Sept. 22, 1942. A. HOPP ET AL 2,296,441

JACOB'S LADDER

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FIG. 1.

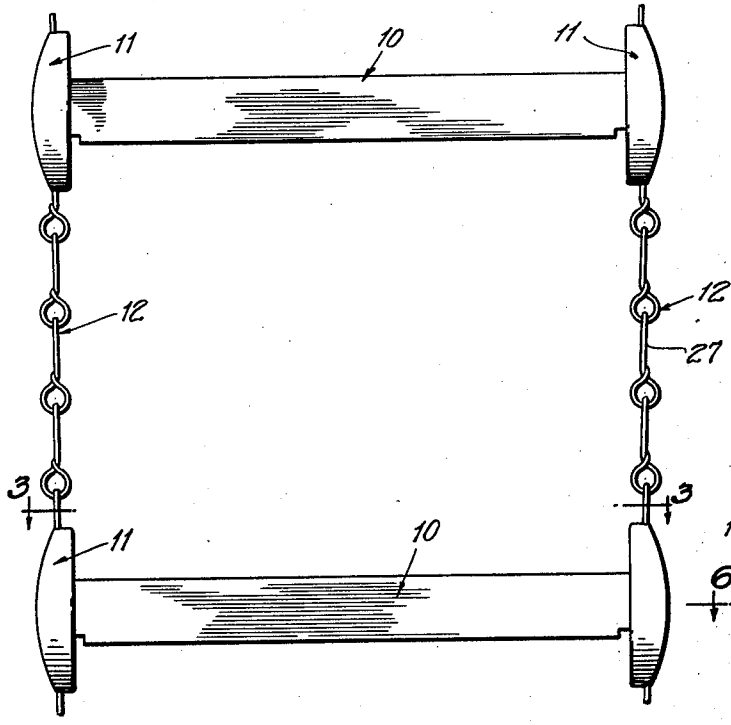


FIG. 2.

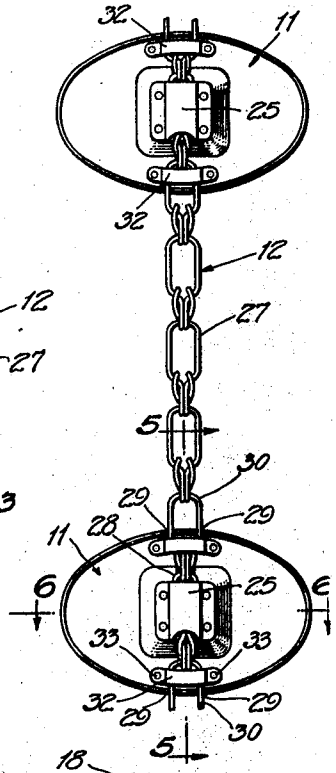


FIG. 3.

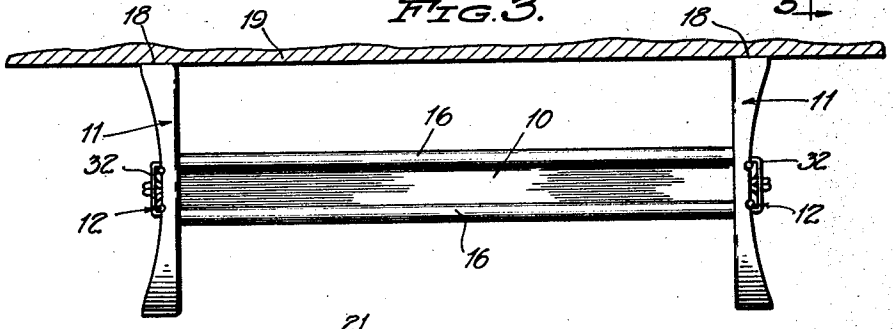
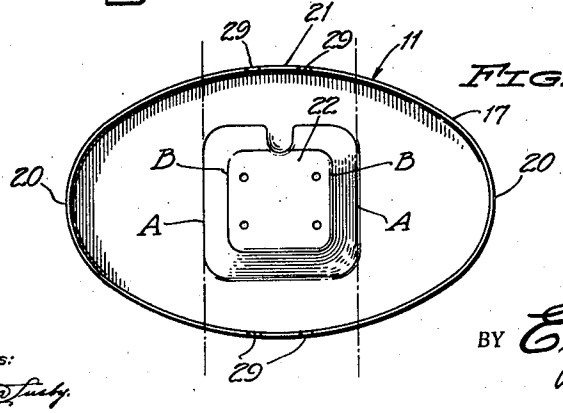


