Jan. 8, 1963 C. A. SOANS 3,072,216

FOLDING STOOL

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Fig. 1

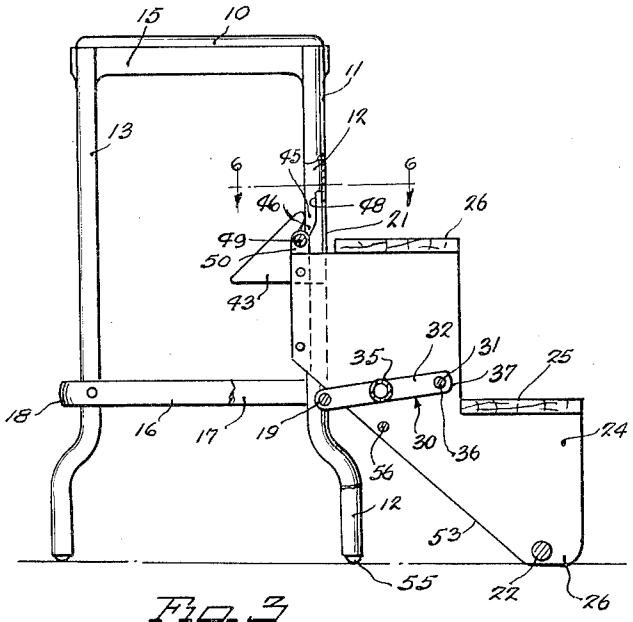


Fig. 2

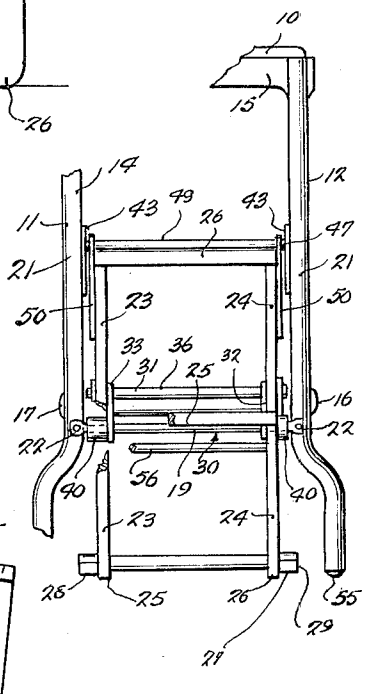
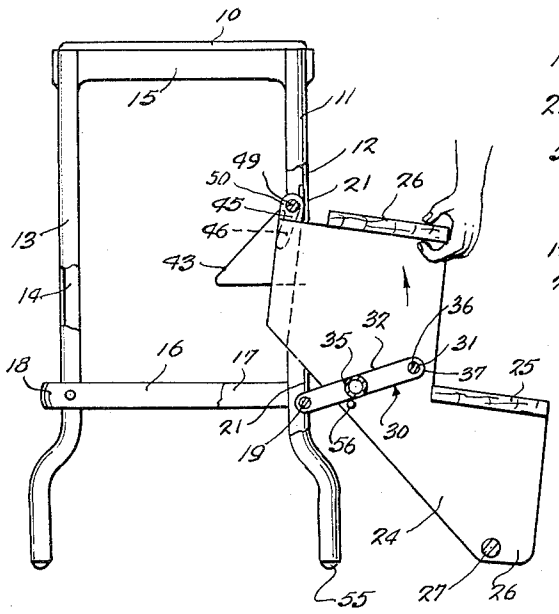


