

[54] **RETRACTABLE STEP**

[76] Inventor: **Glenn A. Kloppenstein**, 230 Meriden-Waterbury Rd., Southington, Conn. 06489

[22] Filed: **Aug. 24, 1971**

[21] Appl. No.: **174,429**

[52] U.S. Cl. **312/235**, 182/91

[51] Int. Cl. **A47b 83/00**

[58] Field of Search 312/235; 182/88, 182/90, 91, 92, 129; 297/330-335; 280/160-169, 291; 296/75; 52/182

[56] **References Cited**

UNITED STATES PATENTS

1,688,834	10/1928	Sharp	312/235 R
2,087,695	7/1937	Miller	312/235 R
3,008,533	11/1961	Haberle	182/88
3,380,697	4/1968	Melcher	182/92 X
2,801,894	8/1957	MacInnes	312/235 R
3,603,429	9/1971	Shepherd	182/91
950,441	2/1910	Ekstrand	312/235 X
2,458,618	1/1949	McDonald	182/91 X
2,919,132	12/1959	Canady	280/164 R

FOREIGN PATENTS OR APPLICATIONS

437,985 12/1926 Germany 297/187

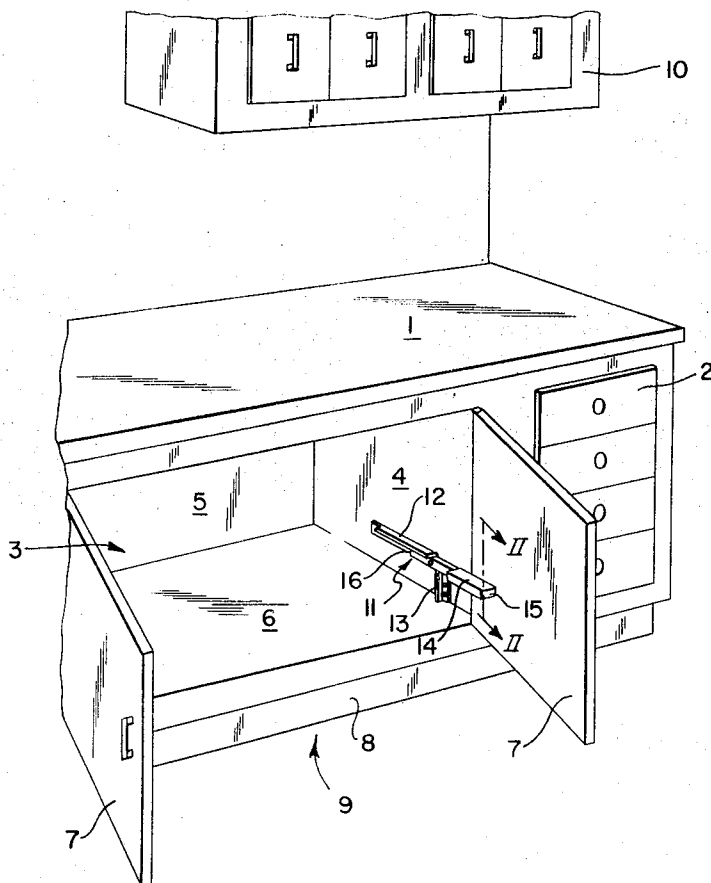
1,307,858 9/1962 France 280/291
530,289 0/1955 Italy 280/166

Primary Examiner—Paul R. Gilliam
Attorney—Thomas E. Beall, Jr.

[57] **ABSTRACT**

The retractable step is mounted solely by means generally in one vertical plane for securement on one side only to the vertical wall of a cabinet interior, the support legs and brace members of a work bench, or like framework of any rigid device wherein it is desired to provide a step so that a person may assume a higher than normal position for reaching elevated objects and the like. In the extended position, the step is cantilevered so that a torque will be produced on its mountings when a person steps on the cantilevered forward portion, which mountings are separately rigidly secured to the framework to absorb the entire spaced vertical oppositely directed force components of the torque so that when the step is pivotally mounted, the pivot pin will not be stressed during use. Desired cut lengths of indefinite length stock metallic tubing and channel members are used in constructing the components for economy.

