United States Patent

[11] 3,545,567

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[45] Patented **Dec. 8, 1970**

[54] **RETRACTABLE FOLDING STEPS**
12 Claims, 14 Drawing Figs.

[52] **U.S. Cl.** **182/97**
[51] **Int. Cl.** **E06c 1/383**
[50] **Field of Search** 182/96, 97, 1, 84, 39, 88, 161

[56] **References Cited**

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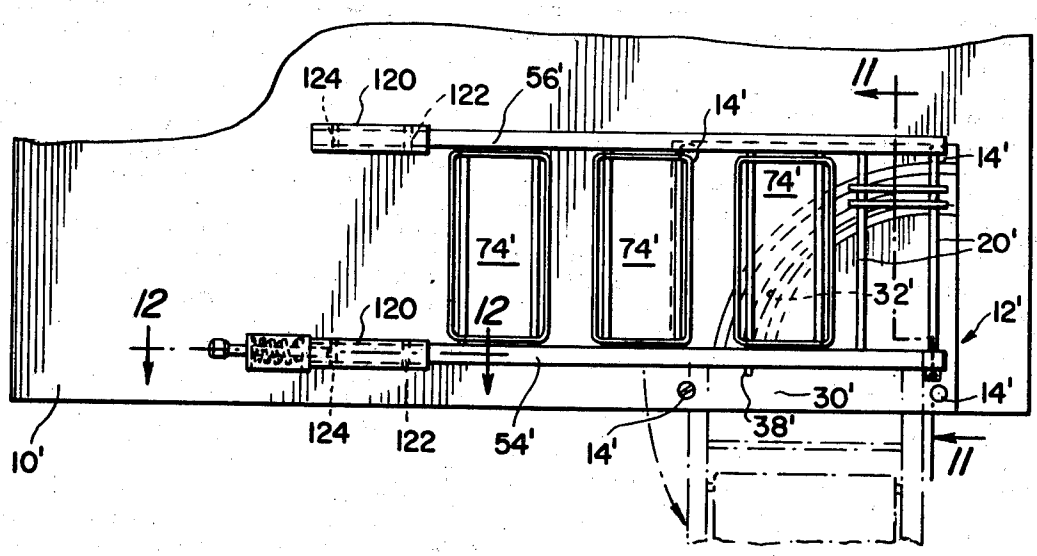
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Primary Examiner—Reinaldo P. Machado
Attorney—Shoemaker and Mattare

ABSTRACT: A support means includes a fixed portion carrying a pivot pin and an arcuate guide slot. The support means includes a second portion having a first part connected with said fixed pivot pin and a second part which is slidably guided by said arcuate slot. A pair of spaced upper side rails and a pair of lower spaced side rails are each swingably supported by the second portion of the support means. A plurality of steps are movably interconnected with the upper and lower side rails and means is provided for holding the arrangement in its stored position.



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Fig. 1.

