July 9, 1957 D. MORROW 2,798,653

EXTENSIBLE LADDER

Filed Oct. 23, 1951 2 Sheets-Sheet 1

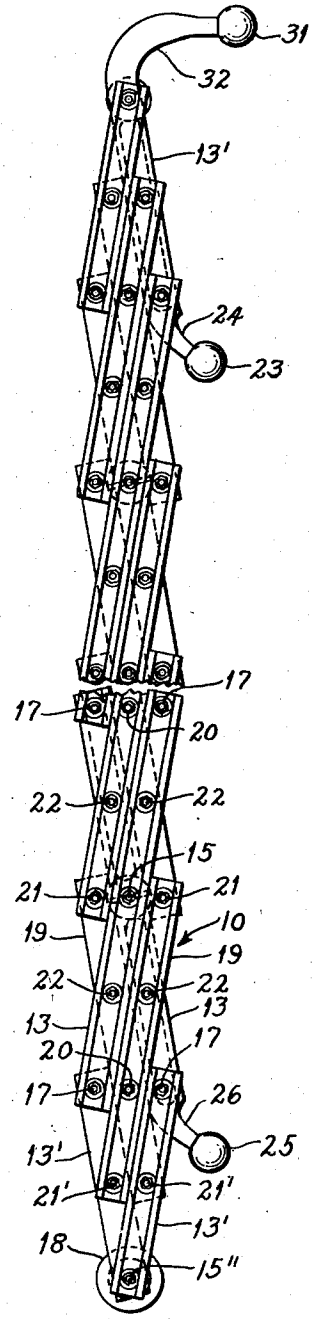


FIG. 1

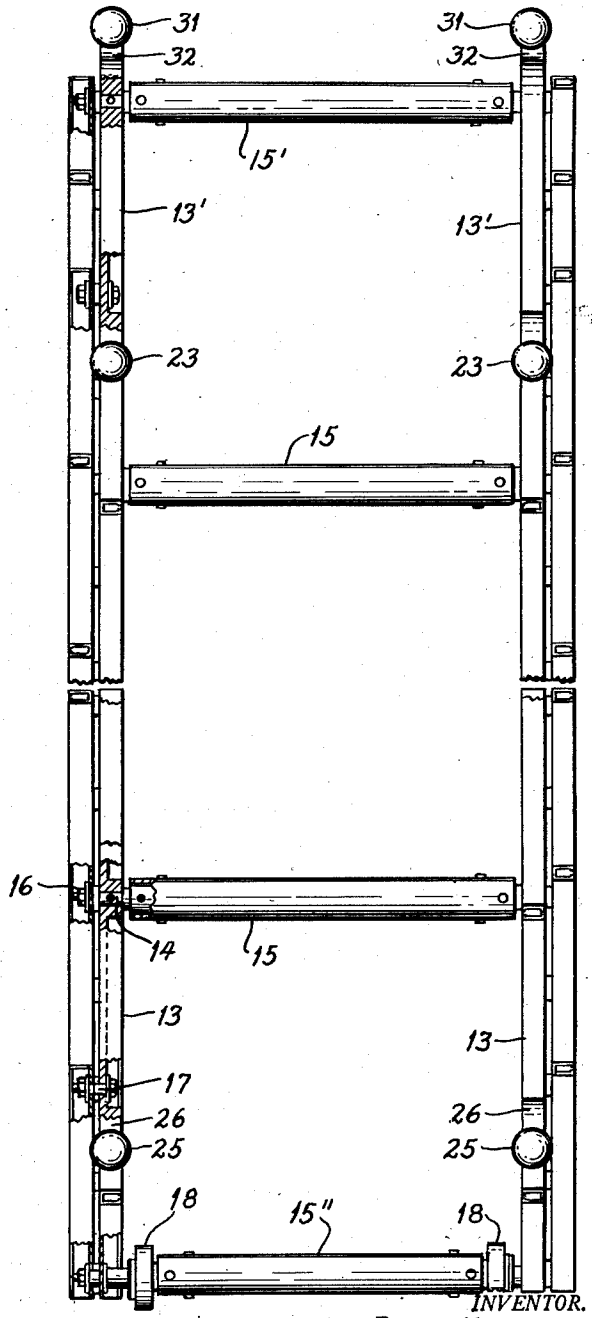


FIG. 2

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EXTENSIBLE LADDER

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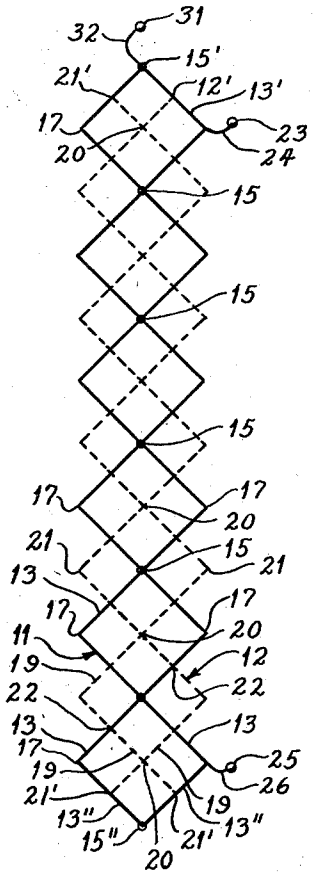


FIG. 3

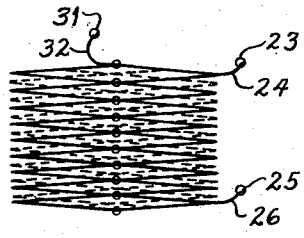


FIG. 4

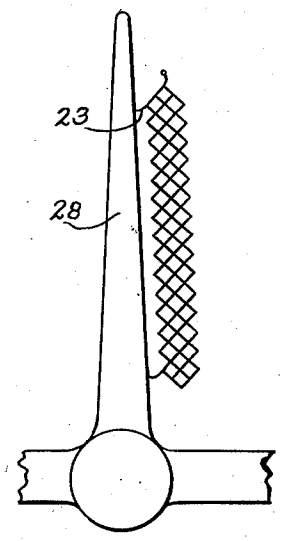


FIG. 6

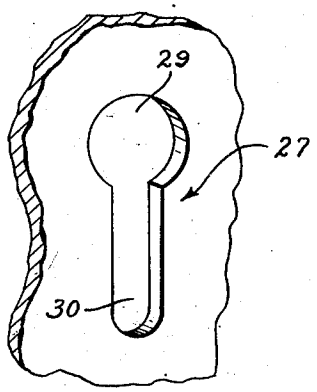


FIG. 5

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EXTENSIBLE LADDER

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Application October 23, 1951, Serial No. 252,688

6 Claims. (Cl. 228—19.2)

This invention relates to extensible ladders, and has particular reference to ladders of "lazy tongs" construction which may be folded into a compact unit for easy stowage when not in use.

The ladder of the present invention was devised to facilitate entry and exit of personnel from an elevated aircraft cabin and has proved to be admirably adapted for that purpose, although its utility is not so limited. The ladder is extended from collapsed or contracted condition in which it is stowed in the cabin or fuselage, and lowered to the ground when exit from the cabin is desired and is extended and elevated to the cabin when entry thereto is desired, thus solving a problem not otherwise susceptible of solution with non-stowable fixed ladders or unstable rope ladders which are not attachable or detachable from the remote end thereof.

The extensible ladder of this invention comprises side members, each of which consists essentially of a primary lazy tong structure and secondary lazy tong structure superimposed thereon to brace and strengthen the former, these side members being spaced in parallel relation by rungs which lie