Sept. 30, 1969 C. A. DOHRMAN 3,469,654

RETRACTABLE FOLDING STEPS

Filed Jan. 12, 1968 2 Sheets-Sheet 1

Fig. 1.

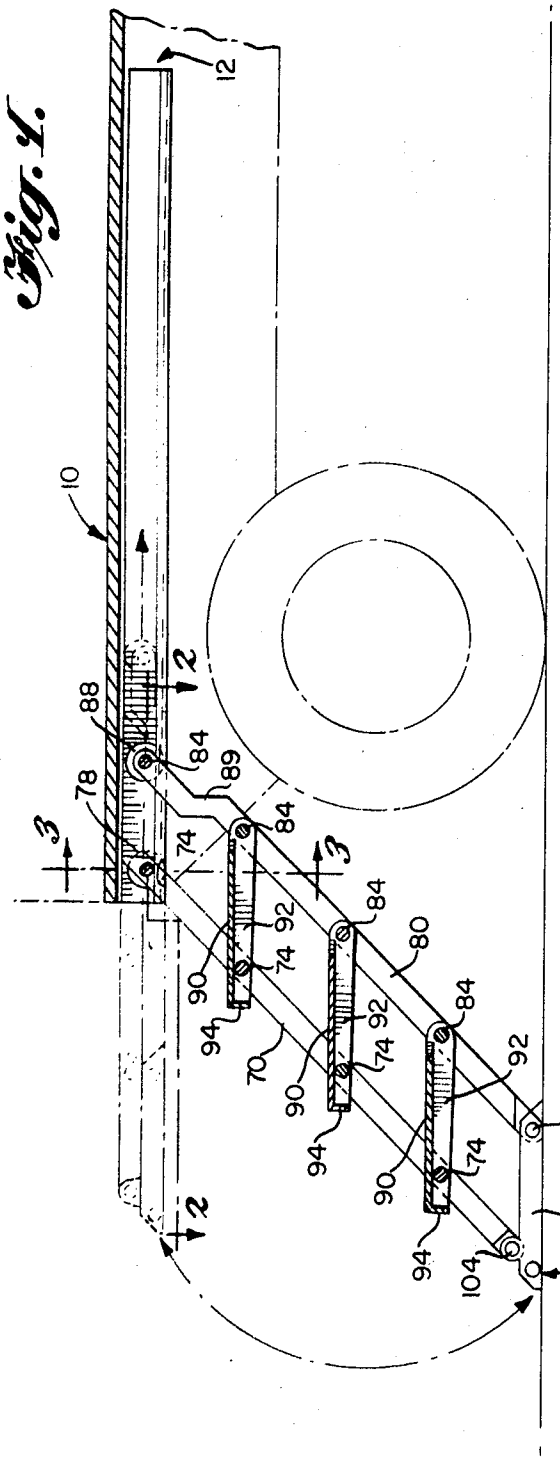


Fig. 3.

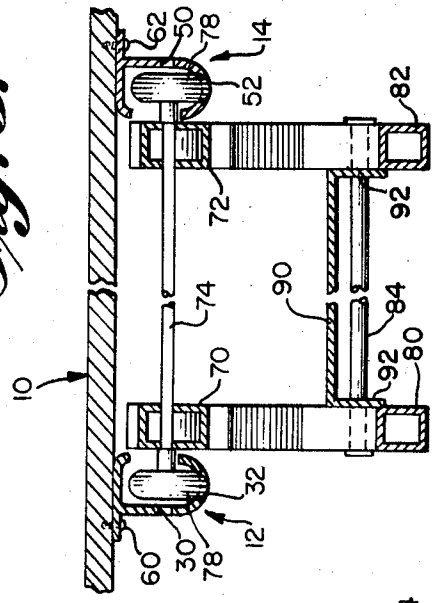
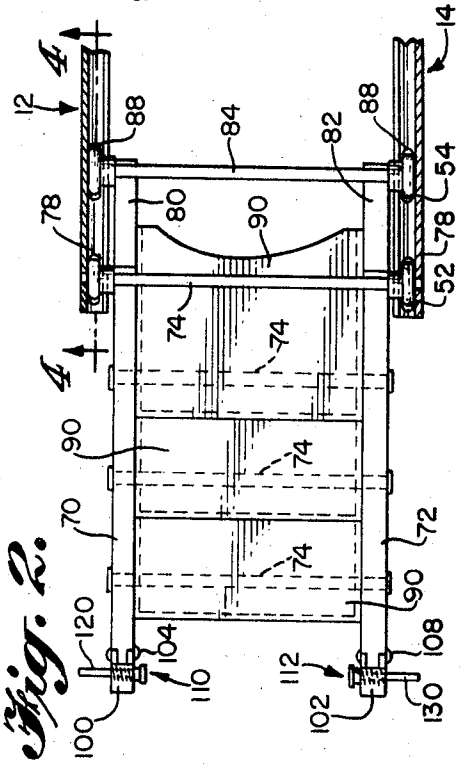


