July 3, 1951 A. J. MORENO ET AL 2,558,975

COMBINED DOOR AND LADDER IN THE SIDE OF A CRAFT

Filed June 2, 1948 4 Sheets-Sheet 1

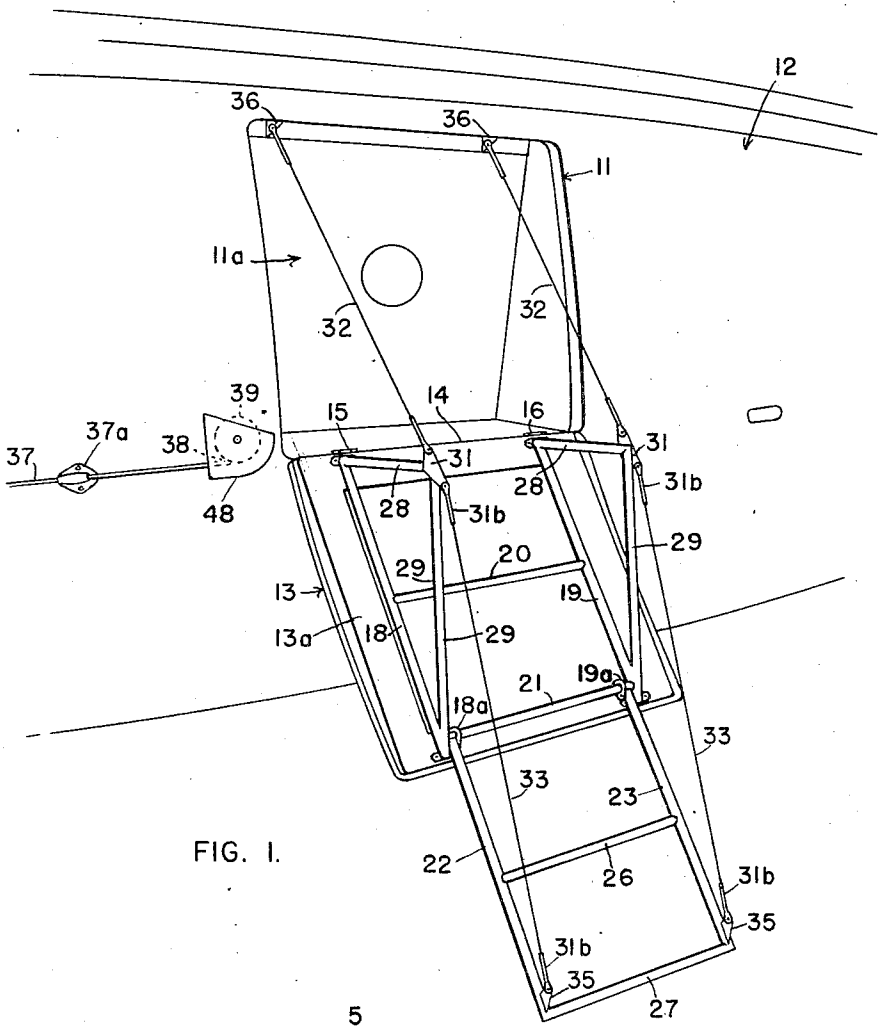


FIG. 1.

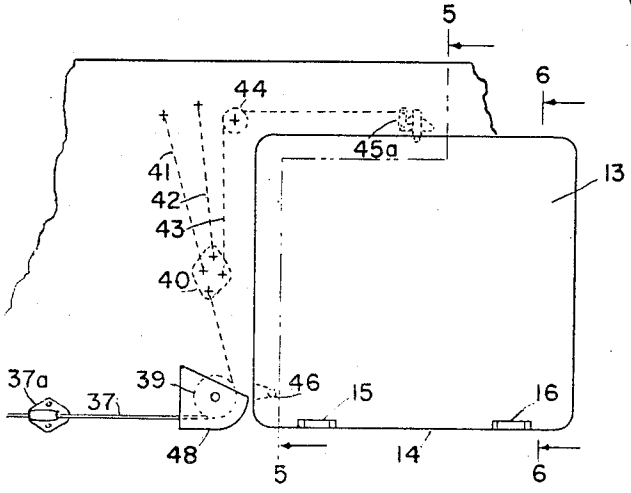


FIG. 2.