FIG. 4.



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FIG. 5.

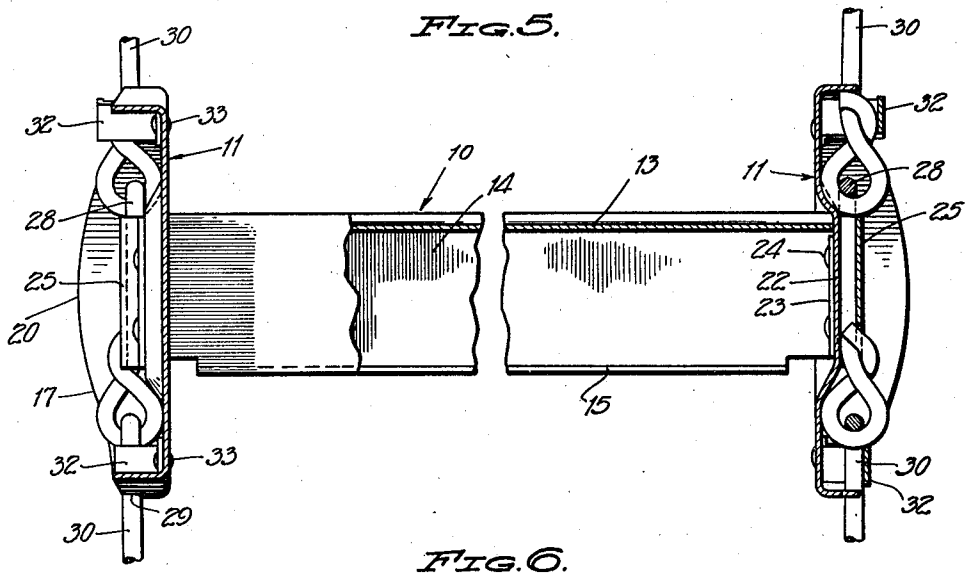


FIG. 6.

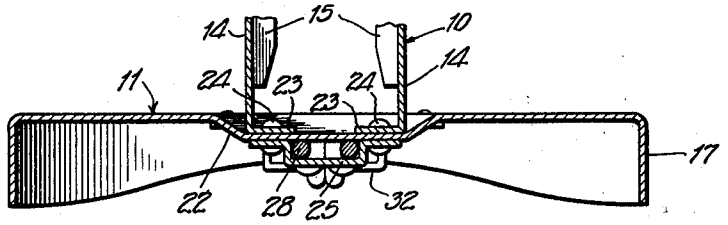


FIG. 7.

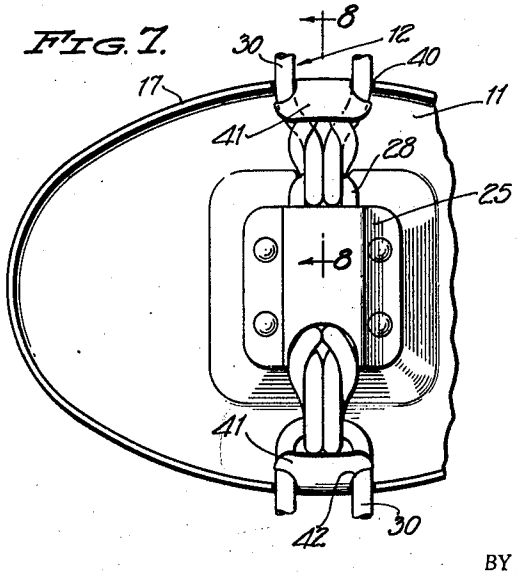
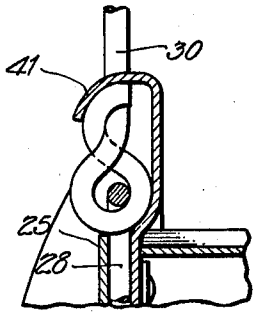


FIG. 8.