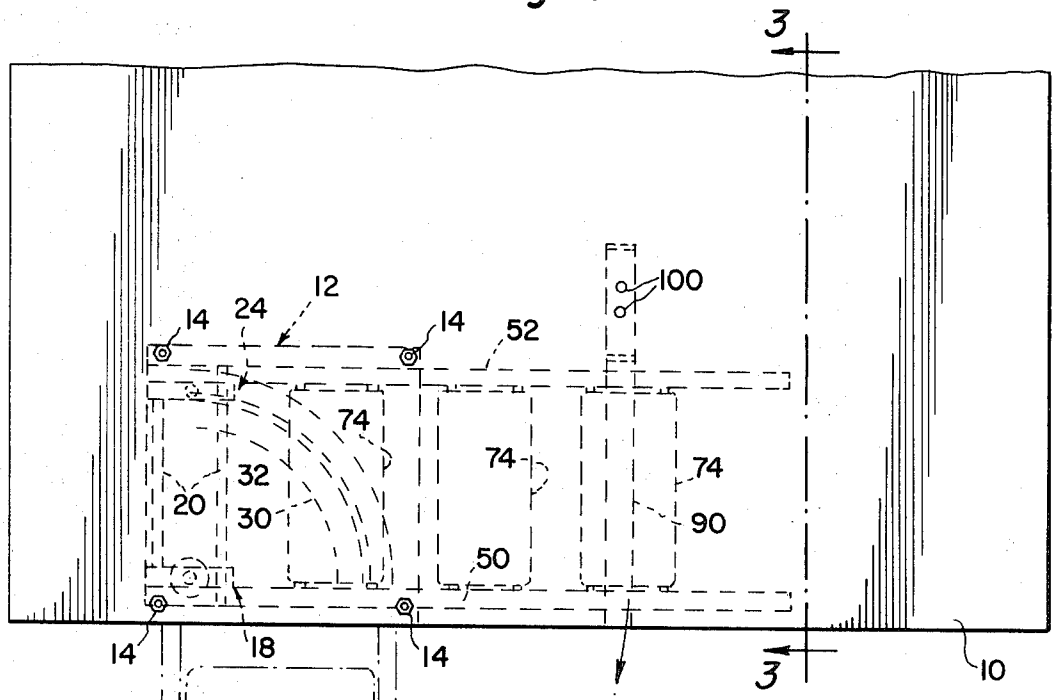
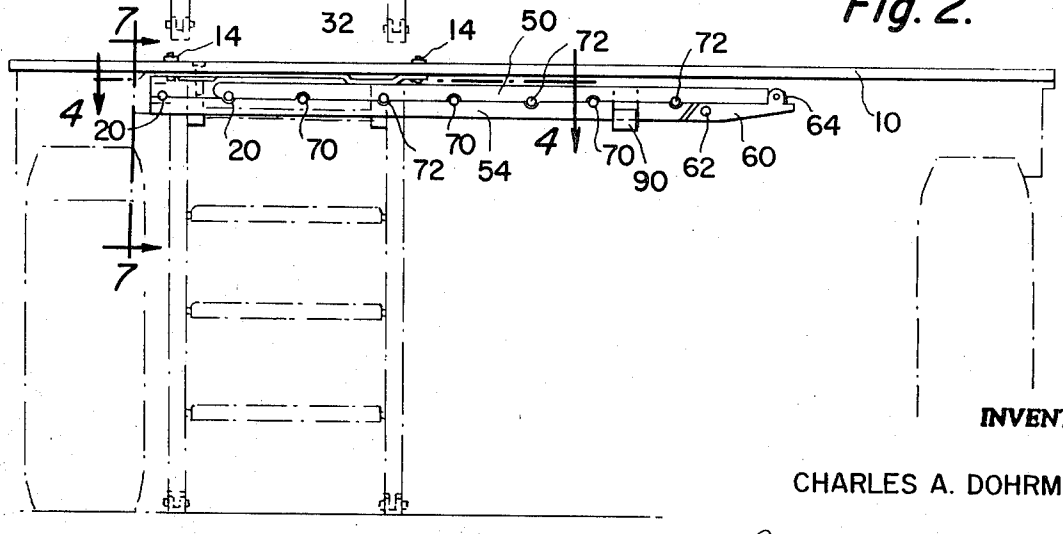


Fig. 2.



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Fig. 3.

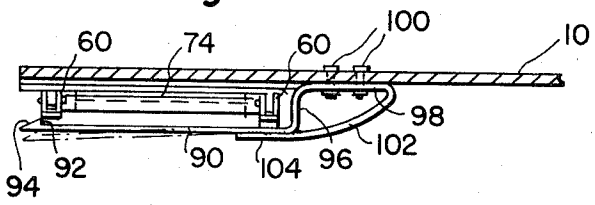


Fig. 5.