Inventors
ANTHONY MORENO
CYRIL L. FENN
by Richard Stutzman
Attorney

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COMBINED DOOR AND LADDER IN THE SIDE OF A CRAFT

Filed June 2, 1948 4 Sheets-Sheet 2

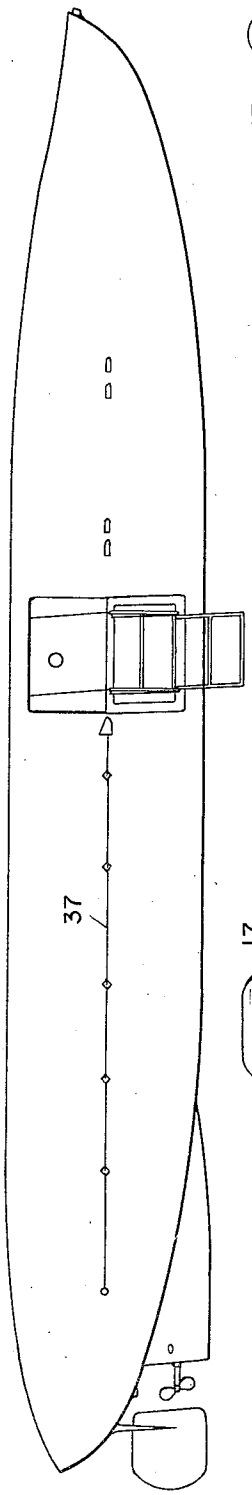


FIG. 3.

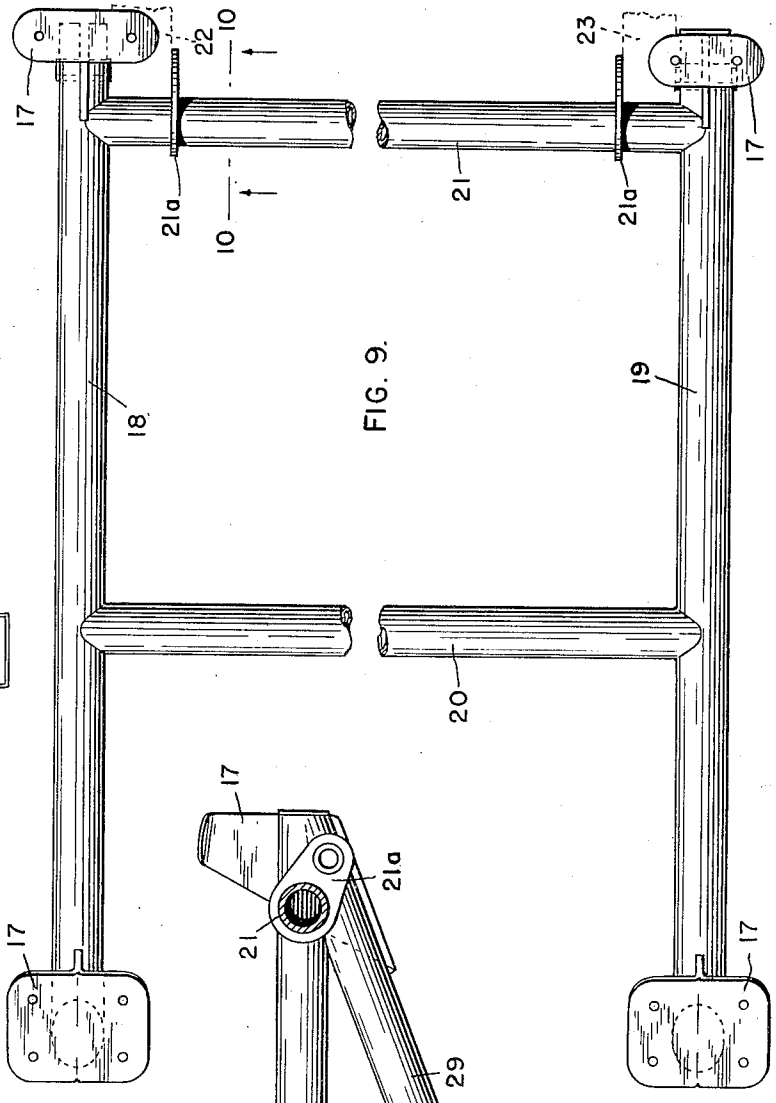


FIG. 9.