Fig. 3



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Fig. 4

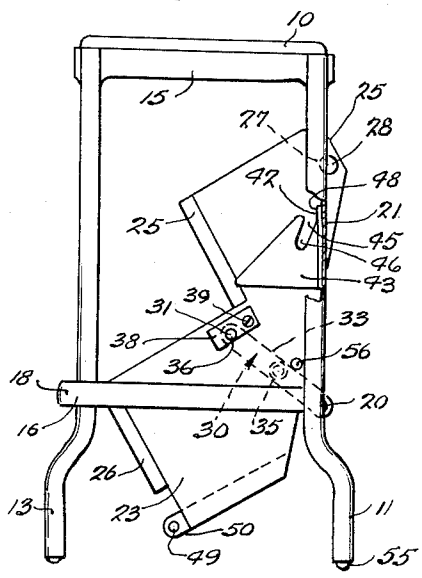


Fig. 7

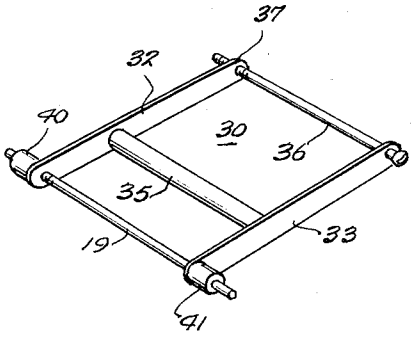


Fig. 5

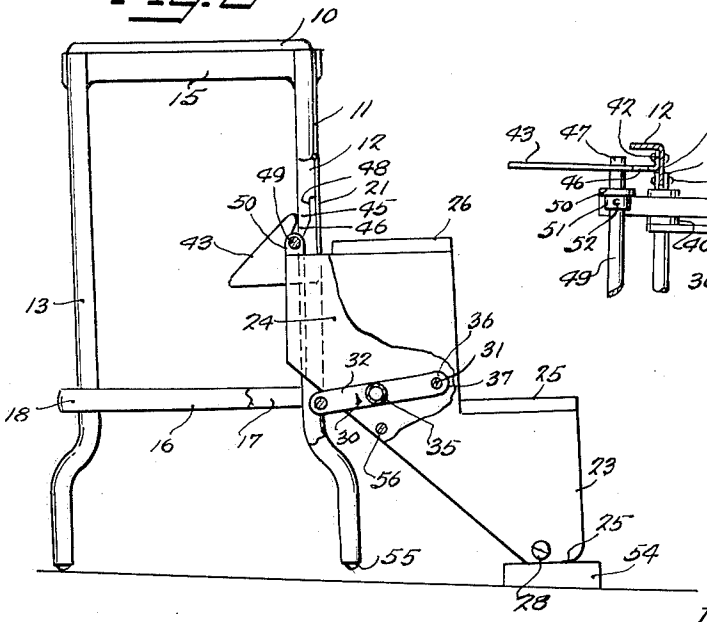
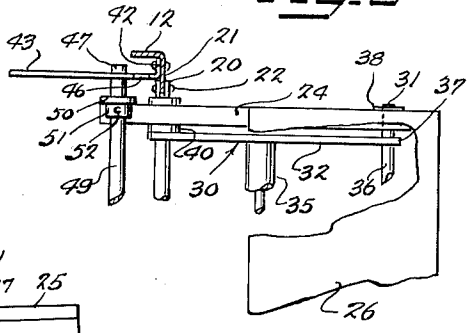


Fig. 6



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FOLDING STOOL

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7 Claims. (Cl. 182—33.6)

The invention relates to a folding stool in the form of a step-ladder for occasional use as such in a home or elsewhere, but which is generally kept folded so that the lower step or steps are caged under the top step or platform of the structure so that the top step can serve as a seat. Such a structure has a self-standing main supporting base or frame, the floor dimensions of which are desirably of relatively small size so that a minimum of floor area is needed for storage or when it is used as a seat.

The usual type of step-stool, when unfolded, may have enough stability when the feet of the user are on a lower step, but when both feet are on the top platform and maximum safety is needed, the unfolded and extended stair part is of little or no help to the stability of the main base. Most persons standing with both feet on the top platform fail to realize that the extended stair part does not function as a rigid front extension or brace for the main base, and adds little to the stability of the structure.

Many accidents have resulted from the collapsing of stepping stools due to reaction forces exerted backwardly by a person standing on the top platform and facing a wall towards which the person is applying a forward pressure.

The principal object of the present invention is to provide a folding stair structure of the class described having a foldable lower stair element which when unfolded is so locked to the main base structure that it serves as a rigid truss or reversed cantilever projecting from the main base.

A further object is to provide a self-locking arrangement of the class described which a person can fold and unfold by simple movements of one hand only.