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JACOB'S LADDER

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Application July 3, 1940, Serial No. 343,682

14 Claims. (Cl. 228—40)

The present invention relates to new and useful improvements in ladders and more particularly it pertains to ladders of the flexible type of which the well-known Jacob's ladder is one good example.

It is an object of the present invention to provide a new and improved ladder of the aforementioned type which will have many advantages over such ladders as generally constructed and with which we are familiar.

Such ladders when not in use are generally stored in rolled form and it is an object of the present invention to provide a new and novel construction which will permit of compact rolling of the ladder for storage purposes.

Such ladders in use are generally thrown over the side of a ship and it is a further object of the present invention, so to construct the ladder that fouling thereof will be prevented in the placing of the ladder in position for use.

A feature of the invention resides in the novel construction whereby any length of ladder may be constructed merely by adding or removing steps and lengths of stiles or side chains.

Another important feature of the invention resides in a novel form of so-called ear. The ears of such ladders are arranged to space the ladder from the side of a ship, wall or the like, in order to give hand and foot room for persons using the ladder.

Ears for ladders of this type as generally constructed have several disadvantages among the most serious of which is, that when the ears are jammed between the side of a ship and a small boat such for example as a lifeboat, pilot's boat or the like, the small boat is often subjected to a staving in action.

It is a further object of the present invention to provide an ear for ladders of this type which will have sufficient rigidity to maintain the ladder in spaced relation with respect to a ship's side, wall or the like and which will have body weakness which will permit of a bending or collapsing of an ear under a pressure which would be insufficient to stave in the side of a lifeboat or similar small craft.

It is a further object of the invention to provide a new and novel construction whereby, should damage occur to one or more of the ears of a ladder, the ladder will not become useless nor will the steps thereof assume angular position as so often happens in the breaking down of ladders of this type as generally constructed.

With the above and other objects in view, reference will be had to the accompanying drawings and the following description and claims wherein is set forth two practical embodiments of the present invention.

In the drawings:

Figure 1 is a view in front elevation of a flexible ladder constructed in accordance with a preferred form of the present invention,

Figure 2 is a view in elevation taken at right angles to Figure 1,

Figure 3 is a horizontal sectional view taken substantially on the line 3—3 of Figure 1,

Figure 4 is a detail plan view of a ladder ear constructed in accordance with the present invention,

Figure 5 is a view partly in elevation and partly in vertical section taken substantially on the lne 5—5 of Figure 2,

Figure 6 is a detail sectional view on an enlarged scale, the view being taken substantially on the line 6—6 of Figure 2,

Figure 7 is a fragmentary side elevational view on an enlarged scale illustrating a slightly modified form of the invention, and;

Figure 8 is a detail sectional view taken substantially on the line 8—8 of Figure 7.

A ladder constructed in accordance with the present invention comprises steps 10, ears 11, and stiles 12, all of which parts are formed from metal.

As best illustrated in Figure 5, the steps 10 are formed from a light metal and are of hollow form, each having top walls 13, side walls 14, the bottom edges of the side walls each having an inwardly turned flange 15 which construction constitutes in effect an inverted channel. The top edge of each step is provided with two or more longitudinally extending ribs 16, see Figure 3, which provide tread surfaces for the steps as well as lend rigidity thereto.

The ears 11 are formed from a relatively light sheet metal and are preferably of oval form as best illustrated in Figure 4. The several ears 11, being of the same construction, the description of one it is believed will suffice.