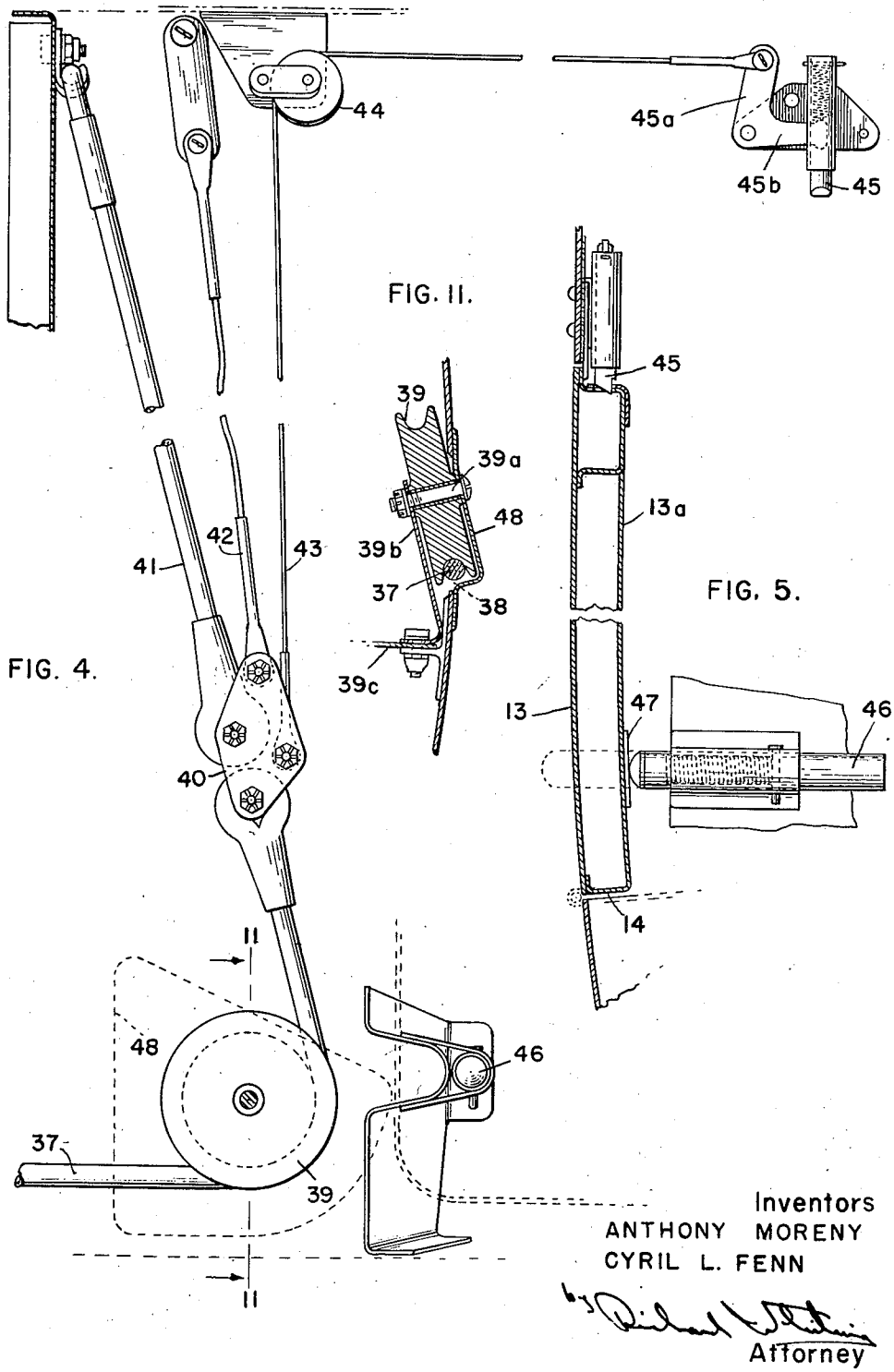
FIG. 10.