Another object is to provide a structure of the class described which when in folded or unfolded conditions, can with one hand be picked up and set down, and carried from place to place without requiring any re-adjustment of its parts as a result of such activities.

Other objects, features and advantages will be described as the description proceeds.

In the drawings accompanying this written description the invention is shown as incorporated in a step-stool of the household type having a seat height of about 24" with a folding stair of 2 steps which are so spaced that when the stair is unfolded there are three rises, each about 8" high, between the floor and the seat. In said drawings:

FIG. 1 is a side elevation of the stool in unfolded and locked condition when used as a step ladder, with certain parts broken away.

FIG. 2 is a fragmentary front elevation of the stool in the unfolded or locked condition.

FIG. 3 is a view similar to FIG. 1, but showing the rear or inner end of the stair raised by the hand into unlocked condition so that it can be swung upwardly and rearwardly into its caged position.

FIG. 4 is a side elevation of the stool in fully folded condition with the stair caged under the seat.

FIG. 5 is a side elevation similar to FIG. 1 with the outer end of the stair shimmed up from the floor to demonstrate the locking feature.

FIG. 6 is an enlarged fragmentary sectional plan view taken on the line 7—7 of FIG. 1.

FIG. 7 is an enlarged perspective view of the linkage unit which constitutes a floating pivotal connection between the base structure and the folding stair element.

Referring to the drawings, the main base frame comprises a top step or platform 10 to which are rigidly secured a pair of front legs 11 and 12 and a pair of rear legs 13 and 14. To prevent racking of the frame the top platform 10 is made with an integral depending continuous outer flange 15, and the legs are also secured together by means of a stout integral lower outer frame element which comprises side pieces 16 and 17 and a rear cross-piece 18. The front legs 11 and 12 of the frame which in the present instance are angular in cross-section, are secured together by a circular rod, the ends of which are made with open-ended vertical slots as at 19 (see FIG. 6) to receive the front flanges 21 of the front legs 11 and 12. The ends of the rod 19 are fastened to the webs of said leg-flanges by means fo pins or rivets 22.

The folding stair-element comprises a pair of side plates 23 and 24 to which are rigidly united a bottom step 25 and a middle step 26. This integral stair element has a pair of front ends or feet 25 and 26 which engage the floor a substantial distance in front of the main frame when the stair element is unfolded or extended, as shown in FIGS. 1 and 2. These feet are tied together by a cross-bar 27 the ends of which extend through and project outwardly beyond the side plates as shown in FIG. 2, said projections 28 and 29 being flattened so that when the stair is folded and caged within the main frame, the flattened ends will lie against the front flanges of the front legs 14 and 13 as shown in FIG. 4. In this fully folded position the ends of the cross-bar 27 serve as limit stops for preventing the stair element from dropping to the floor when the stair is caged.

The folding stair element is pivoted to the base structure so as to swing from its folded position outwardly about the horizontal axis of the stationary tie rod 19. However, the stair is also capable of moving downwardly as a unit relative to the base so that it can be locked or rendered incapable of folding or collapsing when it is in its fully extended condition. Said locking movement of the stair relative to the base is preferably effected by providing an inclined link element 30 the rear end of which is pivoted directly upon the base, preferably on tie rod 19. The outer end of such link-element is pivoted to the stair-element, in the present instance about an axis 31 located preferably above the level of the axis of the tie rod 19 (see FIGS. 1, 2 and 5).

Referring to FIGS. 2 and 7, it will be seen that the link-element 30 comprises a pair of side elements suitably spaced to fit between the side plates 14 and 13, with some clearance to permit relative pivotal movement of the link element and the stair element and thus permit a limited amount of upward movement of the stair as a unit relative to the base-frame when the arrangement is in the extended or unfolded condition. The parallel links 32 nad 33 are held in rigid spaced relation by a stout torsion tube 35 the ends of which are welded to the opposed inside faces of said links 32 and 33. The outer ends of said links are apertured to pivot on the rod 36 extending through the side plates 23 and 24 of the stair-element. One end of said rod 36 is firmly secured against rotation in said side plate while the other end of the rod 36 is threaded to loosely fit threads formed in the apertured outer end 37 of the link 32. The threaded end of rod 36 extends outwardly through the side plate 24 to screw into an outer locknut in the form of a plate 38 (see FIG. 5) which plate is secured in position by a locking screw 39.