10 Claims, 5 Drawing Figures



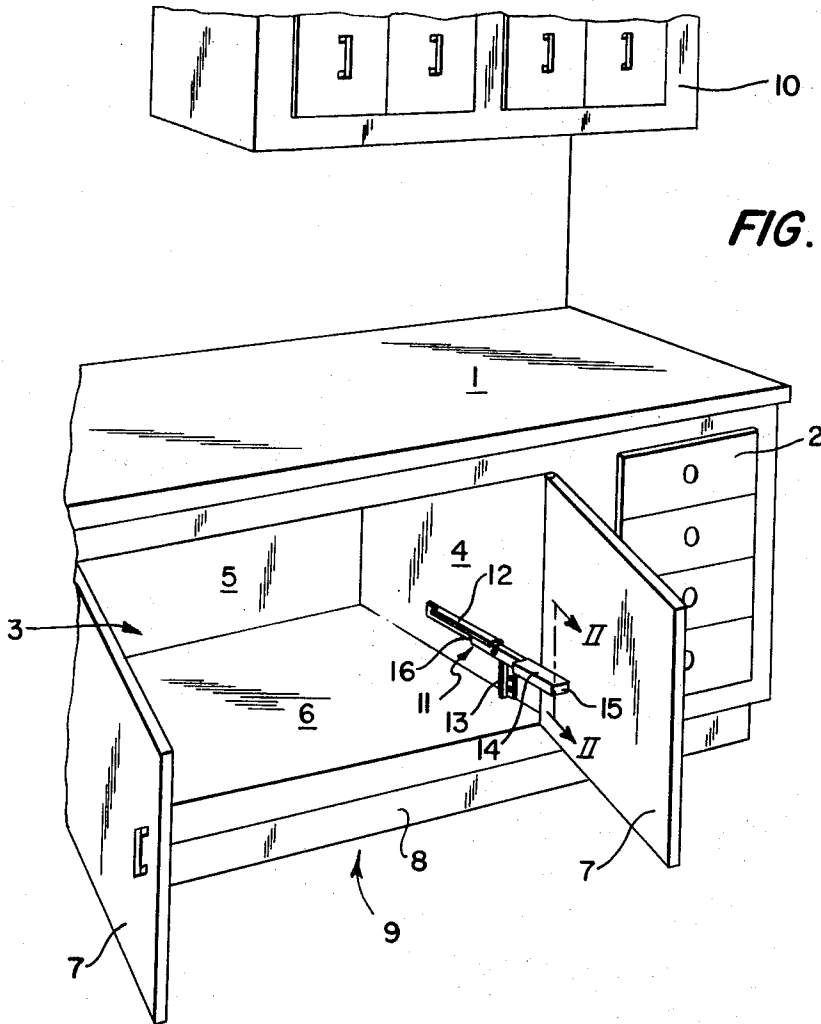


FIG. 1

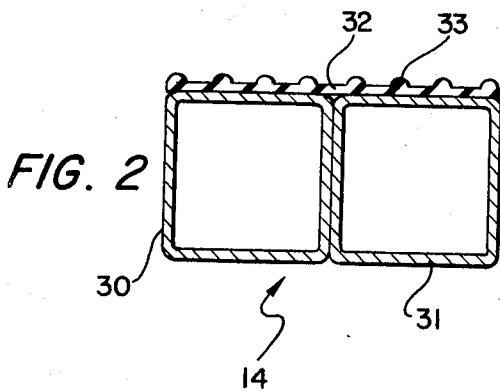


FIG. 2

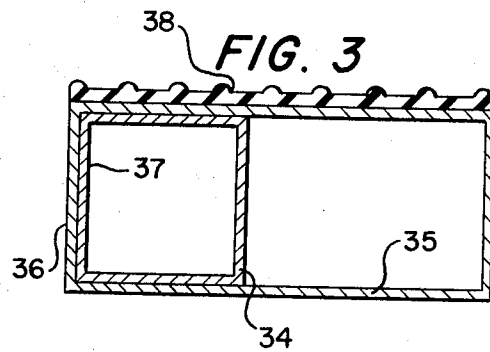


FIG. 3

INVENTOR
GLENN A. KLOPFENSTEIN

Thomas E. Beall, Jr.