Defining the marginal edge of the ear 11, there is a flange 17. This flange 17 serves two purposes. First, it provides marginal rigidity for the body portion of the ear and second, it provides a relatively flat surface of sufficient area to maintain stable contact with the side of a ship, wall or the like, as indicated at 18 in Figure 3, the side of the ship, wall or the like being designated 19 in said figure. The marginal flange 17 is narrower at diametrically opposite points in line with the transverse axis of the ear from which points it

increases in width in opposite directions, its widest dimension being at two diametrically opposite points 20 which are in line with the longitudinal axis of the ear, as illustrated in Figure 4.

By this construction, the flange 17 provides greater strength at the points 20 than at the points 21 and furnishes the necessary body rigidity to maintain the oval form of the ears under ordinary use.

Each of the ears is provided with a centrally disposed depressed portion 22 which is preferably rectangular in form, as best illustrated in Figure 4. This depressed portion provides means for attaching the steps 10 to the ears 11, each side wall 14 of the steps being provided at each end with an inwardly turned flange 23 for the reception of rivets or the like 24 by means of which the steps are rigidly secured to the ears.

By formation of the depressed portion 22, the body portion of the ear is weakened along the lines designated A and B in Figure 4, which lines extend at right angles to the longitudinal axis of the ear, the purpose of which construction will be hereinafter more specifically described.

The stiles 12 are formed from chain and the steps and ears are secured thereto at spaced intervals by means of plates or cleats 25 which are secured to the outer face of the depressed portion 22 by means of the rivets 24 heretofore mentioned as employed to secure the steps to the ears as best illustrated in Figure 6 of the drawings. At spaced intervals, one of the links 27 may be contracted transversely to a dimension rendering it capable of being tightly embraced by the cleat or plate 25 in such a manner that when the cleat or plate 25 is secured in position as shown in Figure 6, the contracted link, which is designated 28 in the drawings, will be rigidly secured to the ear.

As will be apparent from Figures 2 and 3, the flange 17 of the ear is provided with notches 29 at diametrically opposite points in line with the transverse axis of the ear, and these notches receive the legs of the next adjacent link upon each end of the contracted link 28 in order to provide a substantially flush surface at the point where the links intersect the flanges of the ears.

It is desirable to have these links, which are designated 30 in the drawings, rigidly attached to their respective ears, since were they pivotally mounted relatively thereto, there would be a tendency to permit of a pivotal movement of the links 30 relatively to the ears which might result in fouling of the stiles when the ladder is in rolled form.

Means is provided to secure the links 30 rigidly in the flanges of their respective ears and in the preferred form of the invention, this means comprises a strap 32 which embraces the link and is secured to the body portion of the ears by means of rivets or the like 33.

By this construction it will be apparent that the links 30 as well as the links 28 are attached rigidly to their respective ear members. Further it will be apparent that the stiles are not in any way looped and are attached to the ears and the steps in such a manner that any damage, such for example as crushing of an ear, or the breaking of a step, does not either lengthen or shorten the stiles, thus insuring all remaining steps occupying a true position at right angles to the stiles by which they are carried. Still further, a breaking down or crushing of an ear, will not affect the step by which it is carried or the breaking down of a step will not necessarily affect an ear to which it is attached and still further, complete collapse of a step and ear will in no manner render the ladder incapable of use except for the particular step and ear which has been damaged.

We will now describe the manner in which a ladder constructed in accordance with the present invention will function and we will take as an example the ladder as being used over the side of a ship for the purpose of disembarking persons from a ship into a lifeboat or similar small craft.

The ladder being attached at its upper end to a suitable point upon the deck or rail of a ship, when thrown over the side will uncoil without fouling. This result is obtained by reason of the rigid attachment of the links 28 and 30 to their respective ears. As the ladder unrolls to its extended length, the ears 11 will engage the side of the ship as indicated in Figure 3 of the drawings, spacing the steps 10 sufficient distance from the side of the ship to provide ample foot and hand room for a person descending the ladder.

