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KNOCK-DOWN LOAD SUPPORT

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2,230,015

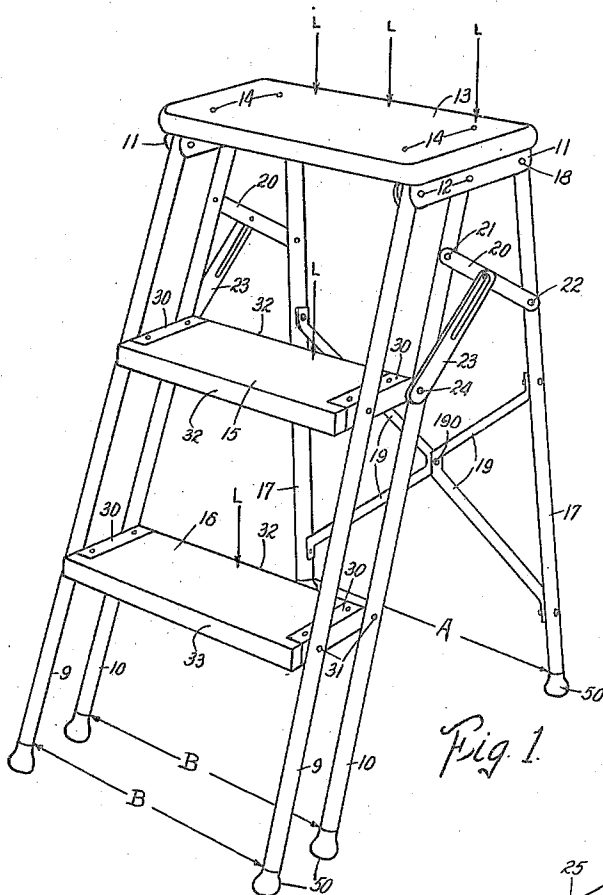


Fig. 1

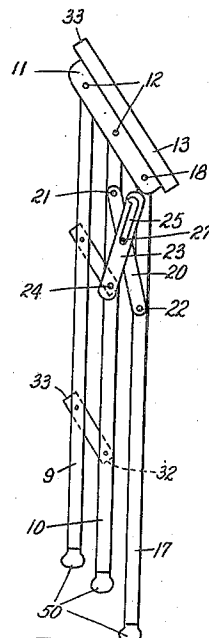


Fig. 2

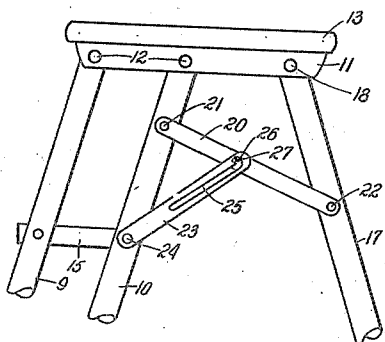


Fig. 3

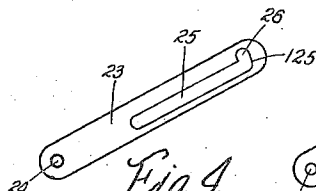


Fig. 4

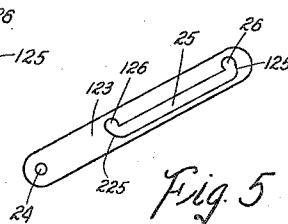


Fig. 5

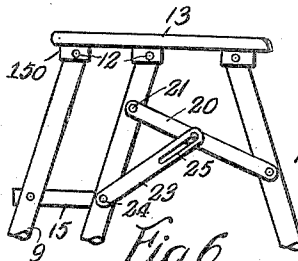


Fig. 6

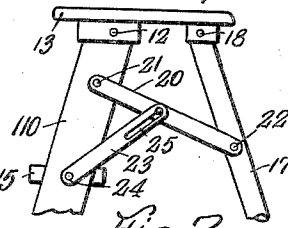


Fig. 7

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KNOCK-DOWN LOAD SUPPORT

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4 Claims. (Cl. 228—37)

This invention relates to load support devices, and more particularly to those devices of the class comprising the so called collapsible step ladders.