ATTORNEY

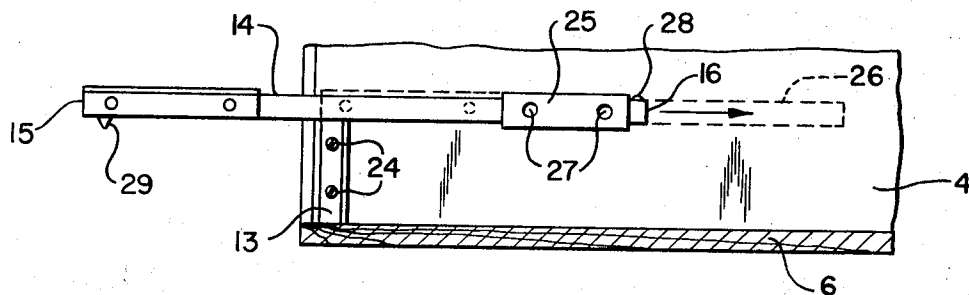


FIG. 5

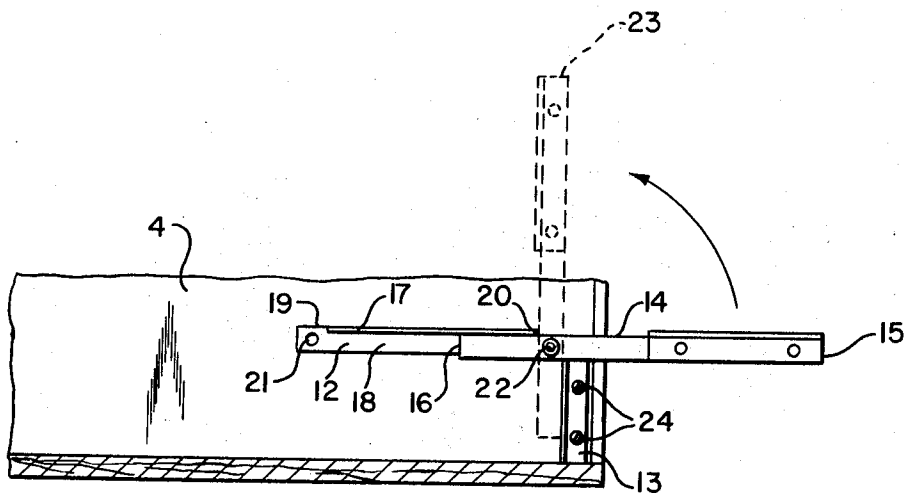


FIG. 4

INVENTOR
GLENN A. KLOPFENSTEIN

Thomas E. Beall, Jr.

ATTORNEY

RETRACTABLE STEP

BACKGROUND OF THE INVENTION

Although numerous steps have been mounted within cabinets, on work benches, on trailers and the like for movement between a retracted position and an extended position, all of these steps have required rather complicated mounting portions and occupied a considerable amount of space so that they have been quite costly to produce and undesirable where space is at a premium. Particularly when mounted within cabinets, the prior art devices have taken up too much room otherwise useable for storage within the cabinet and have been quite bulky with respect to complex means that must be precisely mounted for engaging the floor or the like in the extended position.

The devices of the prior art require mounting on opposed vertical surfaces, which takes up considerable room, or extendable floor engaging legs, which make their location critical, in order to gain sufficient rigidity to be useful. Further, pivotally mounted retractable steps have in general employed the pivot pin as a force carrying member, for which purpose it cannot be sufficiently rigidly designed unless a construction is utilized wherein pivot pins are mounted on opposed vertical frames, that is, there has been no satisfactory construction employing a single cantilevered load carrying pivot pin.

Cost of the prior art devices has not only been increased by the above-mentioned complexity, but also by the use of specially designed components.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a retractable step that may be mounted in a vertical plane on only one side so that it may be moved from a retracted position to an extended cantilevered position and provide sufficient rigidity without engaging the floor or other horizontal support surface. This is accomplished by providing separate horizontally spaced rigid support members to respectively absorb an upward vertical component of force and a downward vertical component of force to counteract the torque produced by a weight being placed upon the cantilevered portion of the step. This is accomplished without providing a tight binding mounting for a reciprocating step and without placing any additional stress on the cantilevered single pivot pin of a pivotally mounted step.