The stair element, as a whole, is always maintained in a central position relative to the legs 11 and 12 of the base by means of a pair of spacing collars 40 and 41 on the ends of the tie-rod 19 and located, as shown best in FIGS. 6 and 7, between the inside edge of the front leg flanges 21 and the outer face of the links 32. The torsion

tube 35 serves to maintain the links 32 at all times in the same plane, thereby preventing the stair-element from racking or twisting during the folding or unfolding movement. Hence the stair-element will always swing centrally in the frame and clashing due to careless operation will be avoided.

The stair is locked in unfolded non-collapsible condition by a pair of interengaging parts which are mounted respectively on the base and the upper end of the stair element preferably some distance above the main pivot rod 19. Although under some circumstances a single pair or set of locking parts could be used, in the present instance two sets, one at either side of the base frame, are provided.

In each set of locking parts the part mounted on the base as best shown in FIG. 6, comprises a cam-bracket in the form of an angular plate having a vertical mounting flange 42 which is riveted or welded to the inside face of the front leg flange 21, and an inwardly extending cam flange 43 disposed in a vertical plane. The cam flange has its top edge sloping rearwardly and downwardly at an angle of about 45° to the horizontal, and is provided with a locking slot open at its upper end as shown at 45 and extending inwardly and downwardly at an angle of about 60° to the horizontal as shown at 46.

The width of the slot 46 and the opening 45 is slightly more than the diameter of the locking pin 47 carried by the stair-element. Above the opening 45 the front or outer edge of the slot 46 is extended upwardly so as to provide an abutment 48 to limit the front movement of the circular locking pin 47. The locking pin 47 constitutes one end of a locking rod 49 extending between the spaced sets of interengaging elements, the other end of the rod constituting a locking pin for another similar set of parts mounted on the other front leg 12 of the frame.

The locking rod 49 is rotatably mounted in holes bored in the upper ends of steel straps 50 secured to the outer faces of the side-plates 23 and 24. Excessive longitudinal sliding movement of the rod 49 in the straps 50 is prevented by opposed collars 51 (see FIG. 6) fixed on the rod 49 by set screws 52. In the extended position shown in FIG. 1, the locking rod 49 preferably engages the bottom ends of the cam-slots 46 so as to limit the downward movement of the upper end of the stair, and in this position the oblique rear edges 53 of the stair may also engage the spaced collars 40 and 41 on the tie rod. By this arrangement the inner end of the inclined stair is supported by the main frame when a person stands on the stair.

In FIG. 5 the unfolded stool is shown with the front legs of the frame spaced from the floor by means of shims or blocks 54 placed under the soles of the front feet 25 and 26 of the stair. This drawing is intended to illustrate the manner in which the locking means prevents collapsing of the stool when a person stands on the top step facing the rear and engages in some activity which results in the application of a force which tends to rock the base frame forwardly around a horizontal axis extending through the two front feet 55 of the base. From an examination of this FIG. 5 drawing it will be observed that the relation between the position and inclination of the cam-slot 46, the position of main pivot 19 and the position and length of the link element 30, and the stair pivot 36, is such that in the unfolded position the stair, so far as resistance to forces tending to fold the stair is concerned, is rendered uncollapsible and functions in effect as a reversed cantilever extending forwardly from and forming a rigid forward extension of, the base frame.

FIG. 3 shows the position of the stair and the locking parts when the operator is beginning the folding operation. To fold the stair, the operator places his hand or fingers under the middle step 26 and lifts up the stair

so as to slide the lock pins 47 upwardly and forwardly until they are raised out of the cam-slots 46. Without further ado the stair assembly can then be swung rearwardly around the axis of the tie-rod 19 until it reaches the fully folded or upside-down position shown in FIG. 4. Excessive upward movement of the upper end of the stair as an incident to the unlocking step of the folding movement is undesirable because of space limitations and the normal clearances required in a folding structure of the type described. Hence, the bodily upward movement of the stair is limited by a small cross rod 56 extending through and between the side plates 23 and 24 of the stair and positioned to engage the bottom edges of the links 32 and 33 when the stair has reached the top limit of its upward unlocking movement. To unfold the stool the cross bar 27 (see FIG. 4) is pulled forwardly by one hand and the stair is thus rocked outwardly until the locking pins 47 engage the cam 44, and are thus cammed up far enough to drop into the slots 46.