Should, however, there be a rough sea and the small craft be pitched against the side of the ship, pinching the ears between the side of the small craft and the side of the ship, the ears will serve to space the small craft from the side of the ship. However, the ears 11 in the present invention are so constructed that when the small craft is pitched violently against the side of the ship, those ears which may be pinched between the small craft and the side of a ship will crush down along either or both of the lines A or B, which action will relieve the impact of the blow and prevent a staving in of the side of the small craft.

It is to be understood that the construction employed is so designed that the afore described action will taken place and furthermore that the metals employed will be of such character as to render such action infallible.

In a case such as above described, it is obvious that where one only of the ears 11 of a step may be crushed, the step connected to such ears would still maintain its true horizontal position although one end of the step would swing closer to the ship. However, this would necessarily be at a point sufficiently low in the ladder that it would not amount to a serious handicap to the operation thereof.

In that form of the invention illustrated in Figures 7 and 8, the ears 11, the retaining cleat or plate 25, and stiles 12 are of the same construction as in the preferred form of the invention.

In the modified form of the invention, the flange 17 of the ear is notched as at 40 to receive the legs of the links 30 as in the preferred form of the invention. However, in the modified form the means for retaining the links rigidly with respect to the ears is different. This retaining means in the modified form of the invention consists of a projecting lug or the like 41 formed integral with the flange 17, the lug 41 having curved side edges 42 to engage the legs of the link 30.

In assembling a ladder of the modified form, the lug 41 occupies the same plane as that of the flange 17 until the ear is attached to the stile. The link 30 is moved to a position at right angles to that in which it is shown in Figure 7 in order that the lug 41 may pass between the legs there-

of after which the link is positioned as shown in Figure 7 and the lug 41 bent inwardly of the ear 11 into clamping engagement with the legs of the link 39 with sufficient force to move them into the recesses 40 and retain them therein against movement relative thereto.

From the foregoing, it will be apparent that the present invention provides a new and novel construction whereby Jacob's ladders and ladders of similar type may be formed entirely from sheet metal, may have sufficient strength for all intended uses and purposes, and yet under extreme conditions of use be incapable of rendering damage to small craft should the same be violently pitched against the ladder ears and the ears pinched between the small craft and the side of a ship.

Furthermore, the present construction provides for compact rolling of the ladder when not in use and insures a free unrolling of the ladder without fouling, even though the ladder is hurriedly and roughly thrown into operation.

Still a further feature of the present construction and an important one, is that by reason of the fact that the links 39 are rigidly secured against movement relatively to the ears 11, there are no moving parts between which the hands or other portions of the body of a person upon the ladder could be injured by pinching or the like.

It will be understood that various types of metals may be employed and while the invention has been herein illustrated in its preferred forms, it is to be further understood that it is not to be limited to the specific construction herein shown, and that it may be practiced in such other forms as rightfully fall within the scope of the appended claims.

Having thus described the invention, what we claim as new is:

1. A ladder of the type described comprising in combination, a plurality of ladder steps, flexible stiles, spacing ears carried by the ends of said steps, means for rigidly securing the ears and the stiles to the ends of the steps, and additional means for rigidly securing the stiles to the spacing ears.

2. A ladder of the type described comprising in combination, a plurality of ladder steps, flexible stiles, spacing ears carried by the ends of said steps, means for rigidly securing the ears and the stiles to the ends of the steps, and additional means for rigidly securing the stiles to the spacing ears, said rigid attachment of the stiles to the ears being at points spaced with respect to the rigid attachment of the stiles with the ends of the steps.

3. A ladder of the type described comprising in combination, a plurality of ladder steps, flexible stiles, spacing ears carried by the ends of said steps, means for rigidly securing the ears and the stiles to the ends of the steps, and additional means for rigidly securing the stiles to the spacing ears, said rigid attachment of the stiles to the ears being at points spaced with respect to the rigid attachment of the stiles with the ends of the steps and upon opposite sides thereof.