5 An object of the present invention is to provide a collapsible step ladder or step stool of such construction as to be strong and rigid when in an open or extended condition for use.

10 A further object of the present invention is to provide a step stool as above described which is adapted to be folded into a compact unit which may be easily handled and stored in a minimum of space.

15 Still a further object of the invention is to provide a collapsible step stool having positive acting safety lock means associated therewith which will automatically set when the step stool is opened for use, and which requires a positive act on the part of an operator to release to effect
20 collapsing of said device.

Another object of the invention is to provide a collapsible step ladder having leg bracing means associated therewith to positively preclude accidental collapse or relative movement of the extended legs even when said device is moved, slid
25 or pushed along its supporting surface.

Still a further object of the invention is to provide a collapsible step stool having means operatively associated therewith to lock said device in a collapsed condition against accidental
30 or unexpected opening.

Another object of the invention is to provide a collapsible step stool of simple construction, which may be inexpensively manufactured and
35 which will give long trouble free service.

These and other objects are attained by the means described herein and disclosed in the following drawing in which:

Fig. 1 is a perspective view of a step stool embodying the present invention in an extended
40 position ready for use.

Fig. 2 is a side view of the device shown in Fig. 1 when in a folded, or collapsed position.

Fig. 3 is an enlarged side view of the device
45 showing a detail comprising a part of the present invention.

Fig. 4 is a plan view of a linkage member comprising a detail of the invention.

Fig. 5 is a side plan view of a modified form of a linkage member comprising a detail of the
50 invention.

Figs. 6 and 7 are side views of modified forms of ladder structures embodying the present invention.

55 The primary object of the present invention is

to provide a step stool which when opened or extended for use will be rigid and positively locked against unexpected collapse.

Such a step stool may comprise two pair of spaced parallel uprights or step support members 9 and 10 which are pivotally connected at their upper ends, as at 12, to a suitable bracket or linkage member 11.

A top step or seat member 13 of any suitable material may be secured to bracket members 10 11, by any suitable means such as rivets 14, whereby the right and left sides of the unit are joined together. Since the right and left sides of the unit are identical in construction just the right side will be described hereinafter for
15 brevity.

Parallel uprights 9 and 10 are maintained in parallelism throughout their length by means of two or more spaced step-bracket or linkage members 30. Opposite ends of such linkage
20 members are pivotally connected, as at 31, to uprights 9 and 10, as shown. Each step bracket or linkage member 30 is in parallelism with top linkage member 11 whereby a parallel link structure is provided comprising uprights 9 and 10
25 and linkage members 11 and 30.

Suitable steps 15 and 16 are adapted to be disposed between opposed, parallel linkage members 30, as shown.

A prop member 17, pivotally secured as at 18
30 to the overhanging portion of top linkage member 11 is provided, as shown.

A fixed linkage member 20, is provided having its opposite ends pivotally secured to upright member 10 as at 21 and to prop 17 as at 22. This
35 fixed linkage member will hereinafter be referred to as spacer bar 20.

A second linkage member, hereinafter referred to as brace bar 23, is pivotally mounted at its lower end to upright 10 as at 24. Said brace bar
40 is provided with a slot 25 which extends longitudinally thereof as clearly shown in Fig. 4. The end of slot 25 remote from pivotal point 24 is provided with a lateral recess or offset 26, as
45 shown.

A suitable pin 27 secured to and extending from spacer bar 20 is adapted for sliding and reciprocable engagement with slot 25 and offset
50 26. If desired the head of said pin may be enlarged somewhat to prevent said pin from becoming disengaged from said slot or offset.

As clearly shown in Fig. 2 pin 27 is disposed in the lower end of slot 25 when the device is in a closed or collapsed condition, at which time uprights 9 and 10 and prop 17 assume the rela-
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tive parallel positions shown. Top step 13 and steps 15 and 16 are in parallelism with their rear edges 32 disposed below their outer or forward edges 33, as shown.