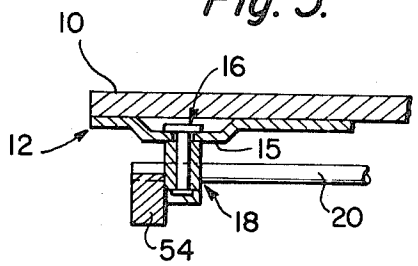


Fig. 4

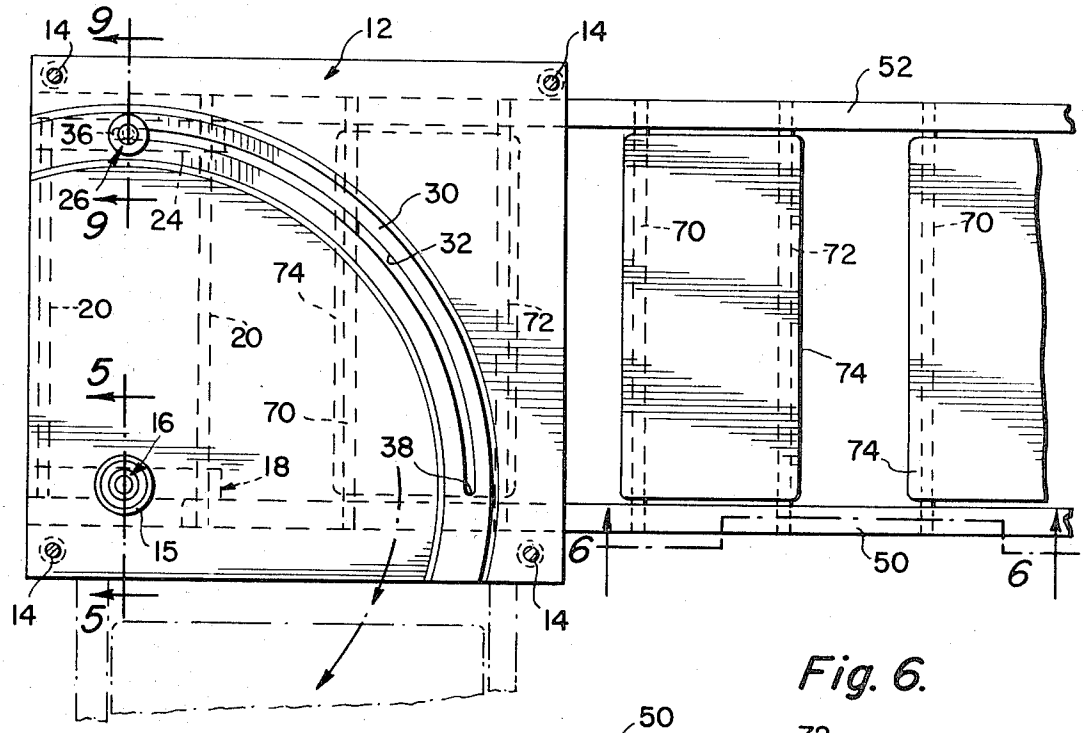


Fig. 6.

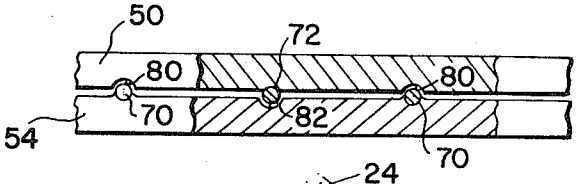


Fig. 7.

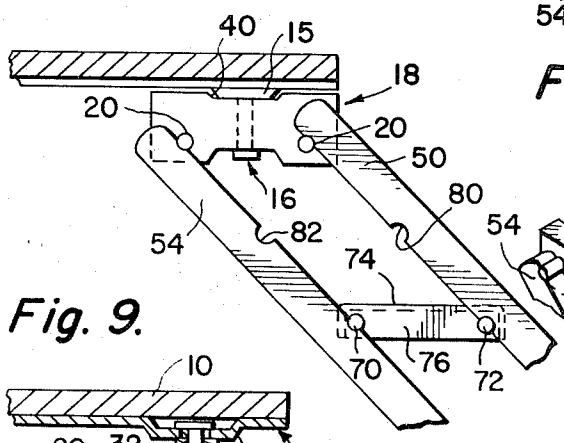


Fig. 8.

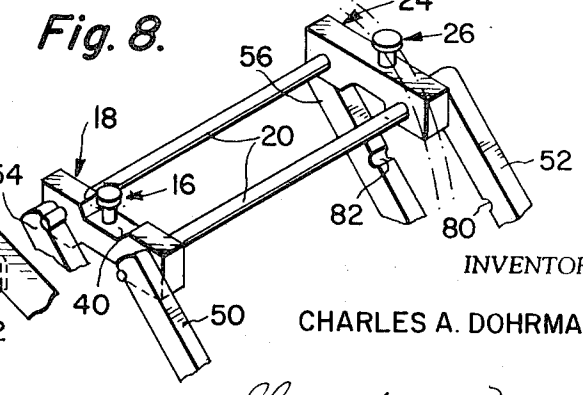
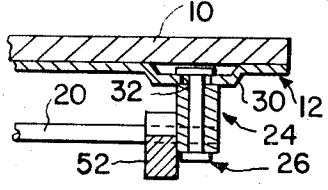


Fig. 9.