Inventors
ANTHONY MORENO
CYRIL L. FENN
by Richard Stevens
Attorney

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COMBINED DOOR AND LADDER IN THE SIDE OF A CRAFT

Filed June 2, 1948 4 Sheets-Sheet 3



Inventors
ANTHONY MORENY
CYRIL L. FENN

by Richard W. Hutchins
Attorney

July 3, 1951 A. J. MORENO ET AL 2,558,975

COMBINED DOOR AND LADDER IN THE SIDE OF A CRAFT

Filed June 2, 1948 4 Sheets-Sheet 4

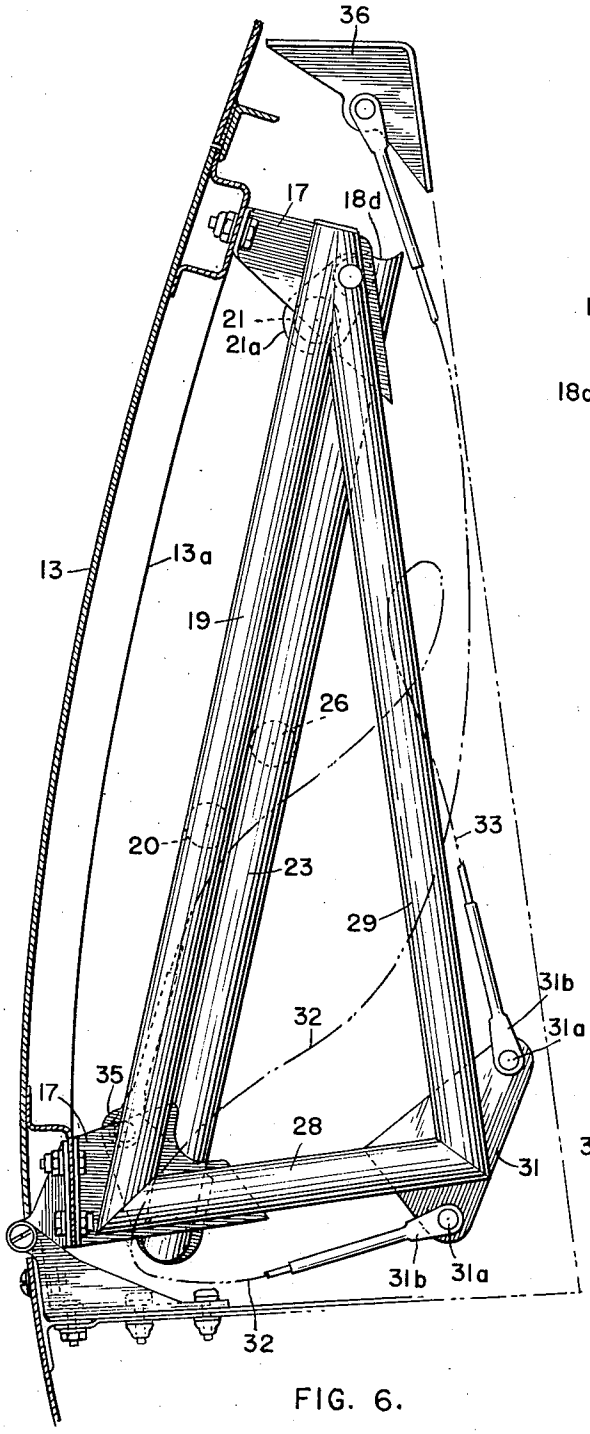


FIG. 6.

FIG. 8.

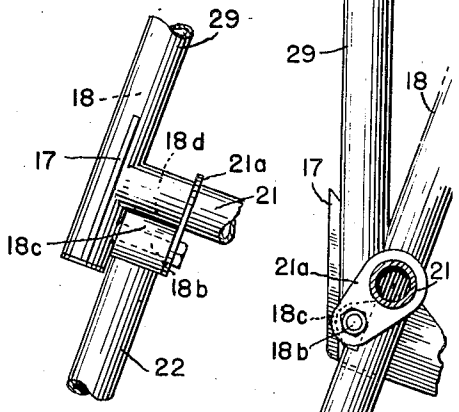


FIG. 7.