The retractable step of the present invention is economical to produce in that it is constructed entirely of stock material. The step and support members are constructed from desired cut lengths of indefinite length stock metallic tubes or channels. The means for securing the mounting members to the rigid framework are preferably simple wood screws or bolts and the pivot pin may be a simple bolt in that it is not required to absorb any overload caused by persons stepping on the cantilevered portion of the step.

Since the retractable step is mounted on only one side in a single generally vertical plane, it may be mounted independent of any critical spacing with respect to the floor or another vertical support surface, and further a minimum of storage space is consumed by the step. Further, the simple mounting and lack of critical spacing requirements allows the step to be added to various existing rigid support framework by relatively inexperienced homeowners or workmen.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a prospective view of a kitchen cabinet showing the retractable step of the present invention being mounted on the inside vertical wall of a cabinet, wherein it may be pivoted into its extended operative position when the cabinet door is open to allow support for a person's foot as they reach for articles in the partially shown upper cabinets;

FIG. 2 is a cross-sectional view of the cantilevered portion of the step as taken along Line II—II of FIG. 1;

FIG. 3 is a cross-sectional view, similar to FIG. 2, but of another embodiment for the step member construction;

FIG. 4 is a side elevation view of the retractable step of the present invention as mounted in FIG. 1, showing the extended step position in full lines and the retracted step position in dotted lines; and

FIG. 5 is a side elevation view of another embodiment of the retractable step mounting as it would appear mounted on the vertical side wall of the cabinet opposed to the vertical side wall in FIG. 1 of the FIG. 4 device, with the extended step position being shown in full lines and the retracted step position being shown in dotted lines.

DETAILED DESCRIPTION OF THE DRAWING

As shown in FIG. 1, the retractable step of the present invention may be mounted within the storage space of a conventional kitchen cabinet, preferably on the vertical side wall so that it may be extended to its operative position when the cabinet door is opened. However, it is also contemplated that the retractable step may be mounted upon the rigid legs and cross members of a work bench, the back of a door, the side wall of a house, the side support for shelves, or on any sufficiently rigid generally vertical framework where it is needed to provide a horizontal foot support surface for assuming elevated positions. In many cases, the side wall of the cabinet or the like mounting surface will be insufficiently rigid to provide sufficient support for the retractable step and may need re-enforcing with a sheet of plywood or the like, but generally no other modification will be required.

For purposes of illustration, the retractable step of the present invention is in combination with a particular mounting, a standard set of kitchen cabinets. The lower cabinet structure includes a horizontal working top 1, a plurality of drawers 2, a storage space 3 having side walls 4 (only one being shown), a rear wall 5, a lower wall 6, and an upper wall being formed by the lower surface of the counter top 1 and its support structure. The open front of the storage space 3 is closed by means of hingedly mounted doors 7, which are shown in their open position. A standard kick plate is shown at 8. In general, this type of lower cabinet structure is pre-assembled in a factory and installed by a workman. Quite frequently, the customer will desire a counter top height other than standard and the kick plate height at 8 is adjusted accordingly; as the result, the distance between the lower wall 6 and the support floor 9 may vary making it difficult to install retractable steps that rely upon engagement with floor 9 for their stability.

Conventional cabinet structure 10 is mounted above the lower cabinet structure for storage purposes and retractable step of the present invention is designed to provide more ready access to these cabinets 10 by al-

lowing a person to assume an elevated position by placing their foot on the step in its extended horizontal position. In the illustrated combination, the side wall 4 forms the rigid and stationary framework for mounting the retractable step 11 of the present invention.

The retractable step 11 includes a support member 12 rigidly mounted to the framework 4 to absorb an upward vertical component of force, a support member 13 rigidly mounted to the framework 4 to absorb a downward component of vertical force, and a step member 14 that is shown engaging the support members 12 and 13 in an extended cantilevered manner so that when a weight is placed upon its forward end 15 the resulting torque may be broken down into a downward component of force at the intermediate portion of the step engaging the support member 13 and a longitudinally spaced upward component of force at the rearward end 16 of the step engaging the support member 12. No other support structure is used to absorb the components of force produced by a person stepping on the forward cantilevered end of the step 14.

