized; for example, the rungs **21**, **22** may be identical, all the ears **23**, **24** are identical, all the clamps **40** are identical, and only two different kinds of bolts **45**, **46** are used. So considering the stiles, rungs, ears, clamps, bolts, nuts, thimbles, and lashing rings, there are only 9 different parts for the ladder and only the ears and clamps are not standard articles of commerce.

The ladder described above has been tested by the United States Coast Guard. The rope side members easily support 2,000 pounds and the center of each step 700 pounds. The ropes are protected from chafing by being secured through the center of the metal ear assembly **23**, **24** which automatically absorbs the majority of wear. They are also protected against chafing by the bolts **45**, **46** due to the stud **47** construction. The steps **21**, **22** do not tend to chip because the safety steel ears **23**, **24** lie flush against the side of the ship or building and therefore hold the steps steady.

The ears **23**, **24** may be used as lashing rings to shorten the length of the ladder if desired. The open construction of the ears **23**, **24** makes it easy to spot wear and simplifies inspection, thereby assuring constant safety. Their open design also keeps the weight equal to or less than the old-style Jacob's ladders. The open design of the ears **23**, **24** also makes it easy to insert wooden outriggers to prevent the ladder from twisting as it is being climbed. Such outriggers are normally placed about two feet apart and comprise wooden two-by-fours extending about two or three feet on each side of the step. The ladder is readily folded together into approximately half the space of comparable ladders.

The clamp **40** may be made of metal, if desired, but it also may be, and preferably is, made of plastic such as polyethylene, for example, what is known as Marlex-50, a strong form of polyethyl. Other plastics are also suitable so long as they have sufficient strength and elasticity. Clamps **40** made from such plastic have been tested; dropping one 10 feet onto concrete caused only slight dents on the edge. When mounted on a rope and submitted to blows of 45 pounds or dropped from a height of 16 inches and hitting on its side at right angles to the bolt, the only damage was slight denting and scratching. Another clamp **40**, when mounted on the rope, was subjected to a force of a falling one-pound steel ball dropped from a height of 24 feet. The ball made a dent about ⅛" deep in the plastic clip **40** but did not break it. Another clip **40** was put together with a bolt without any rope inserted and was subjected to compressive force from end to end. The plastic did not start to yield by bending until a load of approximately 2,000 pounds had been applied. Even at 2,100 pounds, when the sample slowly collapsed, it did not break. The use of the plastic clamp further reduces wear by being very smooth, and makes it easy to provide lightweight, inexpensive members instead of having to use the heavy metal members.

To those skilled in the art to which this invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the invention. The disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

We claim:

1. A rope ladder, comprising a pair of stranded ropes; a series of symmetric handhold, spacing, and step-supporting ears opposite each other, each ear having an upper end portion with a bolt opening therethrough, a handhold portion, and a lower portion with a bolt opening therethrough; a pair of rungs joining each pair of ears on one rope to a pair of ears on the other rope at said lower portions; a rope clamp between said upper end portions of each pair of ears; another rope clamp between said lower portions of each pair of ears, each said clamp comprising a sleeve-like member with a rope passage therethrough and having a bolt passage perpendicular to said rope passage and passing between strands of said rope; a bolt extending through said upper ear portions, a said clamp, and said rope; and a bolt extending through said pair of rungs, said lower portions, a said clamp, and said rope.

2. A rope ladder, comprising a pair of stranded ropes; a series of symmetric handhold, spacing, and step-supporting ears opposite each other, each ear having an upper vertical end portion with a bolt opening therethrough, a generally U-shaped portion, and a lower vertical portion with a bolt opening therethrough; a pair of rungs joining each pair of ears on one rope to a pair of ears on the other rope; a rope clamp between said upper end portions of each pair of ears; another rope clamp between said lower portions of each pair of ears, each said clamp comprising a sleeve-like member with a rope passage therethrough and having a tubular member perpendicular to said rope passage and passing between strands of said rope; bolt means securing said upper ear portions to a said clamp and said clamp to its rope; and bolt means securing said rungs, said lower portions, and a said clamp to said rope and to each other.