in close proximity when the ladder is collapsed and are spaced at regular intervals vertically when the ladder is extended. Secured to the upper end of the ladder are one or more hooks for attaching the ladder to the point which is to be reached thereby. Preferably, the hook is an extension of one of the crossed bars of the side member and has a ball-like head or knob adapted to be inserted in a key hole slot in the structure intended to be scaled with the ladder, such as the hatch of an aircraft cabin, its outer surface, or the surface of a large tail fin or rudder, as examples. Means also may be provided for locking the ladder in extended position, such as a lower mounting hook or knob cooperating with a corresponding lower key hole slot, or means for locking the lazy tong side members against collapsing when extended.

It will be seen that the collapsible ladder of this invention forms a strong and rigid structure when extended and may be handled from either end and secured safely to the object to be scaled, while being capable of being retracted or collapsed from either end for compact stowage.

For a more complete understanding of the invention, reference may be had to the accompanying drawings, in which:

Figure 1 is an edge view of the ladder of this invention in extended position;

Fig. 2 is a front view thereof;

Fig. 3 is a schematic edge view of the ladder in semi-extended position;

Fig. 4 shows the ladder in collapsed position ready for stowage;

Fig. 5 is an enlarged fragment of a side wall having a key hole slot for receiving the knob hook of the ladder; and

Fig. 6 illustrates one way of locking the ladder in semi-extended position for use in ascending a vertical tail fin or rudder of large aircraft provided with the key hole slots

of Fig. 5 for receiving mounting knobs or hooks at both ends of the ladder.