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Fig. 10.

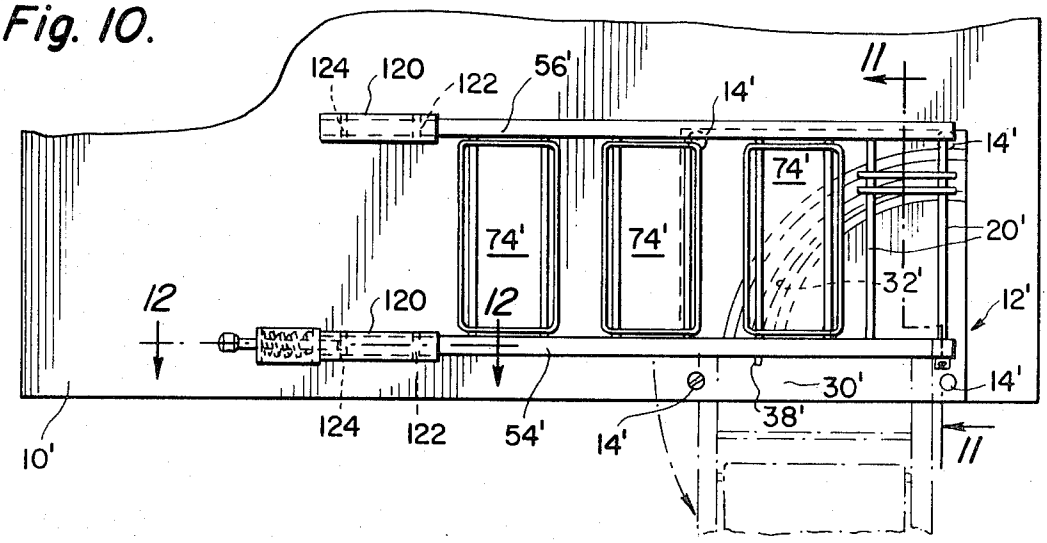


Fig. 11.

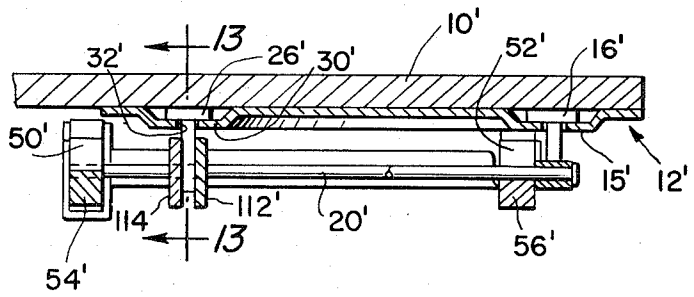


Fig. 14.

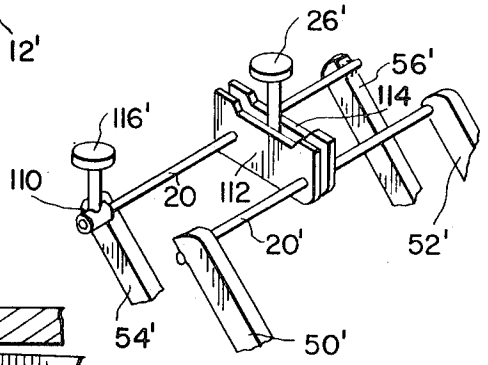


Fig. 12.