In the unfolded position the entire stool can be lifted from the floor by one hand placed under the front edge of the top platform 10 and moved from place to place without danger of dislocating the locking arrangement.

A patent is solicited for any and all herein disclosed patentable subject matter invented by applicant.

The embodiment disclosed herein may be changed or modified without departing from the scope of the invention.

Subject matter now believed to be patentable and invented by applicant is set forth in the appended claims.

I claim:

1. A portable folding step ladder which has

A. a floor-supported rigid cage-like self-standing base-structure having a top platform.

B. a stair normally caged and folded within said base-structure and adapted to be unfolded by an outward and downward swinging movement from its caged position to its extended position so as to engage the floor to provide a step which (X) is at a height intermediate the floor and the platform and (Y) projects outwardly from the base-structure, and

C. a set of two inter-engageable parts which are carried respectively by the base and the stair and which in the extended position are adapted to engage each other to form a lock for preventing forward tilting movement of the base.

D. said inter-engageable parts being adapted to be disengaged by a limited upward movement of the stair relative to the base-structure so as to allow the stair to be folded and thereby caged within the base-structure.

2. A portable folding stool which has

A. a rigid self-standing base frame having floor engaging legs at its front and back,

B. a platform supported by said legs and adapted to serve as a seat or a top step.

C. an extendable stair provided with a lower step and an upper step,

D. a pivotal connection between the frame and the stair permitting, in the extended position of the stair, a limited amount of up and down bodily movement of the stair and also thereafter permitting a rearwardly swinging movement of the stair relative to the base between the extended position and a reversed upside-down caged position under the platform,

E. said swinging movement being around an axis located intermediate the upper step and the floor and adjacent the front of the frame, and

F. a set of two inter-engaging locking parts mounted respectively on the base and on the stair, and which in the extended position, when engaged, prevent said swinging movement, and which, in the extended position prevent forward tilting movement of the base, but are capable of being engaged or disengaged by said bodily movement of the stair relative to the

base so as to prevent or permit said swinging movement.

3. The combination of claim 2 in which the interengaging part on the base is located intermediate the platform and the swinging axis of the stair.

4. The combination of claim 2 in which the pivotal connection comprises a link one end of which is pivotally connected to the base so as to permit said swinging movement and the other end of which is pivotally connected to the stair so as to permit said limited up and down movement.

5. The combination of claim 2 in which the pivotal connection comprises a pair of horizontally spaced links each of which has one end pivotally connected to the base so as to permit said swinging movement and has its other end pivotally connected to the stair so as to permit said limited up and down movement, means being provided for compelling said links to swing in unison with each other.

6. The combination of claim 1 in which the interengaging part which is on the base is located at a distance above the axis of said swinging movement, and which combination includes cam means for automatically effecting said engagement as an incident to the unfolding swinging movement of the stair.

7. A portable folding step ladder which has

A. a floor-supported rigid cage-like self-standing base structure having a top platform.

B. a stair normally caged and folded within said base structure and adapted to be unfolded by an outward movement from its caged position to its extended position so as to engage the floor outside the base area and to provide a step which (X) is at a height intermediate the floor and the platform and (Y) projects outwardly from the base structure.

C. a set of two inter-engageable parts which are carried respectively by the base and the stair and which, in the extended position, are adapted to engage each other to form a lock for preventing folding movement of the stair.

D. said inter-engageable parts being adapted to be disengaged by a limited upward movement of the stair relative to the base-structure so as to release said lock and allow the stair to be folded and thereby caged within the base structure.

E. one of said inter-engageable parts including a cam co-operating with the other inter-engageable part for automatically effecting said engagement as an incident to the outward movement of the stair.

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