Referring to Figs. 1, 2 and 3 of the drawings, numeral **10** designates the side members, each of which comprises a primary lazy tong **11**, shown in heavy lines in Fig. 3, and a secondary lazy tong **12**, shown in dotted lines in Fig. 3.

The primary lazy tong **11** comprises a plurality of crossed bars **13** of light-weight metal, such as alloy steel, preferably channel- or box-shaped in cross-section and pivoted at their center points on the reduced ends **14** of the corresponding rung **15**, which preferably is tubular, although it may be a flat step extending in the common plane of corresponding opposite crossed bars **13**, so as to lie horizontally when the ladder is inclined like a staircase. The rung end extension **14** may be pinned to the inner crossed bar **13** and the outer crossed bar **13** is secured thereto by a nut **16** recessed within the channel- or box-section of that crossed bar, as shown in Figs. 1 and 2. The free ends of the adjacent crossed bars **13** are pivoted together by bolts **17**, also as shown in Figs. 1 and 2.

As many such sets of crossed bars are secured together in that way as the extended length of the ladder may require, and the upper and lower free ends of the crossed bars **13** are connected by half length bars **13'** and **13''**, respectively, the free ends of which are pivoted together on the respective upper and lower rungs **15'** and **15''**.

The lower rung **15''** preferably is provided with buffer rings **18** which are of larger diameter than the rung **15''** so that they rest on the ground or other supporting surface, rather than the rung **15''** or the ends of the lower crossed bars **13'**, whereby the latter are prevented from being injured by contact with the ground.

Superimposed on the primary lazy tong structure **11** just described, is the secondary lazy tong structure **12**, shown in dotted lines in Fig. 3, and constructed essentially the same way except that it is not fitted with rungs or upper and lower half crossed bars like **13'** and **13''**. Thus, secondary crossed bars **19** are pivoted together at their center points on bolts **20** and at their free ends to the free ends of the adjacent set, about bolts **21**, with the free ends of the uppermost and lowermost secondary crossed bars **19** being pivoted at the midpoints **21'** of upper and lower primary crossed bars **13'**. If desired, or the rung spacing requires it, rungs like **15** may also extend between pivot points **20** on secondary structure **12**, or between corresponding opposite points on either or both the primary and secondary structures **11**, **12**.

In addition to being pivoted at its extreme ends **21'** to the primary lazy tong structure **11**, the secondary lazy tong structure **12** is pivoted thereto by pivot bolts **22** at the points where the primary bars **13** cross the secondary bars **19**, which is the first and third quarter points of each, as is shown particularly in Fig. 3. Thus, the primary and secondary lazy tong structures **11** and **12** are pivoted together and jointly constitute the side member at each side of the ladder thus formed, whereby they supplement the strength and brace each other. Notwithstanding this double structure, the ladder may be collapsed into the compact package shown in Fig. 4, which is readily stowable in a small space within aircraft or elsewhere.

Mounting means for the ladder preferably take the form of one or more knob-like hooks such as that designated **23** and comprising a spherical enlargement on an extension **24** of the outer end of one of the upper primary cross bars **13'**. The extension **24** preferably is of reduced diameter and circular in cross-section, and is curved upwardly so as to extend substantially horizontally when the ladder is fully extended. Similarly, the free end of the corresponding primary crossed bar **13** which lies parallel to the hooked upper crossed bar **13'**, is provided with an

integral knobbed hook **25** whose reduced shank **26** also is so curved as to extend substantially horizontally when the ladder is fully extended.

The surface of the structure to be scaled with the collapsible ladder of this invention is provided with a key hole-shaped slot **27** such as is shown in Fig. 5, where a thin wall, like a sheet metal aircraft skin is depicted by way of example. Assuming that the key hole slot **27** is formed high in a vertical wall of a sheet metal structure like the tail fin or rudder **28** of a large airplane, as shown in Fig. 6, for example, the ladder is extended and the upper knob **23** inserted in the circular hole **29** of the key hole slot **27**. When the ladder is released, the reduced shank **24** drops into the narrow portion or slit **30** of the key hole slot **27**, and the upper end of the ladder is secured.

Where the lower end of the ladder may not rest on a suitable supporting surface, a lower key hole slot may be preferably provided in the wall of the structure **28** for the reception of the lower knobbed hook **25**. It will be seen that the lower hook **25** not only locks the ladder at its lower end, but also determines its extended length, in a manner readily understood, and as seen in Fig. 6.

In cases where the entry or hatch is on an elevated platform or floor, such as the under surface of a cabin, crew compartment or fuselage of an aircraft, for example, the securing hook **31** is mounted at the upper end of each side member of the ladder, with its shank **32** extending substantially at right angles thereto, as shown in Figs. 1 and 3. In that case, the key hole slot is positioned vertically as before, although it may be simply a narrow vertical slot like **30** in Fig. 5, cut in the upper edge of coaming surrounding the hatch or the like.

Operation of the collapsible ladder of this invention will be readily understood from the foregoing description of its structure and, although a preferred embodiment thereof has been described, the invention is not limited thereby except to the extent provided by the scope of the appended claims.

I claim:

1. In a collapsible ladder, the combination of a pair of opposite spaced side members each comprising a lazy tong structure of a pair of crossed bars pivoted together at their center points and pivoted at their ends to adjacent pairs of crossed bars at the ends thereof, rungs extending between corresponding points on the opposite side members, and an extension terminating in a knob serving as mounting means on crossed bars near each end of the ladder, whereby each end of the ladder may be attached to a structure with the rungs of the ladder spaced apart from the respective structures.

2. In a collapsible ladder, the combination of a pair of opposite spaced side members each comprising a lazy tong structure of a pair of crossed bars pivoted together at their center points and pivoted at their ends to adjacent pairs of crossed bars at the ends thereof, rungs extending between corresponding points on the opposite side members, an extension on at least one of said crossed bars in proximity to the uppermost ring, a knob on the extremity of said extension adapted to lodge in a slot in the structure to which the ladder is to be attached, whereby the said uppermost rung is spaced in proximity to the structure, as when the ladder is used to attain an elevated platform, another extension on at least one of said crossed bars more remote from the uppermost rung, and a knob on the extremity of said extension adapted to lodge in a slot in the structure to be attained with the use of the ladder, whereby the said uppermost rung is spaced apart from the structure, as when the ladder is used to climb a wall.

3. In combination with an elevated element having a key hole slot therein, a collapsible ladder comprising lazy tong side members connected by spaced rungs, and at least a pair of knob-like extensions at the upper end of each of said side members, one of said knob-like extensions being closer to the uppermost rung than the other, the one being used when the uppermost rung is to be spaced in proximity to the elevated element, and the other being used when the upper rungs are to be spaced apart from the elevated element for insertion in said key hole slot when the ladder is extended.

4. In combination with an elevated element having a hole therein and a second hole below said first hole, a collapsible ladder comprising lazy tong side members connected by spaced rungs, and a hook-like extension at the upper and lower ends of said side members for insertion in said holes when the ladder is extended, whereby the ladder may be attached to said elevated element with the rungs spaced apart from said elevated element.

5. In combination with a wall of relatively thin material having vertically spaced pairs of holes therein, a collapsible ladder comprising lazy tong side members connected by spaced rungs, and a pair of hook-like extensions at the upper and lower ends of said structures for insertion in corresponding pairs of holes in said wall to hold the ladder in extended position with the rungs spaced apart from said wall.

6. In combination with a wall of relatively thin material having vertically spaced pairs of key hole slots therein, a collapsible ladder comprising lazy tong side members connected by spaced rungs, and a pair of knob-like extensions at the upper and lower ends of said structures for insertion in corresponding pairs of key hole slots in said wall to hold the ladder in extended position with the rungs spaced apart from the wall.

References Cited in the file of this patent

UNITED STATES PATENTS

502,485	Dederick	Aug. 1, 1893
663,883	Gregory	Dec. 18, 1900
698,272	Glover	Apr. 22, 1902
874,801	Siems et al.	Dec. 24, 1907
942,683	Vaghi	Dec. 7, 1909
1,141,554	Klumpp	June 1, 1915
1,626,145	Mitchell	Apr. 26, 1927
1,837,585	Redinbaugh	Dec. 22, 1931
2,182,277	Boor	Dec. 5, 1939
2,246,457	Schultz	June 17, 1941
2,367,253	Williams	Jan. 16, 1945
2,396,034	Baker	Mar. 5, 1946

FOREIGN PATENTS

22,271	Austria	July 1, 1905