Fig. 2.



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Sept. 30, 1969 C. A. DOHRMAN 3,469,654

RETRACTABLE FOLDING STEPS

Filed Jan. 12, 1968 2 Sheets-Sheet 2

Fig. 4.

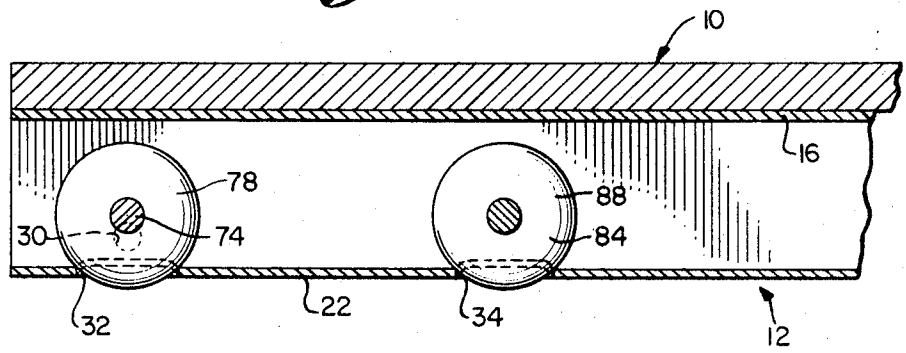


Fig. 5.

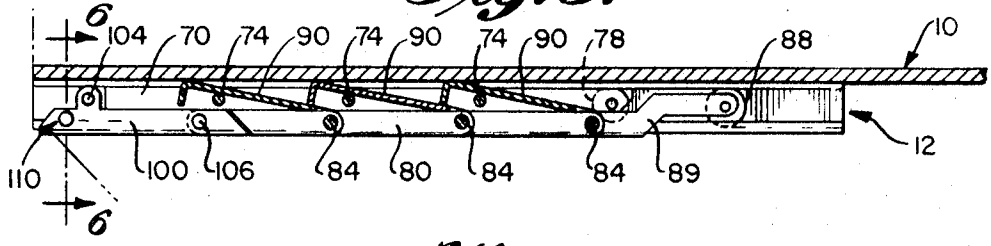


Fig. 6.