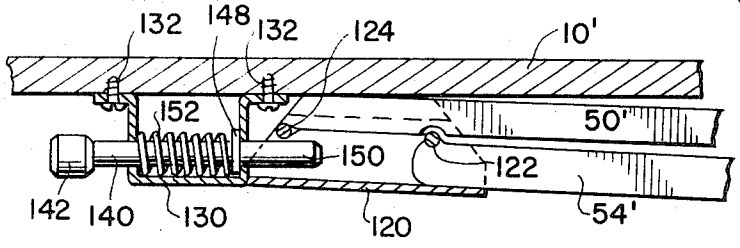
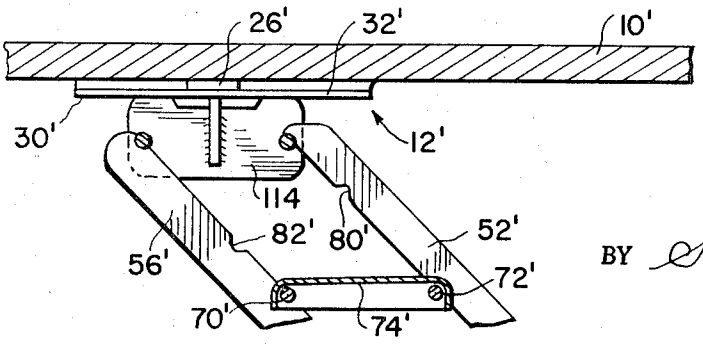


Fig. 13.



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RETRACTABLE FOLDING STEPS

BACKGROUND OF THE INVENTION

The present invention relates to a folding step structure which is adapted to be supported in a retracted compact arrangement, and then selectively swung into operative position to provide a rigid sturdy step construction.

The present invention is adapted to be employed in many applications such as with campers, trailers, mobile homes, flatbed trucks and trailers and the like wherein it is desired to provide steps which can be stored in a limited amount of vertical space, and wherein the steps are manually extended to operative position when desired.

Folding steps of this nature have been heretofore provided in the prior art, and a typical example is illustrated in U.S. Pat. No. 3,291,255. The folding step arrangement as shown in this patent capable of being stored in a relatively small vertical space, but a principal disadvantage of this arrangement is the fact that considerable space is required longitudinally of the associated vehicle to receive the folding step arrangement in its stored position. In other words, when extended, the step arrangement is disposed longitudinally of the vehicle, and then is folded up and slid into place in a longitudinal direction. Accordingly, in order to accommodate the folding step arrangement, it is necessary to have a rather extensive longitudinal space available on the associated vehicle. Many vehicles with which the present invention is intended to be employed do not have sufficient longitudinally extending space for accommodating this type of arrangement.

A further disadvantage of the construction as shown for example in the aforementioned U.S. Pat. is the fact that considerable friction is encountered when moving the step arrangement into and out of operative position. Additionally, no means is provided for positively retaining and holding the step arrangement in its stored position.

SUMMARY OF THE INVENTION

In the present invention, a support means is provided including a first portion adapted to be fixed to the undersurface of a vehicle or the like, the support means also including a second portion which is swingably supported by the first support portion.

The step means is in turn swingably interconnected with the second portion of the support means. This arrangement enables the step means to be folded into a very small vertical space and then to be swung through an angle of approximately 90° so that in its stored position, the step arrangement is disposed substantially at a 90° angle with respect to the disposition of the step arrangement when in its operative erected position.

Accordingly, in an arrangement wherein the steps in erected operative position extend longitudinally of the associated structure such as a vehicle or the like, the step arrangement extends laterally of the supporting structure or vehicle in a stored position. The step arrangement may be stored laterally of a vehicle closely adjacent to the rear end thereof thereby eliminating the necessity of providing considerable space extending longitudinally of the vehicle for storing the steps. In fact, the arrangement of the present invention enables a folding step arrangement to be stored in a very minimum of longitudinally extending space with respect to an associated vehicle.

The swingable or movable portion of the support means of the present invention is mounted for movement about a fixed pivot axis and includes a part which is slidable within an arcuate guide slot in the other portion of the support means. This arrangement reduces to a minimum the friction encountered upon movement of the folding step arrangement between a stored and operative position.

Additionally, the overall construction of the present invention enables a very lightweight yet strong retractable folding step construction to be readily manufactured.