The device may be extended or opened for use by lowering the forward edge 33 of top step 13 whereby linkage member 11 will be moved downwardly about pivot 18. Movement of linkage 11 about pivot 18 causes spacer bar 20 to force upright member 10 laterally away from prop 17, and simultaneously therewith the free end of brace bar 23 is moved relative to said spacer bar until pin 27 contacts the outer end 125 of slot 25 whereupon it is deflected to seat within recess 26. When pin 27 thusly engages recess 26 further relative motion of bracket 11 about pivot 18 is positively precluded and the upright members 9 and 10, prop 17 and linkage members 11 and 30 are locked in what is hereinafter referred to as a fully extended position, as disclosed in Fig. 1.

Each step is prevented from turning about its longitudinal axis by reason of the fact that opposite ends thereof are secured to linkage members 30 of the parallel link structure, therefore since linkage member 11 is locked in a horizontal plane, each step member is likewise locked in a horizontal plane parallel to upper step 13.

It should be observed that the structure, when fully extended is strong and rigid, and that regardless of how a load or loads may be distributed upon top step 13 or upon steps 15 and 16 the structure will not topple or collapse. It should be particularly noted that the application of a load L to the inner edges of steps 15 and 16 and/or to the rear edge of top step 13 will not and can not collapse said device, nor will the application of such load or loads result in relative movement between prop 17, linkage 11 and uprights 9 and 10.

Furthermore it should be noted that the legs (prop 17 and uprights 9 and 10) of a fully extended structure (Fig. 1) are so locked against relative movement as to permit such a structure to be pushed or shoved backwardly or forwardly over a supporting floor without the danger of one or more of said legs striking an object or otherwise resisting movement over the supporting surface so that other parts of the structure could move relative to said leg or legs to tip or collapse said structure. During those periods of time when pin 27 of spacer member 20 is seated within recess 26 of brace bar 23, those portions of prop 17 and upright member 10 which are disposed between common link 11 and spacer bar 20, comprise, along with said link and spacer bar, a trapezoid. Relative motion or movement of any one of the sides (17, 20, 10 and 11) to the other sides is positively precluded so long as the relationship between pin 27 and recess 26 is maintained, as disclosed in Figs. 1, 3, 6 and 7. By reason of this fixed relationship these elements comprise the sides of a fixed trapezoid.

In order to close or collapse such a device from its fully extended position it is necessary for the operator to intentionally lift or swing the outer end of brace bar 23 about pivot 24 whereby to disengage pin 27 from recess 26 and realign it with the longitudinal axis of slot 25. Upright members 9 and 10 may then be lifted relative to prop 17 to close the device into a compact unit as shown in Fig. 2.

If desired suitable resilient tips such as 50

may be secured to the free lower ends of uprights 9 and 10 and props 17, as shown.

In the preferred embodiment of the invention the lateral distance A between the lower ends of corresponding props 17 is greater than the lateral distance B between the lower ends of corresponding uprights 9 and 10, in order to give proper stability to the device when in a fully extended position.

The lateral distance between props 17 may be fixed by means of suitable tie rod members such as 19, which may be anchored together as at 190.

When the device is in a collapsed condition (Fig. 2) it often occurs that the weight of uprights 9 and 10, steps 15 and 16, linkage members 30 and top step 13 will cause the device to suddenly and unexpectedly swing open to an extended position. It has been found that by substituting a brace bar such as 123 (Fig. 5) for brace bar 23 the device may be positively locked in a collapsed or closed position. Brace bar 123 is similar to 23 except for the provision of an offset recess 126 provided adjacent the lower end 225 of slot 25, as shown.

Pin 27 is adapted to automatically engage recess 126 when the device is fully collapsed whereby the parts are locked against further relative movement. Said device may be unlocked from its collapsed condition only after the operator has lifted or swung the outer end of brace bar 123 upwardly of pivot 24 whereby pin 27 is disengaged from recess 126 and aligned with the lower end of slot 25.

From the foregoing it is apparent that I have provided a step stool device having means associated therewith for locking said device in both an extended and collapsed position, and which locking means may be released only in response to an intentional act upon the part of an operator.

In the preferred embodiment of the invention uprights 9 and 10 and props 17 may be tubular members and the links 20 and 23 and braces 19 may be of suitable flat metal stock. The tread portion of each step may be suitably secured or anchored to the linkage members 30 which may be U-shaped in cross section, which in turn may be pivotally anchored to uprights 9 and 10 by suitable pivots 31.