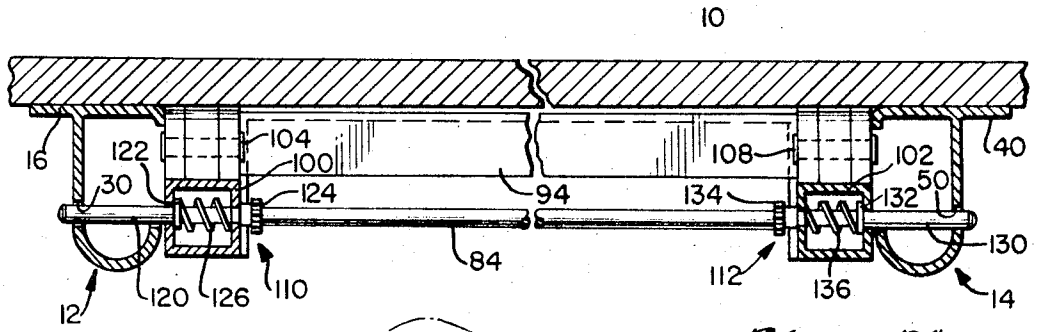
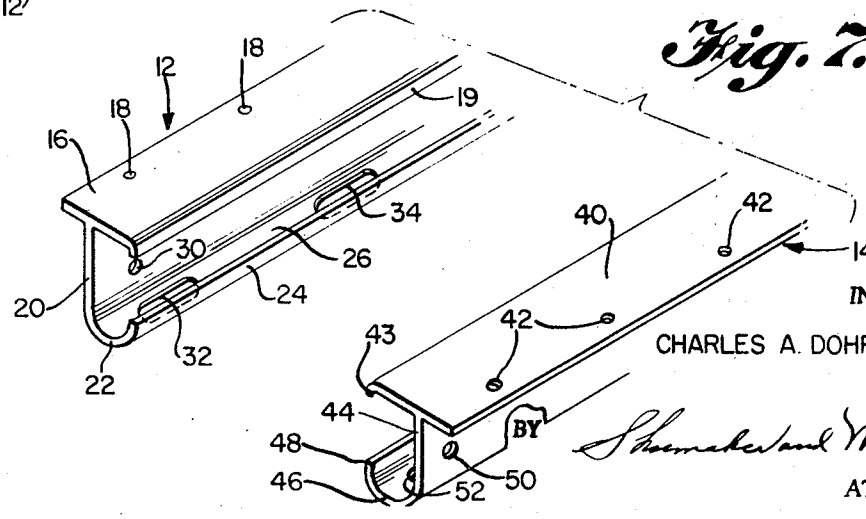


Fig. 7.



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RETRACTABLE FOLDING STEPS

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U.S. Cl. 182—88 6 Claims

ABSTRACT OF THE DISCLOSURE

A pair of support channel members are provided, and the folding steps include a pair of upper side rails and a pair of lower side rails having a plurality of steps pivotally interconnected therewith. A lower base member is pivotally interconnected with the lower end of the side rails. An anti-friction roller is supported at the upper end of each of said side rails and is adapted to ride along the support channels when moving from retracted to operative position. Means is provided for holding the step means in either its operative position or its stored position.

BACKGROUND OF THE INVENTION

The present invention relates to folding steps which are adapted to be mounted in a retracted compact arrangement, and then extended when desired into operative relationship to provide an effective and sturdy step arrangement.

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 in a small amount of vertical space and wherein the steps are to be manually extended or stored as required.

Folding steps of this nature have been heretofore provided in the prior art, and a typical example is illustrated in U.S. Patent No. 3,291,255. This patent discloses a folding step arrangement which can be stored in a relatively small vertical space and manually extended and retracted, but it suffers from a number of disadvantages.

A disadvantage of this arrangement as well as others of the prior art is the fact that the folding steps are mounted in such a manner that they encounter considerable friction when being moved from operative position to stored position and vice versa. As a result, it is rather difficult to manually manipulate this type of structure.

A further disadvantage of this type of arrangement is the fact that the steps are supported about a single pivot axis, or in other words only one pair of the side rails of the arrangement are pivotally connected with the supporting structure. As a result, it is necessary to employ a more rigid and strong construction than would otherwise be the case.

A further disadvantage of such prior art arrangements is the fact that the folding steps are not arranged so that they can be readily completely removed from the support structure so that the steps can be employed with other support structures which may be mounted on the same vehicle or other supporting means.

A further disadvantage of this type of prior art arrangement is the fact that no means is provided for positively holding the steps in both the extended operative position as well as the stored position.

SUMMARY OF THE INVENTION

In the present invention, the steps are pivotally connected with a pair of upper side rails and a pair of lower side rails, the spacing of the pivot points being such that the steps define with the upper and lower side rails parallelogram arrangements so that the steps remain substantially parallel with one another at all times. Anti-friction means in the form of rollers are mounted at one end of the various side rails, these rollers being mounted within supporting channel members. This arrangement enables the folding step structure to be readily moved from its stored position to its extended operative position, and subsequently returned to its stored position, the anti-friction rollers minimizing the amount of effort required.