A holding means is also provided for positively holding the folding step arrangement in its stored position, this holding means including a resiliently biased means readily permitting the steps to be moved from the stored position when so desired.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top view showing a suitable support means such as the rear end of a vehicle beneath which the folding step arrangement of the present invention is supported;

FIG. 2 is an end view of the structure shown in FIG. 1;

FIG. 3 is a sectional view taken substantially along line 3–3 of FIG. 1 looking in the direction of the arrows;

FIG. 4 is a view on an enlarged scale taken substantially along line 4–4 of FIG. 2 looking in the direction of the arrows;

FIG. 5 is a sectional view taken substantially along line 5–5 of FIG. 4 looking in the direction of the arrows;

FIG. 6 is a view partly in section taken substantially along line 6–6 of FIG. 4 looking in the direction of the arrows;

FIG. 7 is a sectional view on an enlarged scale taken substantially along line 7–7 of FIG. 2 looking in the direction of the arrows and illustrating the steps in erected position;

FIG. 8 is a top perspective view illustrating the manner of swingably interconnecting the upper and lower side rails with a portion of the support means;

FIG. 9 is a sectional view taken substantially along line 9–9 of FIG. 4 looking in the direction of the arrows;

FIG. 10 is a bottom view illustrating a modified form of the invention in stowed position;

FIG. 11 is a sectional view taken substantially along line 11–11 of FIG. 10 looking in the direction of the arrows;

FIG. 12 is a sectional view on an enlarged scale taken substantially along line 12–12 of FIG. 10 looking in the direction of the arrows;

FIG. 13 is a sectional view taken substantially along line 1–13 of FIG. 11 looking in the direction of the arrows and illustrating the folding steps in the down position; and

FIG. 14 is a top perspective view illustrating a portion of the structure of this form of the invention. DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings wherein like reference characters designate corresponding parts throughout the several views, reference numeral 10 indicates any suitable supporting surface such as the floor of a camper or the like to the underside of which it is desired to secure the retractable folding steps.

The support means for the retractable folding steps includes a first portion indicated generally by reference numeral 12 comprising a sheet of metal which is fixedly secured to the undersurface of member 10 by a plurality of nut and bolt assemblies 14 shown as being four in number and extending through suitable aligned holes provided in members 10 and 12.

As seen most clearly in FIG. 5, member 12 includes a depressed integral portion 15 which receives a headed pivot pin 16, this pivot pin extending through a first part 18 of a second portion of the support means. As seen in FIG. 8, a pair of connecting rods 20 extend through holes in member 18 and a similar member 24 having a headed pivot pin 26 rigidly interconnected therewith.

The support member 12 also includes an integral depending arcuate portion 30 having an arcuate slot 32 formed through the bottom wall thereof as seen most clearly in FIGS. 4 and 9. This slot includes opposite closed ends 36 and 38.

The shank of headed pin 26 extends upwardly through slot 32, and the head of pin 26 is larger than the slot 32 whereby pin 26 is supported by the depending portion 30, and the slot 32 guides movement of pin 26 and the associated part 24 of the second support means portion.

It is apparent that the second portion of the support means is swingably mounted with respect to the first portion of the support means and is swingable about the fixed axis of pin 16. As seen most clearly in FIGS. 7 and 8, the upper surface of

member 18 is provided with a central depressed portion 40 to provide clearance with the portion 15 of member 12 whereby the second portion of the support means can freely swing about the axis of pivot pin 16.

As seen most clearly in FIG. 8, the step means of the present invention includes a pair of upper side rails 50 and 52 the upper ends of which are rigidly secured as by welding or the like to the outer ends of one of the connecting rods 20. These upper side rails are offset above the pivot axis of the associated connecting rod, this connecting rod being freely rotatable within the holes through which it extends in members 18 and 24 whereby the upper ends of the upper side rails are swingably connected to the support means.

A pair of spaced lower side rails 54 and 56 are rigidly secured as by welding at the upper ends thereof to the opposite ends of the other of the connecting rods 20. These lower side rails are offset below the pivot axis of the associated rod 20 which is freely rotatable within the holes through which it extends in members 18 and 24.

As seen in FIG. 2, the lower or opposite ends of side rails 50 and 54 are interconnected with one another by a base member 60. This base member is pivotally interconnected at 62 with lower side rail 54, and is pivotally interconnected at 64 with the upper side rail 50. The lower ends of the other pair of side rails 52 and 56 are similarly interconnected with one another by a similar base member, these base members being adapted to rest upon the ground or the like for supporting the lower end of the retractable folding steps when in operative position.