4. A ladder of the type described comprising in combination, a plurality of ladder steps, flexible stiles formed of pivotally connected links, and spacing ears, means for rigidly securing the spacing ears to the ends of the steps and for embracing one of the links of the stiles for rigidly securing the steps to the stiles, and separate means for rigidly securing the stiles to the spacing ears.

5. A ladder of the type described comprising in combination, a plurality of ladder steps, flexible stiles formed of pivotally connected links, and spacing ears, means for rigidly securing the spacing ears to the ends of the steps and for embracing one of the links of the stiles for rigidly securing the steps to the stiles, and separate means for rigidly securing the stiles to the spacing ears, said means comprising a strap like member carried by the spacing ears and embracing one of the links of the stiles.

6. A ladder of the type described comprising in combination, a plurality of ladder steps, flexible stiles formed of pivotally connected open links, and spacing ears, means for rigidly securing the spacing ears to the ends of the steps and for embracing one of the links of the stiles for rigidly securing the steps to the stiles, and separate means for rigidly securing the stiles to the spacing ears, said means comprising a lug projecting from the spacing ears and extending through the open links of the stiles for clamping the stiles to the ears.

7. A spacing ear for ladders of the type described comprising a body portion of sheet metal, a flange extending angularly from the body portion to impart marginal rigidity thereto, said body portion being weakened along predetermined lines within the confines of the flange to provide zones of collapse within the body portion of the ear.

8. A spacing ear for ladders of the type described comprising a sheet metal member of oval form, a flange defining the marginal edge of said member and a centrally disposed rectangular depressed area struck out of the plane of the body portion of the member, two of the opposed side edges of the depressed area forming lines of fold upon which the ear may collapse under pressure.

9. A spacing ear for ladders of the type described comprising a sheet metal member of substantially oval form, and a flange defining the marginal edge of said member, said flange being of greatest width at the ends of the member and gradually reducing in width in the direction of the center point of each side of the member.

10. A ladder of the type described comprising in combination, a pair of stiles, a plurality of steps, a pair of spacing ears for each of said steps, said spacing ears being secured one to each end of each step, a single means for rigidly securing the stiles and the spacing ears to the ends of the steps, and separate means for rigidly securing the stiles to the spacing ears at the marginal edge of the ears.

11. A ladder of the type described comprising in combination, a pair of stiles, a plurality of steps, a pair of spacing ears for each of said steps, said spacing ears being secured one to each end of each step, a single means for rigidly securing the stiles and the spacing ears to the ends of the steps, and separate means for rigidly securing the stiles to the spacing ears at the marginal edge of the ears, said means comprising integral portions of the ears having interlocking engagement with the stiles.

12. A ladder of the type described comprising in combination, a pair of stiles formed of a plurality of pivotally connected open links, a plurality of steps, a pair of spacing ears for each of said steps, said spacing ears being secured, one to each end of each step, a flange defining the marginal edge of each of said ears, means for

rigidly securing the stiles and the spacing ears to the ends of the steps, and means for securing the stiles to the spacing ears, said last mentioned means comprising straps embracing the stiles and secured to the ears.

13. A ladder of the type described comprising in combination, a pair of stiles formed of a plurality of pivotally connected open links, a plurality of steps, a pair of spacing ears for each of said steps, said spacing ears being secured, one to each end of each step, a flange defining the marginal edge of each of said ears, means for rigidly securing the stiles and the spacing ears to the ends of the steps, and means for securing the stiles to the spacing ears, said last mentioned means including notches in said flange for receiving the stiles and means for retaining the stiles within the notches.

14. A ladder of the type described comprising in combination, a pair of stiles formed of a plurality of pivotally connected open links, a plurality of steps, a pair of spacing ears for each of said steps, said spacing ears being secured, one to each end of each step, a flange defining the marginal edge of each of said ears, means for rigidly securing the stiles and the spacing ears to the ends of the steps, and means for securing the stiles to the spacing ears, said last mentioned means including notches in the flange for receiving the legs of the open links of the stiles, and means for retaining the legs of the open links of the stiles in the notches.

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