In the present invention, each of the upper and lower side rails has a roller mounted at the upper end thereof when in operative position. Accordingly, each pair of side rails is supported at the upper end thereof enabling a more lightweight over-all structural arrangement to be employed. The present invention also incorporates an offset portion in each of the lower side rails which enables the above construction while at the same time allowing the upper and lower side rails to be positioned closely adjacent one another when in stored position.

In the present invention, stop means is provided for limiting the outward movement of the folding steps, and to hold the steps in operative extended position. At the same time, this stop means also readily permits the folding steps to be completely removed from the supporting structure when desired so that the folding steps may be employed with other support members which may be mounted at different portions of the same vehicle, or on other supporting members.

Additionally, the present invention includes a lock means for positively locking the folding steps in stored position when not in use.

An object of the present invention is to provide new and novel retractable folding steps which minimize the effort employed in moving the steps from operative to stored position; and wherein a more lightweight construction is employed than that of the prior art; and further wherein means is provided for limiting outward movement of the folding steps and to hold the folding steps in both operative extended position and retracted stored position, and furthermore permitting ready removal of the folding steps from the support means when so desired.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal section through a portion of a vehicle having the folding steps of the present invention mounted thereon;

FIG. 2 is a sectional view taken substantially along line 2—2 of FIG. 1 looking in the direction of the arrows;

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 sectional view taken substantially along line 4—4 of FIG. 2 looking in the direction of the arrows;

FIG. 5 is a longitudinal section through the apparatus illustrating the folding steps in stored position;

FIG. 6 is a sectional view taken substantially along line 6—6 of FIG. 5 looking in the direction of the arrows; and

FIG. 7 is a top perspective view illustrating the end portion of the supporting channel members of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings wherein like reference characters designate corresponding parts throughout the several views, reference numeral **10** indicates any suitable member such as the floor of a camper or trailer and the like upon which it is desired to support the retractable folding step construction of the present invention.

As seen in FIG. 7, the support means of the present invention includes a pair of spaced support members **12**

and 14 which are mirror images of one another. These members may be formed of any suitable lightweight rigid material.

Support member 12 includes an upper horizontal flange portion 16 having a plurality of spaced holes 18 formed therethrough along the outer edge thereof for attaching the support member to member 10 as hereinafter described. The inner edge 19 of flange 16 is curved to define a downwardly extending lip portion.

Support member 12 includes a vertical flange portion 20 which joins with an integral arcuate portion 22 which finally terminates with an upwardly extending portion 24. The construction is such as to define a channel-shaped member which opens toward the other support member 14.

It will be noted that the curved configuration of portion 22 defines a longitudinally extending trough or raceway 26 within which the anti-friction means of the present invention is adapted to travel.

A hole 30 is formed through the flange portion 20 of support member 12 for a purpose hereinafter described. Additionally, a pair of elongated slots 32 and 34 are formed through the arcuate portion 22 of support member 12 for a purpose hereinafter fully explained.

Support member 14 includes an upper generally horizontal flange 40 having a plurality of spaced holes 42 formed therethrough adjacent the outer edge thereof. The inner edge 43 of flange 40 is bent over to define a downwardly extending lip.

Support member 14 also includes a flange 44 which joins with an arcuate portion 46 which finally terminates in an upwardly extending portion 48 to define a channel member opening toward the other support member 12.

Flange 44 of support member 14 has a hole 50 formed therethrough similar to the hole 30 previously described, and a pair of elongated slots 52 and 54 are formed through the arcuate portions 46 similar to the slots 32 and 34 previously described, only one slot 52 being visible in FIG. 7, the other elongated slot 54 being visible in FIG. 2 of the drawings.

As seen in FIG. 3, support member 12 is secured to the undersurface of member 10 by screws 60 which extend upwardly through the holes 18 formed in support member 12. In a similar manner, support member 14 is secured to member 10 by a plurality of screws 62 extending through the holes 42 formed in the support member.