As shown in FIG. 4, the support member 12 is constructed of L-shaped stock material, preferably steel, that is cut to a desired length from an indefinite length of stock material and further fabricated as indicated below. The support member 12 includes a horizontally extending leg 17 that will engage the upper surface of the rearward end 16 of the step member 14 in its extended full line position, and a horizontally extending leg 18, which will engage the adjacent surface of the framework 4. Once the full length of stock channel material has been cut, a portion of the length of the horizontal leg 17 is cut from each end as shown respectively at 19 and 20. The cut end 19 facilitates the assembly of a screw 21 through a suitably formed hole in the vertical leg 18 for driving into the framework 4. The other cut end 20 facilitates the assembly of a bolt or the like 22 through the step 14 to form a pivot, through a suitably formed hole in the forward end of the vertical leg 18, and into the framework 4 where it is secured by a nut or the like, not shown. Further, the cut end 20 forms a stop abutment when the step 14 is pivoted about the bolt 22 from its full line extended position into its dotted line retracted position 23, so that the retracted step will assume a generally vertical position.

The support member 13 is constructed of a U-shaped or L-shaped cut length of stock material, preferably steel. Further fabrication includes the drilling of two longitudinally spaced holes in the wall portion engaging the framework 4 for receipt of wood screws or bolts 24 used to rigidly secure the support member 13 to the framework 4. In this position, the upper end of the support member 13 will engage the lower surface of the retractable step 14 in its full line extended position as shown to absorb the downward vertical component of force produced by a person's stepping on the forward end 15. From the dotted line position, it is seen that this support member 13 forms the forward-most portion of the retractable step assembly and does not in anyway interfere with closure of the door 7 or any other activities in the vicinity of the forward portion of the framework 4. Further, these support members 12 and 13 absorb the entire force components produced by a person's stepping on the forward end 15 of the retractable step, so that no additional complicated and critically spaced leg structure is required to engage the floor 9 and no further mountings are required to be provided

on any other surface, which would require critical spacing between the surfaces. Further, a minimum of room is required for the retractable step and its mountings since it is mounted on only one side and is movable in a single vertical plane.

In FIG. 5, like numerals are used to designate parts identical with those previously described with respect to FIG. 4, although FIG. 5 does show another construction of the retractable step. The forward and rearward orientation of FIG. 5 is reversed as compared to that of FIG. 4. The basic structure of the step 14 is the same as that of FIG. 4 with a forward end 15 and a rearward end 16. The support member 13 is substantially identical to that of FIG. 4 and will not be discussed further.

In FIG. 5, the support member 25 is constructed from a desired cut length of stock material having a generally rectangular or specifically square cross section and provided in stock form in indefinite lengths of preferably steel. The rearward and intermediate portions of the step 14 have an external configuration substantially the same as the internal configuration of the support member 25 so that the two are telescopically slidable with respect to each other in a horizontal direction in the plane of FIG. 5, with the forward extended position of the retractable step 14 being shown in full lines and the rearward retracted position being shown in dotted lines at 26. The support member 25 is rigidly mounted on the framework 4 by means of screws that initially pass through outer holes 27 that are larger than the screw heads and sufficiently large to accommodate the driving head of a screwdriver; thereafter, the screws are driven through smaller holes in the opposite side wall of the support member 25 to be secured within the framework 4 and preferably counter-sunk within the side wall of the support member 25 so that they will not interfere with movement of the step member 14 within the support member 25.

The rearward end 16 of the step 14 is provided with a preferably tapped hole for receiving a machine screw or the like 28 that forms a lateral projection for engaging the rearward end of the support member 25 when the step is moved to its full line position for preventing removal of the step from the support member 25; the screw 28 would be assembled after the step 14 is assembled within the support member 25. The forward end 15 of the step 14 is provided with a similar preferably tapped hole to receive a machine screw mounting a preferably rubber downward lateral extension 29, which may be engaged by the toe of the operator to move the step 14 from its dotted line retracted position to its full line extended position. The step may be moved in the opposite direction by merely engaging the foot with the forward end 15 and pushing. As shown in FIG. 5, the torque produced by a person stepping on the forward end of the cantilevered step 14 will produce a downward component of vertical force to be absorbed by the support member 13 engaging the lower surface of the step 14 and an upward vertical component of force to be absorbed by the upper wall of the support member 25 engaging the upper surface of the rearward end of the step 14. Thus, the support member 25 is not itself subjected to a torque, but only to an upward component of force.