3. A rope ladder, comprising a pair of stranded ropes; a series of handhold, spacing, and rung supporting ears, each ear comprising an uppermost vertical portion lying generally axial of a said rope with a bolt opening therethrough, a generally U-shaped portion connected to said uppermost portion and a lowermost reverse U-portion

having a vertical portion with a bolt opening therethrough, said ears being arranged in symmetric pairs on the opposite sides of each rope; a pair of rungs connected in the reverse U-portion of each ear; pairs of clamps secured to said rope, one between a pair of said uppermost portions of each pair of ears, the other between said lowermost vertical portion of each pair of ears, each clamp comprising a sleeve-like member surrounding said rope and having a rope passage therethrough and having a tubular member perpendicular to said rope passage and passing between strands of said rope; bolt means passing through the bolt opening of the uppermost portion of one ear, said tubular member, and the bolt opening of said uppermost portion of the other said ear to anchor the upper ends of said ears on said rope; and bolt means passing horizontally through one said rung, said lowermost vertical portion of one ear, said tubular portion of a clamp, said lowermost portion of the other ear, and the other said rung, to secure the lower end of said ear and said rungs to said rope and to anchor said rungs to said ears.

4. A rope ladder, comprising a pair of stranded ropes; a series of handhold, spacing, and stile-supporting ears, each ear comprising an uppermost portion lying generally parallel to a said rope with a bolt opening therethrough, a generally U-shaped portion connected to said uppermost portion and a lowermost section having an axial portion parallel to said rope with a bolt opening therethrough and a horizontal supporting portion extending out away from said rope at the lower end of said axial portion, said ears being arranged in pairs arranged symmetrically on opposite sides of each rope, one said pair on each rope horizontally on the same level; a pair of rungs joining each pair of ears to another pair and resting on said supporting portion; a pair of clamps, one between said uppermost portions of each pair of ears, the other between said lowermost portions of each pair of ears, said clamps comprising a sleeve-like member surrounding said rope to provide a rope passage therethrough and having a tubular member perpendicular to said rope passage and passing between strands of said rope; bolt means passing through the uppermost portion of one ear, a said tubular member, and the uppermost portion of the other said ear to anchor the upper end of said ear and said clamp to said rope; and bolt means passing horizontally through one said rung, said lowermost portion of one ear, a said tubular portion of another clamp, said lowermost portion of the other ear, and the other said rung, to secure the lower end of said ear, said other clamp, and said rungs to said rope and to anchor said rungs to said ear.

5. The rope ladder of claim 4 wherein said clamp is made in two parts, a male part including said tubular member as a tubular stud projecting across said rope passage, said stud passing between strands of said rope and isolating the bolt from direct contact with said rope, and a female part having a socket in which said stud fits and forming an opening for said bolt in alignment with said stud.

6. The rope ladder of claim 4 wherein said clamp has narrow end portions for tightly grasping said rope and a wider central portion to accommodate some strands on one side of said tubular member and some on the other side.

7. The rope ladder of claim 4 wherein said clamp has guide means in said rope passage for separating and guiding said strands around said tubular member, thereby filling space between said strands and preventing their deformation.

8. The rope ladder of claim 4 wherein the inner surface of said clamp defining said rope passage has a plurality of parallel ribs transverse to the axis of said rope for gripping the surface of said rope.

References Cited in the file of this patent

UNITED STATES PATENTS

287,560	Miller	Oct. 30, 1883
1,349,125	Full	Aug. 10, 1920
1,976,533	Affleck	Oct. 9, 1934
2,638,260	Skolmen	May 12, 1953
2,698,471	Peirce	Jan. 4, 1955
2,834,529	Dahlander	May 13, 1958
2,862,270	Fox	Dec. 2, 1958
2,877,527	Bond	Mar. 17, 1959

FOREIGN PATENTS

271,613	Great Britain	June 2, 1927
469,877	Germany	Dec. 28, 1928