As seen most clearly in FIGS. 1–3, the step means of the present invention includes a pair of similar upper side rails 70 and 72 which are tubular in construction and of generally rectangular cross-sectional configuration. These members may be made of a suitable lightweight rigid material such as aluminum or the like. The upper side rails are interconnected with one another by laterally extending rods 74 having the opposite ends thereof secured to the upper side rails, these rods being spaced substantially equally from one another along the length of the upper side rails as seen most clearly in FIG. 1. As seen most clearly in FIGS. 2 and 3, the uppermost rod 74 extends laterally outwardly from the associated upper side rails 70 and 72 and supports anti-friction means in the form of rollers 78 on the outer end thereof, these rollers being adapted to roll along the trough or raceway portions defined by the arcuate portions 22 and 46 of each of the support members 12 and 14 respectively.

A pair of similar lower side rails 80 and 82 are provided, these lower side rails also being tubular and of generally rectangular cross-sectional configuration. These lower side rails may be formed of a material similar to the upper side rails.

The lower side rails are interconnected with one another by rods 84 having the opposite ends thereof secured to the lower side rails. The uppermost rod 84 extends laterally beyond the opposite lower side rails 80 and 82 and supports anti-friction means in the form of rollers 88 thereon, these rollers being adapted to also roll along the trough or raceway portions of the associated support members.

As seen most clearly in FIG. 1, each of the lower side rails includes an offset 89 formed therein adjacent the upper end thereof and adjacent to the rollers 88 supported thereat. The purpose of this offset will be explained hereinafter.

Again referring to FIG. 1, a plurality of steps 90 are provided, each of these steps including opposite depending integral flanges 92 as seen in FIG. 3, and a forward flange 94 formed integral with each of the steps is also provided. The rods 74 and 84 extend through suitable holes provided in the depending flanges 92 so that the steps are pivotally interconnected with the rail members in a parallelogram arrangement, the rods 84 being spaced along the lower side rails a distance substantially equal to that of the spacing of the rod 74 extending between the upper side rails to accomplish this effect. The rods 74 and 84 may extend loosely through the holes provided in the depending flanges 92 of the steps to permit the necessary pivotal movement when moving the apparatus from its stored position to its extended operative position and vice versa.

A pair of lower base members 100 and 102 are provided, base member 100 being pivotally interconnected by pin 104 with upper side rail 70, and also being pivotally interconnected by pin 106 with lower side rail 80. The base member 102 is similarly pivotally interconnected between the lower ends of the upper and lower side rails at the other side of the apparatus, a pin 108 as seen in FIG. 2 corresponding to the pin 104, and a similar pin (not shown) serving to pivotally interconnect base member 102 with lower side rail 82. These base members are adapted to rest upon the ground or other suitable surface when the apparatus is in its extended operative position as seen in FIG. 1.

A pair of lock means are indicated generally by reference numerals 110 and 112 as seen most clearly in FIG. 6 of the drawings. Lock means 110 includes an elongated generally cylindrical portion 120 having an enlarged integral collar portion 122 formed at an intermediate point thereof. An enlarged end portion 124 is provided on the lock member, and as seen in FIG. 6 the lock member extends through suitable holes provided in tubular base member 100, the outer end of the lock member extending through the hole 30 previously described formed in support member 12. A compression spring 126 is interposed between one wall of the base member 100 and the enlarged collar 122 for normally biasing the lock member to the left as seen in FIG. 6 toward its lock position.

The lock member of the opposite lock means 112 comprises a generally cylindrical portion 130 having an enlarged integral collar 132 formed thereon, an enlarged end portion 134 being provided at one end thereof. This lock member is adapted to slidably extend through suitable holes provided in the tubular base member 102, and a compression spring 136 is inteposed between one wall of the base member and the collar 132 on the lock member to normally bias the lock member toward the operative lock position as seen in FIG. 6 wherein the right-hand end of lock member 130 extends through the hole 50 previously described formed in support member 14.