As seen most clearly in FIGS. 4 and 6, the step means of the present invention includes a first plurality of support rods 70 supported between the lower side rails 54 and 56. These support rods are of generally circular cross-sectional configurations and are disposed within cutouts formed in the upper edges of the lower side rails so that approximately one-half of the cross-sectional dimension of the support rods is disposed within each cutout, the support rods then being suitably secured in place as by welding or the like.

A further plurality of support rods 72 are secured to the lower edges of the upper side rails 50 and 52. These support rods are also of generally circular cross-sectional configuration and are disposed within cutouts provided in the lower edges of the upper side rails so that approximately one-half of the cross-sectional dimension of the rods is received in each cutout. The support rods are suitably secured in place as by welding or the like.

A plurality of similar steps 74 are provided, these steps being of generally rectangular plan configuration as seen in FIG. 4, each of the steps includes a depending flange 76 formed about the peripheral edge of the step. The support rods 70 and 72 extend freely through suitable holes provided in opposite parts of the flange 76 of each of the steps whereby the steps are movably interconnected to the rods 70 and 72 and thereby to the upper and lower side rails. The steps form a parallelogram arrangement with the associated upper and lower side rails so that the steps remain parallel with one another at all positions of the side rails. Members 18 and 24 as well as the base members secured to the opposite ends of the side rails also remain parallel with the steps at all times so that the steps are maintained in substantially a horizontal plane during normal use to enable them to be utilized as steps.

The lower edge of each of the upper side rails is provided with a plurality of spaced cutouts 80 formed therein, these cutouts being adapted to receive a support rod 70 secured to the lower side rails when the side rails are pivoted into the stored position as seen particularly in FIG. 6.

Similarly, the upper edges of each of the lower side rails are provided with a plurality of spaced cutouts 82. Both the cutouts 80 and 82 are generally semicircular in cross section. The cutouts 82 are adapted to receive the connecting rod 20 as well as the various support rods 72 secured to the upper side rails when the apparatus is in its stored position as seen in FIG. 6.

Accordingly, with the arrangement described, the retractable folding step arrangement can be folded into the position shown in FIG. 2 wherein it occupies a minimum of vertical space. As seen in FIG. 2, the step arrangement is disposed laterally of the supporting structure. When it is desired to move it into operative erected relationship, the retractable steps are moved from the dotted line position shown in FIG. 1 in the direction of the arrows into the phantom line position illustrated in that figure whereupon the side rails may be dropped downwardly into the position shown in FIGS. 7 and 8 so that the steps will assume the erected operative relationship.

Referring now to FIG. 3, a holding means is provided for holding the folding steps in stored position. This holding means includes a resilient portion 90 disposed substantially parallel with the under surface of member 10 and including an outer shoulder portion 92 adapted to engage the adjacent lower side rail of the step means to hold the step means in stored position. A sloping cam surface 94 is provided on the end of member 90 so that the folding means will be automatically biased downwardly into the phantom line illustrated in this figure when the folding steps are swung toward the stored position.

Portion 90 of the holding means joins with an i war upwardly extending portion 96 which in turn is integral with a portion 98 secured to the undersurface of member 10 by a plurality of nut and bolt assemblies 100.

Portion 98 of the holding means joins with a portion 102 which extends downwardly and terminates in an end portion 104 rigidly affixed as by welding to the previously described portion 90.

It is apparent that in the position shown in solid lines in FIG. 3, the holding means will retain the folding steps in the stored position. When it is desired to move the steps into erected position, the portion 90 may be manually moved downwardly so that the folded steps can clear the shoulder 92, whereupon the steps may be swung through an angle of approximately 90° and then lowered downwardly into erected operative position.

When it is desired to return the steps to stored position, the side rails are swung upwardly and then turned through an angle of approximately 90° to return to the stored position shown in FIGS. 1, 3 and 4.

Referring now to FIGS. 10—14 inclusive, a modified form of the invention is illustrated. This embodiment is similar in many respects to that previously described, and similar parts have been given the same reference numerals primed.

The manner in which the folding steps are secured to the movable portion of the support means in this form of the invention is simplified. The lower end of the headed pivot pin 16' is provided with a tubular portion 110 receiving an end of one of the connecting rods 20' whereby this connecting rod is journaled within this tubular portion. The lower end of the headed pivot pin 26' is disposed between and rigidly affixed as by welding or the like to a pair of parallel plates 112 and 114. These plates have aligned holes formed therethrough for receiving the connecting rods 20' which are thereby journaled for rotation within the two plates.