FIG. 2 shows one form of constructing the step 14 to be used in the device of either FIG. 4, or FIG. 5. As shown, two identical square cross-section tubular steel members are placed horizontally with their adjacent

side walls in engagement and secured by screws, welding or the like. The tubular member 30 will extend for the full length of the step 14 and be provided at its intermediate portion with aligned horizontally extending holes in its opposite side walls for receiving the pivot pin 22 of FIG. 4 or provided at its rearward end 16 with a tapped hole for receiving the screw 28 as shown in FIG. 5. The other tubular portion 31 is cut from the same indefinite length stock material as the tube 30, but is shorter so that it extends for only a portion of the cantilevered forward end 15 of the step. At the forward end 15, the construction is provided with a welded or the like secured end plate (not shown), which will have a shape corresponding to the combined cross sectional shape of the secured tubes 30, 31. Only the adjacent upper surfaces of the tubes 30, 31 are covered by a rectangular piece of rubber or other resilient material tread 32 that may be provided with ridges 33 to prevent slippage between a user's foot and the step.

The form of the step as shown in FIG. 3 may be employed with either the structure of FIG. 4, or FIG. 5. The tube 34 is preferably of square cross-sectional shape and cut to desired length from an indefinite length of stock tubing, preferably steel. This tube 34, similar to the tube 30, will extend for the full length of the step and be provided with the holes as previously mentioned for either the pivot pin 22 or the lateral abutment 28, and perhaps also for the lateral toe engaging projection 29. The rectangular cross section tube 35 is cut from an indefinite length of stock tubing, preferably steel, and extends for a length corresponding to the length of the tube 31 of FIG. 2. The tube 35 encloses the forward portion of the tube 34 so that their forward ends are flush with each other and covered by means of a rectangular shaped cover plate (not shown). Preferably, the tubes 34 and 35 are spot welded together, but they also may be screwed together so that their walls 36, 37 that are closest to the framework 4 are in abutting engagement. Further, the vertical external dimension of the tube 34 is substantially the same as the vertical internal dimension of the tube 35 for a rigid connection. In a manner previously described with respect to FIG. 2, a suitable resilient tread 38 is of rectangular configuration and covers the entire upper surface of the tube 35 to prevent slippage between the user's foot and the step.

In constructing the device of the present invention it may be designed for relatively limited home useage with thin wall tubing or heavy industrial useage with thick wall tubing, without changing any of the external dimensions. In actual models of the invention produced, steel tubing has proved to be extremely rigid and serviceable.

In constructing the mountings, they are cut from indefinite length stock material as mentioned above and further fabricated to provide the cut ends 19, and various mounting holes. The step portion 14 is cut to desired lengths from stock material and fabricated by being welded together, provided with necessary holes and covered with a tread. The steps may be made up and used with either the pivoted construction or the reciprocating construction. The setup on site is simple in that it requires only the mounting of the support members to the framework 4 by means of four screws and the assembly of the step 14 by means of the bolt 22 or the screw 28. The positioning of the bolt 22 is determined by the holes within the step 14 and the hole

within the leg 18 of the support member 12. The support member 12 or 25 may be secured generally horizontally without regard to spacing from another framework or the floor 9 and thereafter the support member 13 may be secured in proper position by merely making sure that its upper surface engages the step 14 in the extended position. Thus, the assembly is quite simple and may be carried out by untrained personnel. It is also to be noted that the entire step assembly may be mounted on the framework 4 as shown in FIG. 1 or on the opposite side wall (not shown) of FIG. 1, for example, by merely rotating the support member 12 one hundred eighty degrees in a horizontal plane, rotating the support member 13 one hundred eighty degrees in a vertical plane parallel to the wall 5 and rotating the step 14 one hundred eighty degrees about a horizontal axis parallel to the wall 4. For this purpose, it is most desirable according to the present invention to provide the resilient tread 32 or 38 as an unassembled item with an adhesive coating on its intended lower surface temporarily covered by a removable cover strip, so that it may be mounted on whatever portion of the step ends up facing upwardly, which will depend upon whether the support members 12, 13 are mounted on a left facing framework or right facing framework.