Referring to FIG. 5 of the drawings, the apparatus is illustrated in its folded stored position. It will be noted as seen in this figure that the apparatus is adapted to fold into a very compact arrangement. The rollers 78 and 88 are supported by the associated support members, and the offsets 89 provided in each of the lower side rails permit the upper and lower side rails to be brought into closely adjacent relationship with respect to one another. The steps are adapted to move into the stored position shown in FIG. 5, and accordingly, it is apparent that the structure occupies a minimum of vertical space in this position.

In order to retain the apparatus in its stored operative position as shown in FIG. 5, the lock means **110** and **112** are disposed in the lock position illustrated in FIG. 6. It is apparent that when the lock members extend through the holes **30** and **50** formed in the support members **12** and **14** respectively as illustrated, this end of the step means will be positively retained in operative relationship with respect to the support means, whereby the step means will remain in the operative relationship shown in FIG. 5.

When it is desired to extend the apparatus into its operative position, the enlarged ends **124** and **134** of the lock means are grasped and pulled inwardly so as to move the lock members out of the holes formed in the associated support members. After so removing these lock members, the step means may be moved outwardly or to the left as seen in FIG. 5. As seen in FIG. 1, the apparatus is moved into the phantom line position illustrated in such figure and is moved outwardly until the rollers **78** and **88** drop into the slots **32** and **34** formed in support member **12** and the slots **52** and **54** provided in support member **14**. This operative position is illustrated in full lines in FIGS. 1, 2, 3 and 4.

It is apparent that when the rollers move into the slots as illustrated in these figures, the slots will serve as stop means to limit the outward movement of the step means and to hold it in operative position. In place of the slots 32 and 34, an integral recessed portion may be provided in the lower part of each of the support members to serve the same purpose.

While the stop means in the form of the slots previously described effectively serves to limit outward movement and to hold the step means in operative relationship, it is apparent that if it is desired to completely remove the step means, the step means may simply be lifted up so that the rollers clear the slots, whereupon the step means may be moved further outwardly so as to be completely disengaged from the support members. The step means can then be employed with any other support members desired.

When it is desired to again move the step means from the extended operative position to the stored position, the step means may be swung upwardly so as to lie substantially in a horizontal plane and the folded step means can then be readily moved inwardly into the stored position after lifting the rollers out of the slots, since the rollers provide an anti-friction means which reduces the amount of effort required to move the steps longitudinally of the apparatus to a minimum.

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.

What is claimed is:

1. Retractable folding steps comprising support means, step means including upper side rail means having anti-friction means adjacent one end thereof and supported by said support means, said step means also including lower side rail means having anti-friction means adjacent one end thereof and supported by said support means, a plurality of steps pivotally interconnected with said upper and lower side rail means and said lower side rail means including an offset portion therein adjacent the anti-friction means thereof, whereby the arrangement is adapted to be folded into a very compact arrangement, and yet may be readily extended into operative relationship.

2. Retractable folding steps comprising support means including a pair of spaced channel members forming horizontal raceways, step means including a pair of like upper side rails of generally hollow-cross-sectional configuration, spaced substantially horizontal rods interconnecting said rails the uppermost rod extending laterally of said rails and carrying anti-friction rollers operating in said raceways, said step means also including a second pair of like lower side rails of generally hollow cross-sectional configuration, correspondingly spaced substantially horizontal rods interconnecting said second pair of rails, the uppermost of these rods also extend laterally of said pair of rails and carrying anti-friction rollers operating in said raceways to the rear of the first named rollers, steps having opposite depending integral flanges, and said flanges having holes loosely receiving corresponding rods of said first and second pair of rails.

3. Apparatus as defined in claim **2** wherein said channel members of said support means open toward one another and toward the front whereby the step means may be readily removed from the support means.

4. Apparatus as defined in claim **2** wherein said support means includes stop means for limiting outward movement of said step means and for holding the step means in desired operative position.

5. Apparatus as defined in claim **2** wherein said support means includes stop means, said stop means comprising slots formed in each of said channel members.

6. Apparatus as defined in claim **2** including lock means for locking said step means in stored position relative to said support means.

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REINALDO P. MACHADO, Primary Examiner

U.S. Cl. X.R.

182—161