The folding step portion of this form of the invention is substantially identical with that previously described. The base members in this form of the invention are simplified. A pair of similar base members 120 are provided, each of the base members being of generally U-shaped cross-sectional configuration and having opposite generally parallel leg portions, these leg portions receiving opposite ends of pivot pins 122 and 124 which are secured respectively to the lower ends of the lower side rails and upper side rails.

A modified holding means is provided in this form of the invention. The holding means includes a generally U-shaped bracket 130 secured to the undersurface of member 10' by a pair of screws 132. A holding pin 140 is slidably mounted within suitable aligned holes provided in bracket 130. This pin includes an enlarged head 142 which is adapted to be manually grasped for operating the pin. A stop means 148 is

provided at an intermediate portion of the pin and may comprise a cotter pin positioned within a diametrically extending hole formed through pin 140. The opposite end 150 of the pin is adapted to fit within one of the U-shaped base members 60 for retaining the apparatus in its stowed position as seen in FIGS. 10 and 12.

A compression spring 152 is disposed in surrounding relationship to pin 140 and is interposed between bracket member 130 and the cotter pin 148 for normally biasing pin 140 toward its lock position. When it is desired to unlock the device the pin is simply manually withdrawn against the force of the spring whereupon the apparatus may be swung into the desired position.

As this invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, the present embodiment is therefore illustrative and not restrictive, and since the scope of the invention is defined by the appended claims, all changes that fall within the metes and bounds of the claims or that form their functional as well as conjointly cooperative equivalents are therefore intended to be embraced by those claims.

I claim:

1. Retractable folding steps comprising support means including a first portion adapted to be fixed to suitable means and a second portion movably supported by said first portion for swinging movement about a fixed axis, said first portion of the support means including guide means adjacent said fixed axis to guiding movement of the second portion of the support means with respect thereto, step means swingably supported by said second portion of the support means about an axis perpendicular to said fixed axis, whereby the structure is adapted to be folded into a very compact arrangement, and yet may be readily extended into operative position.

2. Apparatus as defined in claim 1 wherein said second portion of the support means includes one part which pivots about said fixed axis and a spaced part which is slidably supported by said first portion of the support means.

3. Apparatus as defined in claim 1 wherein said guide means includes an elongated arcuate slot formed in said first portion of the support means.

4. Apparatus as defined in claim 3 wherein the ends of said slot are closed to limit movement of the second portion of the support means with respect to the first portion of said support means, said second portion of the support means including a part slidably disposed within said slot.

5. Apparatus as defined in claim 1 wherein said step means includes a pair of upper side rail means and a pair of lower side rail means, and a plurality of steps pivotally interconnected with said pairs of upper and lower side rail means to provide a parallelogram arrangement.

6. Apparatus as defined in claim 5 including support rods connected between said upper side rail means and additional support rods connected between said lower side rail means, said steps being movably interconnected with said support rods, said upper side rail means being offset above the associated support rods, said lower side rail means being offset below the associated support rods.

7. Apparatus as defined in claim 6 wherein each of said upper side rail means and said lower side rail means includes a plurality of cutouts formed therein for receiving certain ones of said support rods.

8. Apparatus as defined in claim 1 including holding means for holding the retractable folding step arrangement in its stored position.

9. Apparatus as defined in claim 1 wherein said second portion of the support means includes a tubular portion journaling a member connected with said steps.

10. Apparatus as defined in claim 1 wherein said second portion of the support means includes a depending member rigidly connected with plate means, and a pair of members interconnected with said steps and journaled by said plate means.

11. Apparatus as defined in claim 1 wherein said steps include a pair of upper side rail means and a pair of lower side rail means, said steps being pivotally connected with said pairs of upper and lower side rail means, and base members pivotally connected with the lower ends of adjacent upper and lower side rail means, each of said base members being of generally U-shaped cross-sectional configuration.

12. Apparatus as defined in claim 1 including holding means for holding the retractable folding step arrangement in its stored position, said holding means including a support bracket, a pin slidably supported by said support bracket, and resilient means for normally biasing said pin in one direction.