Dec. 5, 1939. L. M. BOOR 2,182,277

COLLAPSIBLE LADDER

Filed Sept. 10, 1938

Fig. 1.

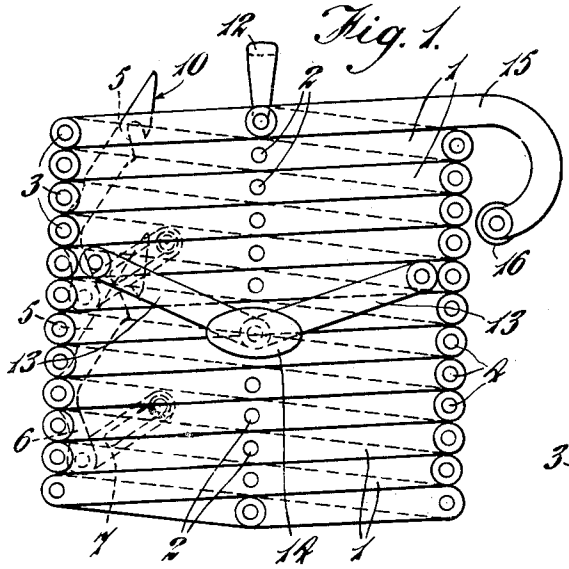


Fig. 2.

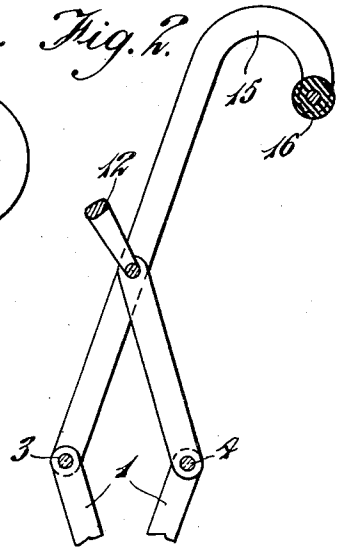


Fig. 3.

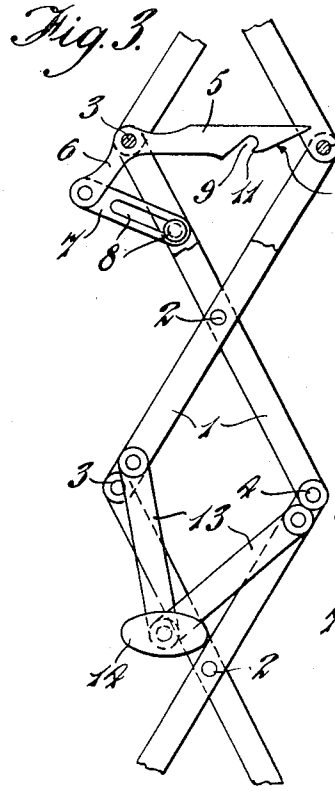
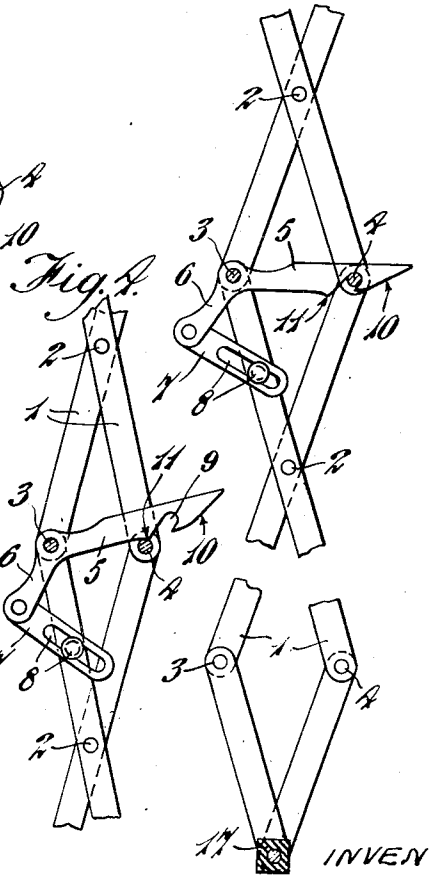


Fig. 4.



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COLLAPSIBLE LADDER

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5 Claims. (Cl. 228—19.2)

This invention relates to extensible and collapsible ladders of the kind wherein the sides are formed by lazy tongs and the rungs are formed by pairs of bars the ends of which form the end pivots of successive interpivoted lazy tong links.

The object of the invention is to provide a ladder of this kind which can be extended and collapsed very easily and becomes automatically locked in extended position at the end of the extending operation.

According to the invention an extensible and collapsible ladder of the kind referred to includes catch means for interlocking at least one pair of rung bars in the extended position of the ladder, so as to prevent spreading movement of said bars. It follows from the nature of the lazy tongs that when same (i. e. the ladder sides) are extended, the individual bars of each rung pair are closest together and that when the lazy tongs are completely collapsed said bars are farthest apart. Consequently, if at least one pair of rung bars is locked together when the ladder is extended (rung bars close together), the ladder cannot collapse because it is necessary for the rung bars of each pair to spread apart for permitting collapse.

The catch means may be constructed in any suitable manner, but a convenient and simple embodiment thereof will now be described by way of example with reference to the accompanying drawing wherein:

Figure 1 is a side view of a ladder according to the invention in the collapsed position;

Figure 2 is a similar view in the extended and locked position;

Figure 3 is a fragmentary side view, partially extended position prior to locking; and

Figure 4 is a fragmentary side view, extended position, showing the unlocking method described later.

Referring to the drawing, each ladder side is constructed in the known manner of a lazy tongs with pairs of links 1 interpivoted at 2 in scissors-manner, successive pairs being pivotally attached together at their ends. The rungs of the ladder are formed by pairs of bars 3, 4 the ends of which form the aforesaid end pivots of the successive inter-pivoted lazy tong links 1.

Pivoted to one of the rung bars 3 of a pair of rung bars there is a two armed lever including the catch arm 5 and the tail piece 6, said catch arm 5 extending towards the other bar 4 of the pair transversely of the longitudinal direction of the ladder. This arm 5 may be long enough to bear against said other bar 4 by gravity in all positions of the ladder, or—as illustrated—the arm 5 need be only sufficiently long to bear against the bar 4 (for locking therewith as described later) in the extended position of the ladder. The tail 6 on the side of the pivot 3 opposite the arm 5 maintains the latter in an operative position by the supporting link 7 fixed to a link 1 by a pin-and-slot connection 8. At a suitable distance from its pivot point the arm 5 has a hook slot 9 formed in its lower edge. In the collapsed position of the ladder the hook slot 9 is clear of the bar 4 of the pair, but as the ladder is extended said bar 4 moves towards the pivoted end of the arm as in Figure 3, and when the bar 4 reaches the hook slot 9 the arm 5 drops over the bar 4 by said slot 9 and interlocks the bar 4 with the bar 3 to which it is pivoted as in Figure 2. The inclination of the hook slot 9 is such that it prevents spreading of the bars of the pair in interlocking position. The distance apart of the hook slot 9 from the pivot point 3 of the arm 5 is such that interlocking takes place before the ladder becomes fully extended. For collapsing the ladder it is first extended a little further as in Figure 4, whereby bar 4 engaged by the hook slot 9 further approaches the other bar 3 and thereby becomes disengaged from the slot. It will be observed that the inclination of the slot 9 causes the arm 5 to rise during this manoeuvre; further the hooked corner 11 of the slot is higher than the other corner. Consequently, the ladder may now be allowed to collapse so rapidly that the slot 9 will not have time to re-engage the receding bar 4 and as soon as this is past the slot the ladder may be allowed to collapse smoothly and slowly.

It will be observed that in the extended and locked position depicted in Figure 2 a portion of the catch arm 5 beyond the hook slot 9 thereof will overhang perpendicularly of the general plane of the ladder. This may be a comparatively long portion, especially in the case (not shown) where an arm 5 is employed long enough to rest on the bar 4 in all positions of the ladder. Should it be found that this overhanging portion is in the way it may be pivoted to the arm so as to be free to drop downwards, a suitable stop being provided for preventing the pivoted portion from rotating upwards from the position of alignment with the rest of the arm.

The catch arm 5 may be disposed at any suitable position along the pair of bars 3, 4, but conveniently it is mounted at or near one side of the ladder, on the inner side of the lazy tongs 1, 1. Any desired number of catch arms may be

provided, for example one arm may be pivoted at each end of a bar of pair of rung bars at the inner side of the lazy tongs forming the sides of the ladder and each pair of rung bars may be so provided with two catch arms, or one pair with one arm on one side and the next pair with one arm on the other side and so forth.

The ladder may be extended by applying a pull to the uppermost rung bars, or the uppermost links 1 of the lazy tongs may be reduced to one half terminating at the uppermost pivot 2 and connected together by a bar 12 formed with pivots at its ends for said half links and this bar may be used as a handle for extending the ladder by applying a pull thereto. However, it is preferred to provide operating means for the ladder, so as to facilitate extension and collapse thereof, particularly in the case of long ladders.

Such an operating means may conveniently comprise pairs of links 13 (Figures 1 and 3) each slightly longer than half the length of the lazy tong links 1, each pair being pivoted together at one end, the other ends of the links being pivoted to the outer sides of the lazy tongs, so that each pair of operating links will be positioned V-wise with an obtuse angle in the collapsed position. The common pivot of each pair of operating links is provided with a knob 14. The operating links are conveniently attached to a pair of links 1 which, when the ladder is extended, are about level with the shoulders of a person of average height. When, with the collapsed ladder resting on the floor, the knobs are pulled upwards the ladder becomes extended owing to the lazy tongs action.

In its preferred form the invention is used as a self-sustaining ladder, the catch lever 5 in conjunction with the spaced rungs serving to hold the sections erect. However, in situations where this type of ladder is not necessary or desired, it may be used as a suspension ladder. That is to say, on hooks 15 may be formed, the uppermost lazy tong links as seen in Figures 1 and 2 so as to enable the ladder to be hooked on to a rail or the like, opposite hooks being joined by a padded bar 16, and at the lower end of the ladder pads 17 (Figure 2) e. g. of rubber, may be provided to prevent slipping on the floor, and to accommodate a user's foot if necessary during the action of extending or collapsing the ladder.

I claim:

1. In a collapsible ladder of the type including opposite side members formed of lazy tong levers having their knee joints connected by cross-rungs which move vertically away from one another when the ladder is extended, a catch lever having a notch and pivoted to one run of at least one of an opposite pair of knee joints to engage the other rung of the related pair of knee joints when the ladder is extended, said lever having cam means at the side of the notch nearest the pivot operative when said ladder is further extended to raise said catch lever wholly above the level of said second mentioned rung of said related pair of knee joints to automatically release the catch and facilitate collapse of the ladder.

2. In an extensible and collapsible ladder of the type including opposite side members formed of lazy tong levers each having their knee joints connected by transverse cross rungs, a catch device including a two armed member having a latch arm and an actuating arm, said member being pivotally supported on a rung at the junction of said latch and actuating arms and the latch arm having a notch, an operating link pivotally connected with the actuating arm of said cranked member, said operating link having a slot engaging a pin on an adjacent lazy tong member whereby the extending movement of the ladder renders the notched latch arm of the cranked member operative to engage a related rung as the ladder reaches the extended position.

3. In an extensible and collapsible ladder according to claim 2, a catch device wherein the latch arm of the two armed member which projects toward the opposite rung bar has a retaining recess at its under side, said recess being obliquely inclined in the direction of the pivotal support of the member to engage the related rung when the ladder is in the extended position to prevent spreading of the bars.

4. In an extensible and collapsible ladder according to claim 2, a catch device wherein the latch arm is provided at the mouth of the notch with a raised corner onto which the rung engaged in the said notch in the extended position of the ladder, is caused to rise as the ladder is extended slightly beyond the normal extended position whereby the latch arm can be moved past the operatve position when collapsing the ladder.

5. In an extensible and collapsible ladder according to claim 2, means for extending the ladder comprising V-wise operating links pivoted between a pair of corresponding rung bars, a handle being provided at the joint of the operating links.

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