Further modifications, embodiments and variations are contemplated within the spirit and scope of the present invention as defined by the following claims.

What is claimed is:

1. A retractable step to be mounted on a single vertical planar surface of a stationary framework for movement between a rearward position and a forward extended position, with respect to the framework, to provide a foot support in the extended position, comprising: first rigid support means to be rigidly mounted on the single planar surface of the framework; second rigid support means to be rigidly mounted on the single planar surface of the framework in the same general vertical plane as said first support means and spaced a substantial horizontal distance forward of said first support means; step means for mounting in said generally vertical plane for movement to a first horizontal extended position where it has a foot receiving portion cantilevered forward of said second rigid support means, an intermediate portion supportingly engaging said second support means to absorb a downward force component and having a rearward retracted portion supportingly engaging said first support means to absorb an upward component of force spaced rearwardly the substantial distance from the downward component of force; said foot receiving portion being substantially wider than said intermediate and rearward portions; both of said support means together absorbing the entire force components of a weight being placed upon said foot portion in said first position and transferring it directly only to the vertical planar surface; mounting means further providing a second position for storage of said step means for movement of said step means between said two positions; said first support means being a horizontally extending metallic channel member having means for mounting it on the framework; and said second support means being a vertically extending metallic channel having means for mounting it on the framework.

2. The step of claim 1, wherein said mounting means includes pivot pin means, separate from said support means, for securement to the planar surface of the framework for pivotally mounting said step means for

7

movement with said generally vertical plane between said first and second positions, with said step member being vertical in said second position and horizontal in said first position; and said first and second support means absorbing substantially all of the force components caused by a weight being placed upon the cantilevered foot portion of said step member in said first position without stressing said pivot pin means.

3. The step of claim 1, wherein said mounting means confines said step means for only translational horizontal movement between said first and second positions.

4. The device of claim 1, wherein said first support means is an annular member encompassing the rearward portion of said step means; said step means being provided with a transverse projection extending laterally beyond said support means to prevent forward removal of said step means from said support means.

5. The device of claim 1, wherein said step means further is provided with a downward projection on its forward foot portion to provide a toe grip means for moving the step means from its retracted position to its extended position.

6. The step of claim 1, wherein said step means includes a first rectangular cross-section metallic tube extending its full length and engaging both of said support means in said forward extended position, and a second rectangular cross-section metallic tube parallel with said first tube and extending only within said cantilevered foot portion of said step means.

7. The device of claim 6, including means rigidly securing said tubes together; an end plate closing the forward

8

end of said tubes; and a resilient mat secured to the upper surface of said tubes within said cantilevered foot portion with respect to said horizontal extended position.

8. The device of claim 6, wherein each of said tubes is of identical square cross-section throughout their length with uniform wall thickness, and said tubes are secured side by side in a common horizontal plane with respect to said horizontal extended position.

9. The device of claim 6, wherein with respect to said extended position: said first tube is of square cross-section and uniform wall thickness throughout its length; said second tube has a cross-sectional internal vertical dimension substantially equal to the external vertical dimension of said first tube, a horizontal cross-sectional dimension substantially twice that of said first tube, and contains therein said first tube with their respective side walls to be positioned closest to the framework being in abutting engagement.

10. The step of claim 1, wherein said first support means is tubular with a generally rectangular cross-section having opposed side walls, longitudinally spaced first apertures within the side wall to engage the framework, and longitudinally spaced second apertures in the opposite side wall aligned with said first apertures and being of substantially larger diameter than said first apertures, whereby a headed screw may be passed completely through said second apertures along with a screwdriver blade for engaging said first apertures and the framework.

* * * * *

35

40

45

50

55

60

65

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,756,678 Dated September 4, 1973

Inventor(s) Glenn A. Klopfenstein

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet [19] "Kloppenstein"

should read -- Klopfenstein --.

Signed and sealed this 12th day of February 1974.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents