Oct. 20, 1942. O. M. LOW 2,299,584

FOLDING LADDER

Filed March 28, 1942

Fig. 1

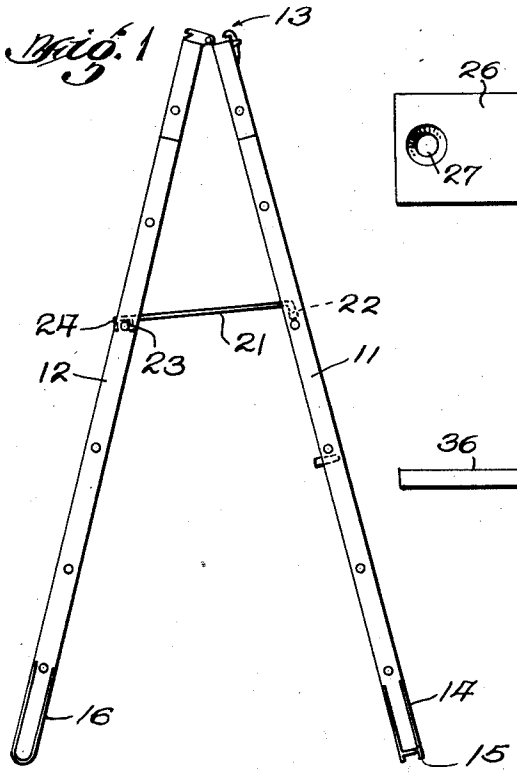


Fig. 5

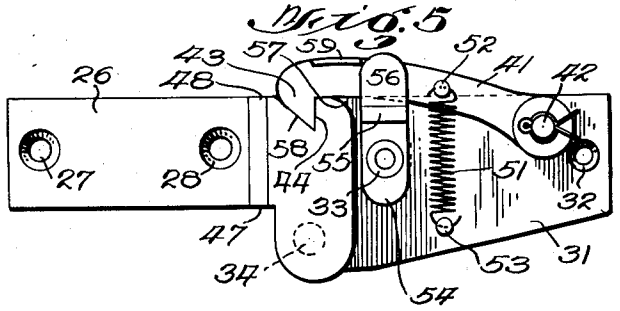


Fig. 4

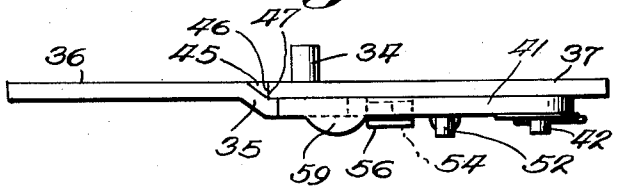


Fig. 3

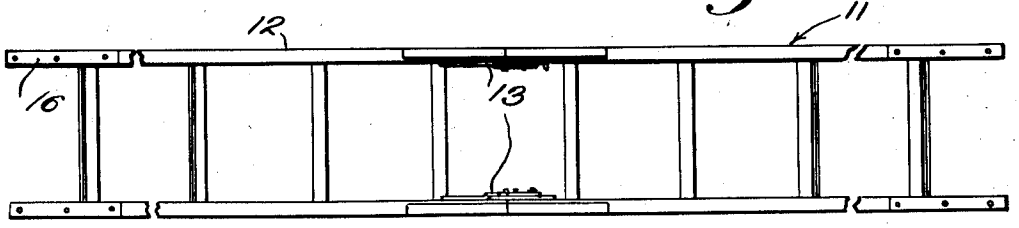




Fig. 2

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UNITED STATES PATENT OFFICE

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FOLDING LADDER

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Application March 28, 1942, Serial No. 436,665

2 Claims. (Cl. 228—23)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein, if patented, may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

The present invention relates to folding ladders and more particularly to a novel and improved type of folding ladder, particularly adapted for use on an airplane crash truck, that is, a truck including wrecking apparatus and fire fighting apparatus such as used in military air fields to rescue pilots and extinguish fires in the event of serious airplane crashes.

It has long been the custom to provide such trucks with some type of short ladder so that the fire fighters could gain access to the plane, as, for example, gain access to the cockpit of the plane in order to remove an injured pilot, but the present types of military aircraft have become so large that any form of straight ladder sufficiently small to be conveniently carried on the crash truck is entirely too short to reach either the cockpit of the ship or the engine nacelles when the plane is standing upright on the ground.

The present invention, accordingly, contemplates the provision of a folding type of ladder of such design and construction to include bed ladder and fly ladder sections of approximately the same length, so that they can be locked in a V-shape and used as a stepladder or extended into alignment with each other and used as a straight ladder, the length being sufficient in the latter case to reach the upper portions of any ordinary types of military aircraft.

The applicant is aware that various types of folding ladders have existed before this invention, but it is submitted that none of the structures known in the prior patent art or in the field of commercial manufactures has been found to be in any way satisfactory for the purpose for which this invention has been developed.

One of the objections to the structures of the prior art has been their complicated types of locking apparatus for maintaining the ladder either in V-shape or in straight position, and it is believed pertinent to point out that in any type of ladder intended for use on damaged and burning aircraft, it is absolutely essential that the ladder securing devices be adapted for almost instant operation and also that they be entirely positive in their action and not subject to accidental release. It is also essential that the securing device of the ladder be so designed as to be steady and permit no lost motion or play between the different sections of the jointed ladder.

It is therefore the prime object of the invention to provide a folding ladder structure including means for maintaining the ladder in V-shape or in straight position that are simple in operation, positive in effect and of a simple compact mechanical arrangment.

The present preferred embodiment of the invention is shown in the drawing attached to and forming a part of this specification in which

Fig. 1 is a side elevational view of the ladder in inverted V or "stepladder" position,

Fig. 2 is a side elevation of the ladder in folded position,

Fig. 3 is a front elevation of the ladder in straight extended position,

Fig. 4 is an edge view of one of the ladder hinges, and

Fig. 5 is a face view of the hinge illustrated in Fig. 4.

The ladder comprises in general a bed section 11 and a fly section 12 pivotally interconnected at their ends by a pair of hinges 13. The bed section 11 is provided with a metal reinforcement 14 at its lower end including gripping spikes 15 to engage the earth and prevent slipping of the ladder while in use. The fly section is also provided with a metal reinforcement 16 at the ladder end but this reinforcement is preferably rounded rather than provided with the spikes as used on the bed portion of the ladder. It will be understood, of course, that each section of the ladder includes two side rails and a plurality of rungs as in any type of ladder construction.

The means for maintaining the ladder in inverted V or "stepladder" position comprises a cross rod 21 having a pivotal connection 22 with the bed portion 11 of the ladder at a point about two-thirds of the distance from the lower end of the portion 11. The cross rod is provided with a pair of right-angled fingers 23 and 24 extending outwardly at right angles to the rod 21 and of sufficient length that they may be dropped on each side of one of the rungs of the fly ladder. When so arranged, it will be apparent that the two sections of the ladder will be locked in predetermined position with respect to each other but that the sections may be instantly released either to fold the ladder or to extend it to its straight position by simply lifting the cross rod 21. To lock the ladder in extended position, it is only necessary to pivot the two sections above the hinges 13 until they reach alignment with each other.

From an examination of Figs. 4 and 5, it will be seen that the hinges 13 each include a hinge plate 26 rigidly connected to the lower portion of the fly section of the ladder by wood screws extending through the countersunk openings 27 and 28. Similarly, the upper end of the bed section 11 of the ladder is rigidly secured to the hinge plate 31 by means of a pair of wood screws arranged to seat in the countersunk openings 32 and 33.

The hinge plates 26 and 31 are pivoted to each

other by hinge pins 34 extending through the plate 26 and the plate 31 and the hinge plate 26 is angularly off set at the point 35, a distance substantially equal to the thickness of the metal of the hinge plates so that the faces 36 and 37 of the hinge plates 26 and 31 respectively, will lie in the same plane in order that the side rails of the upper and lower sections of the ladder will be in alignment when the ladder is extended.

The ladder sections are locked in extended position by a latch arm 41 pivoted on a stud 42 in the hinge plate 31 and provided with a hook portion 43 adapted to engage the notch 44 formed in the hinge plate 26. When the latch hook 43 is in engagement with the notch 44, a folding movement of the ladder will be impossible without disengaging the latch, but it is equally important to provide a structure wherein the two sections of the ladder, when latched, are not only prevented from unlatching but are held in absolutely solid vibrationless association without any play or lost motion between the ladder sections.

To this end the off-set section 35 of the plate 26 is built up, preferably by welding, to provide a triangular area 45 of metal having a flat, smooth, front face 46 serving as an abutment to receive the square front edge 47 of the hinge plate 37 when the ladder is swung to extended position. The surfaces 46 and 47 extend completely across the hinge plate from the point indicated at 48 in Fig. 5 to the point indicated at 47 so that a relatively large surface is in full flush contact between the upper and lower hinge sections and any possibility of damaging the hinge by the inertia of the ladders swinging into position is prevented. This structure, in cooperation with the latch to prevent release movement, provides an extremely rigid hinge construction.

It is, of course, desirable that the latches automatically engage when the ladder sections reach alignment, and to this end a spring 51 is stretched between the stud 52 on the latch arm 41 and a stationary stud 53 on the hinge plate 31. The spring tends to draw the latch hook downwardly into engagement with the notch 44, but when the ladder is in folded position, the movement of the hook 41 is limited by a retaining clip 54 spot-welded to the hinge plate 31. The clip 54 is off-set from the plate 31 to provide a latch stop 55 and upper end 56 positioned beside the latch arm 41 and prevent any possibility of sideward movement of the latch arm away from the surface of the plate which might result in an accidental release of the latch. In addition, it will be noted that the stop portion 55 of spring retainer clip is located to extend just below the latching position of the latch arm 41, so that when the ladder is folded, the latch arm will be held in predetermined position, and when the ladder is straightened the curved upper portion 57 of the hinge plate 26 will engage the angular portion 58 of the latch hock so that the hinge plate 26 will ride under the latch and permit the hook to engage with the notch 44.

The hinges of the ladder are intended to be released manually and a lip 59 has been provided on each of the latch arms 41 in order to lift the latch arm against the action of the spring 51 and disengage the hook 43 from the notch 44.

From the foregoing it will be seen that the present invention provides a novel hinge and latching structure that is capable of maintaining the sections of the ladder in exact alignment with a high degree of rigidity of the structure and at the same time the hinges are of such mechanical design as to be very compact and rugged so that they will not interfere with the movements of firemen climbing up or down the ladder and will not be easily subject to damage in use.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a folding ladder, a bed section and a fly section, each section including a pair of side rails and a plurality of rungs; the sections being connected at the upper and lower ends respectively by a pair of latching hinges, one of said hinges being secured between the ends of each of the side rails of the ladder; each of said hinges including a pair of hinge plates secured in face-to-face relationship with the inner face of the rails of the ladder and one of said hinge plates being off set a distance approximately equal to the thickness of the plates so that the inner faces of each plate lie in the same plane and so that a portion of the inner face of one plate may lie in face-to-face sliding relationship with the opposite plate; a hinge pivot extending through both of said plates at said off-set portion; a hinge latch hook pivotally mounted on one of the plates; a notch adapted to receive said hook on the off-set portion of the other plate; a spring arranged to urge said latch hook into engagement with the notch and a latch hook clip having a stop portion to limit the movement of the latch hook against the spring and an extension portion to lie in face-to-face relationship with the side of the latch arm opposite the hinge plate and prevent lateral displacement of the latching hook.

2. In a folding ladder, a bed section and a fly section, each section including a pair of side rails and a plurality of rungs; the sections being connected at the upper and lower ends respectively by a pair of identical opposite latching hinges, one of said hinges being secured between the ends of each of the side rails of the ladder; each of said hinges including a pair of hinge plates secured in face-to-face relationship with the inner face of the rails of the ladder and one of said hinge plates being off-set a distance approximately equal to the thickness of the plates so that the inner faces of each plate lie in the same plane and so that a portion of the inner face of one plate may lie in face-to-face sliding relationship with the opposite plate; a hinge pivot extending through both of said plates at said off-set portion, the off-set plate including a square flat shoulder adjacent the offset and extending the full width of the plate, said shoulder being adapted to receive and seat against the edge of the opposite hinge plate; a hinge latch hook pivotally mounted on one of the plates; a notch adapted to receive said hook on the off-set portion of the other plate; a spring arranged to urge said latch hook into engagement with the notch and a latch hook clip having a stop portion to limit the movement of the latch hook against the spring and an extension portion to lie in face-to-face relationship with the side of the latch arm opposite the hinge plate and prevent lateral displacement of the latching hook.

OTTO M. LOW.