It should be observed that in some instances it may be desirable to provide but one brace bar 23 and one spacer bar 20 in lieu of the two pair shown in Fig. 1.

It should be understood that instead of being pivotally connected to linkage member 11, as shown, the upper ends of props 17 and uprights 9 and 10 may be pivotally secured to one or more individual bracket members 150, each of which may be independently anchored to top step 13, in which event the top step would comprise the common linkage member from which the legs are secured, as disclosed in Fig. 6.

It should also be understood, that if desired, a single wide upright step carrying member 110, Fig. 7, such as step frame 3 as disclosed in the patents to Reed No. 1,644,856, and Cassidy No. 1,064,289, may be substituted for the parallel uprights 9 and 10. Such a member may be pivotally secured to linkage member 11 by any suitable means. Such an upright member would be capable of being locked in a fully extended position or in a collapsed position by means of spacer bars 20 and brace bars 23 in the same manner in which the spaced parallel

uprights 9 and 10 are locked relative to prop 17.

It should be understood that various modifications and changes in the structural details of the device may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What is claimed is:

1. In a device of the class described comprising a pair of spaced parallel uprights and a prop pivotally connected to a common linkage member, a spacer bar, the opposite ends of which are pivoted to said prop and to one of said upright members, a pin carried by said spacer bar, a brace bar one end of which is pivotally secured to the aforementioned upright member, the opposite end of said brace bar including a slot extending longitudinally thereof and terminating at its outer end in a recess offset from said longitudinal axis, said spacer bar pin adapted for reciprocable engagement with said brace bar slot and for engagement with said offset recess to limit the degree of relative movement between the free ends of said prop and said spaced parallel uprights, and linkage means for maintaining said upright members in constant parallelism.

2. In a device of the class described comprising a pair of spaced parallel upstanding members interconnected by a plurality of parallel links, one link including an overhanging portion, a prop member pivotally secured to said overhanging portion, a spacer bar having opposite ends pivotally secured to said prop and to one upstanding member for permitting said upstanding members and prop to be collapsed to substantial parallelisms about a common link, a brace bar one end of which is pivoted to the aforesaid upstanding member and including a slot extending longitudinally thereof terminating in an offset recess adjacent its outer end, a slot engageable member carried by said spacer bar adapted to engage said offset recess when the prop and upstanding members are fully extended from their collapsed position to lock said parts in their relative extended positions.

3. In a device of the class described comprising

a pair of spaced parallel upstanding members interconnected by a plurality of parallel links, one link including an overhanging portion, a prop member pivotally secured to said overhanging portion, a spacer bar having opposite ends pivotally secured to said prop and to one upstanding member for permitting said upstanding members and prop to be collapsed to substantial parallelisms about a common link, a brace bar one end of which is pivoted to the aforesaid upstanding member and including a slot extending longitudinally thereof, opposite ends of said slot terminating in offset recesses, a slot and recess engageable member carried by said spacer bar adapted to engage one offset recess to releasably lock the device in a fully extended position, and adapted to engage the other offset recess to releasably lock the device in a fully collapsed position.

4. In a device of the class described, comprising a pair of spaced parallel uprights and a prop pivotally connected to a common linkage member, a plurality of parallel steps the front and rear portions of each of which are pivotally connected to the parallel uprights whereby to provide a parallel linkage structure, a spacer bar having opposite ends which are pivotally connected one each to said prop and to that upstanding linkage member adjacent said prop and to which the rear portion of said steps are secured, a pin secured to and carried by said spacer bar, a brace bar one end of which is pivotally secured to the same upstanding member to which one end of said spacer bar is connected, said brace bar including an axial slot terminating at its outer end in an offset notch, said slot adapted to slidably engage said pin when the prop and upstanding members are moved between collapsed and fully extended positions, said notch adapted to releasably engage said pin when the prop and upstanding members are fully extended for locking them against unintentional relative movement, said brace bar and the rear portion of one step being secured to a common upright member by means of a common pivot.

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