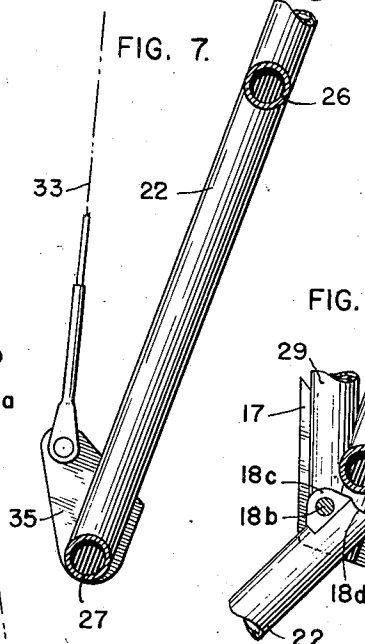


FIG. 7a.

Inventors
ANTHONY MORENO
CYRIL L. FENN
by Richard W. [illegible]
Attorney

Patented July 3, 1951

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UNITED STATES PATENT OFFICE

2,558,975

COMBINED DOOR AND LADDER IN THE SIDE OF A CRAFT

Anthony J. Moreno, Elmhurst, and Cyril L. Fenn, Flushing, N. Y., assignors to Edo Corporation, a corporation of New York

Application June 2, 1948, Serial No. 30,644

5 Claims. (Cl. 114—65)

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This invention relates to retractable ladders adapted for use in vehicles, by which term we include land conveyances, vessels and small boats, and aircraft.

The object of our invention is to provide a ladder which may be let down either by persons outside the vehicle, or, if desired, from within.

It is also an object to provide a ladder which when not in use can be retracted into the side or bottom of the vehicle in such a manner as to effect a streamlining of the hull of the vehicle at the place where the ladder is retracted.

Our ladder is particularly useful in life boats which are launched without occupants from aircraft to rescue survivors of a ship or air accident floundering in the water and who have been located by air search. The invention is also adapted for installation in large military airliners or bombers having fuselages which are high off the ground, for boarding them in the event that external portable ladders or ramps are not available.

In the drawings:

Fig. 1 is a perspective view of an embodiment of our invention installed in a lifeboat and shown in open or boarding position.

Fig. 2 is an elevation of the door closed within the boat hull, the ladder being retracted therein, the view also showing the location of the elements of the release mechanism.

Fig. 3 is a side elevation of a complete lifeboat, also showing our invention in open or boarding position.

Fig. 4 is a detail elevation of the release mechanism.

Fig. 5 is a side view, partly in section, taken on the line 5—5 of Fig. 2, of the release spring plunger.

Fig. 6 is a side elevation, partly in section, of the ladder in retracted position taken on the line 6—6 of Fig. 2.

Fig. 7 is a detail elevation, partly in section, of part of one of the ladder sides showing particularly the hinge mechanism in open position; Fig. 7*a* shows the same hinge mechanism where the element 22 has been moved slightly from open toward folded position with plate 21*a* removed.

Fig. 8 is a detail of the tubular hinge junction shown in Fig. 7.

Fig. 9 is a side elevation of the basic tubular members as would appear if seen through the door from the outside.

Fig. 10 is a view, partly in section, taken on the line 10—10 of Fig. 9.

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Fig. 11 is a section on the line 11—11 of Fig. 4.

Referring to Fig. 1, a rectangular opening 11 having an inside skin wall 11*a* is provided in the side of the boat's hull 12, and a skin section 13 is made to fit into and cover the opening, functioning as a door. When this door 13 is closed, the smooth contour of the side of the boat 12 is unbroken. A backing 13*a* is secured to the inside of door 13 to make it sturdy and to support the elements fixed thereto as will be described. The lower edge 14 of the door 13 (in closed position) is appropriately hinged at 15 and 16 to permit the door to be swung open from the top and down to the position shown in Figs. 1 and 3 through an arc of about 170°, although the precise angle is not critical. On the inside of the door 13 are secured, by bracket plates 17 (Fig. 6), two vertical tubular members 18, 19 (Figs. 1, 6 and 9), each extending almost the full height of the door. Tubular rungs 20, 21 are joined to members 18, 19 at spaced intervals. These rungs 20, 21 serve as braces and also as steps. The vertical members and rungs thus secured constitute the upper section of the ladder.

Tubular extension members 22, 23 designed to lay parallel to and within members 18, 19 when the ladder is in retracted position, are hinged at 18*a*, 19*a* respectively inside the lower (in open position) extremities of members 18, 19. Figs. 7, 7*a*, 8 and 9 illustrate the detail of our preferred hinge construction, and its operation which is as follows: Near each of the junctures of tubular rung 21 with the vertical members 18, 19, we provide a plate 21*a* fixed to rung 21 and receiving a pin 18*b* on which is pivoted lug 18*c* protruding from and fixed to the end of each member 22, 23. The extremity of each member 22, 23 is arcuately cut at 18*d* (Figs. 7, 7*a*) to fit the surface of the rung 21. Thus, members 22, 23 pivot about the pin 18*b*, itself so located with respect to rung 21 as to permit complete clearance thereof by the members when swung from their folded position about the pivot until the arcuate extremity 18*d* of the members 22, 23 abuts rung 21, thus positively stopping and supporting the members in extended position. Other types of hinges may also be employed, but we have found that the above described hinge construction is well suited for this purpose.

Additional tubular rungs 26, 27 (Fig. 1) are welded to members 22, 23 to form a lower ladder section, these rungs being regularly spaced in relation to rungs 20, 21. When the ladder is opened outwardly and swung down, the lower section falls into alignment with the upper sec-

tion, as above described, to constitute a straight ladder projecting into the water from the side of the boat hull in the manner illustrated (Figs. 1, 3).

To the opposite extremities of the member **18**, are joined an additional pair of tubular members **28, 29** (Figs. 1, 6) disposed at right angles relative to each other in a plane normal to that of the ladder and a similar pair of members **28, 29** is joined to the opposite extremities of member **19**. The members **28, 29**, constituting each pair, are joined to each other, and to their junction is welded a perforated plate **31** which serves to secure by pins **31***a*, the lugs **31***b* of one of the ends of each of the supporting cables **32, 33**. The other end of cable **32**, which is designed to prevent the door **13** from overswinging and to hold the ladder base at an easily ascendable angle, is secured to a plate **36** (Figs. 1, 6) in the boat's hull within the opening **11**; while the other end of cable **33** is secured to a fastening plate **35** on the lower extremities of members **22, 23**. These cables, as thus supported and secured, serve as hand rails to assist the boarder of the boat and also to afford means by which the ladder may be pulled up from within the boat to retract it after boarding. Cables **33** also prevent shock on the hinge fittings **18***b*, **18***c*, **18***d* and **21***a* when the door is opened out and the ladder drops down and also eases the strain on the ladder during boarding.

When the boat is to be launched, the ladder is in retracted position and folded up as shown in Fig. 6. Means are provided, after the boat is launched, to enable a person in the water to release the ladder—assuming that the boat is unoccupied. This is accomplished by a release cable **37** (Figs. 1, 2, 3, 4), along the water level of the boat, which can be grasped by a person in the water.

From Fig. 3 it will be seen that we have installed our ladder forward of the midsection of the boat. To provide a long release line, we run the release cable aft of the opening, securing the after end thereof in a fixed position near the stern. The forward end of the cable is brought through the eye-brackets **37***a*, into the aperture **38** in the skin of the hull and about the pulley **39** (Fig. 4) above which the cable **37** is rotatably secured between two release control plates **40**. To the opposite sides of these plates are also rotatably secured three separate cords **41, 42, 43**. **41** represents a tension cord or spring the function of which is to hold cable **37** in tension, but yet allow it and the plates **40** to be drawn downward upon a strong pull on the cable **37**. The thin cord **43**, itself extending about a pulley **44**, leads to arm **45***a* of a bell crank, the other arm **45***b* of which engages a slot in a latch **45** spring pressed downwardly to hold door **13** closed (Figs. 2 and 4). Upon downward pull on cord **43**, the spring held latch **45** is raised to unlock the door and permit the ladder to fall out. **42** is a stop-cord having slack which, when taken up by downward movement of plates **40**, prevents the application to cable **43** of more pull than is required to release latch **45**.

Opening **38** in the hull through which cable **37** passes is covered with a streamlined but slightly skewed plate **48** (Figs. 4, 11) which serves as one of the bearing supports for the axle **39***a* of the pulley **39**, other support being a bracket **39***b* mounted on the deck **39***c*, or other convenient place. The pulley is thus in a plane which is inclined to guide cable **37** from the outside to the inside of the hull. The cable **37** encounters no substantial friction at the opening **38**, most of the direct contact being made on the rotatable pulley **39** itself.

While the boat's roll and gravity might be relied upon to drop the ladder into the water after the latch is released by pulling on cable **37** as above described, we prefer to insure this result by providing a heavy spring plunger **46** (Figs. 2, 4, 5) within the hull, the ramming end of which plunger abuts a small plate **47** secured on the inside of and near the hinged base of the door **13**. This plunger **46** forces the door outwardly as soon as the latch **45** is released. The door swings on its hinges **15, 16**, about 170° into open position and the lower section of the ladder drops down in alignment with the upper section as previously stated. The boat is then easily boarded by persons in the water. A cable **37** may, of course, be provided forward as well as aft of the opening **11**.

After boarding the boat, the person may retrieve the ladder by simply reaching over the gunwale, pulling up the door and folding the lower section of the ladder back in retracted position. The door **13** and associated apparatus are then slammed into the recess **11** in the boat's hull and thereby relatched. Mechnical means may be provided, if desired, for retracting the ladder.

The dropping of the ladder may also be effected from within the boat by releasing the latch **45** manually.

In the preferred embodiment of our invention, except for steel cables, all parts including tubular elements, plates, attaching pieces and hinges are made of aluminum alloy, so that the apparatus is light in weight and easy to draw up. The braced door is ordinarily constructed of the same material as the boat's hull.

While the adaptation of our invention described above is specifically for a lifeboat, it is obvious that it may likewise be adapted to any vehicle to facilitate boarding and where the ability to retract the apparatus completely within the vehicle's body in streamlined fashion is desirable.

We claim:

1. A ladder adapted to fit into an opening in the hull of a vehicle when retracted and, when released, to open outwardly therefrom to permit ascension thereof, comprising a door fitting said opening which, in closed position, blends with the contour of said hull, hinge means securing one edge of said door to the lower edge of the opening in said hull and permitting the door to swing outwardly, a first ladder section secured on the inside of said door in a position to provide for ascension when the door is swung down to full open position, said first ladder section having a pair of side bars and at least one rung in the vicinity of the lower extremities of the side bars in open position, apexed side supports disposed in planes normal to that of the first ladder section and secured to the opposite extremities of each of said side bars, a second ladder section pivotable in the vicinity of said lower rung and having side bars spaced apart less than the distance between the side bars of the said first ladder section whereby in closed position the second ladder section may be folded up and laid substantially parallel to said first ladder section, rungs on said second ladder section, and flexible means extending between points inside of said opening to the apexes of each of the said side supports and further extending between

said apexes and the lower extremities of said second ladder section, whereby said articulated ladder may be supported at an angle to a vertical plane passing through said vehicle and is provided with hand-assisting means for ascension.

2. The ladder as described in claim 1 wherein means are provided for locking the door within the hull and a spring plunger is provided within the opening, constantly urging the door outward.

3. The ladder as described in claim 2 wherein there is provided a cable-like member for releasing the door lock accessible both from within and without the hull.

4. In combination with the ladder as described in claim 2 wherein the vehicle is a boat and the hull is provided with an orifice in the vicinity of the water line of the boat, a cable-like member for releasing the door lock which member is extended through said orifice and along said water line whereby when the boat is waterbourne that part of the cable-like member extending along the water line serves as a grab-line as well as a means for releasing the door lock.

5. A ladder as described in claim 1 wherein the pivoting of said second ladder section is accomplished by providing a pin in each side bar of

the first ladder section in the vicinity of the lower rung and parallel to said rung, lugs to receive said pins adjacent each pivoting extremity of the side bars of the second ladder section and arcuately shaped extremities to conform with part of the perimeter of said lower rung, whereby when said second ladder section has pivoted to approximate alignment with the first ladder section, the arcuate extremities of the second ladder section engage the lower rung of the first ladder section to prevent further swinging beyond said position of alignment.

ANTHONY J. MORENO.
CYRIL L. FENN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
377,219	Webster	Jan. 31, 1888
2,095,392	Marschke	Oct. 12, 1937
2,453,937	Ray	Nov. 16, 1948
2,531,263	Fink	Nov. 21, 1950