

Feb. 8, 1966

F. L. FELTROP
SELF-LEVELING LADDER

3,233,702

Filed May 8, 1964

2 Sheets-Sheet 1

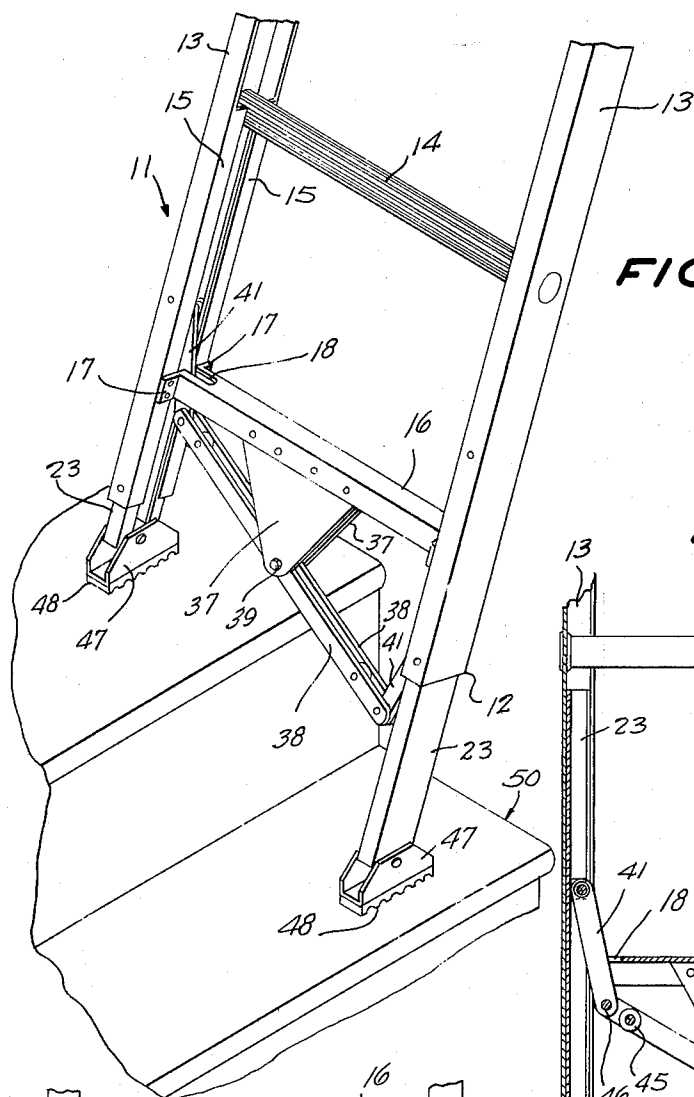


FIG. 1.

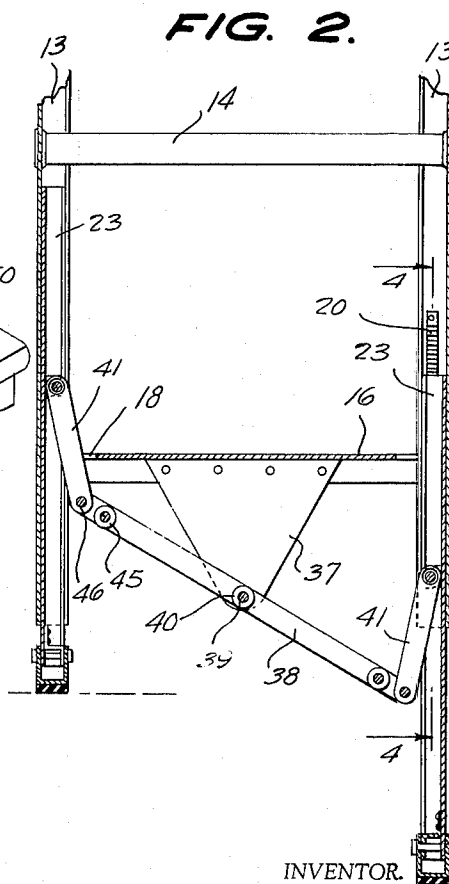


FIG. 2.

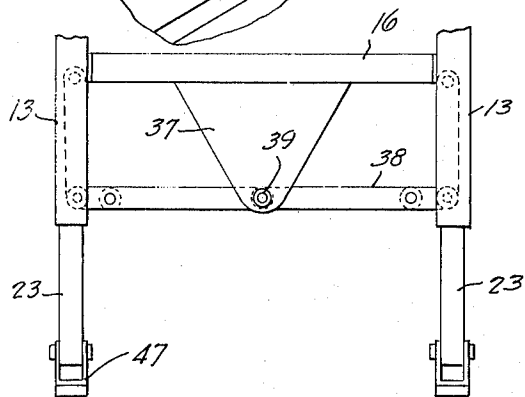


FIG. 3.

INVENTOR.
FLOYD L. FELTROP,
BY

McMorrow, Perman & Davidson
ATTORNEYS.

Feb. 8, 1966

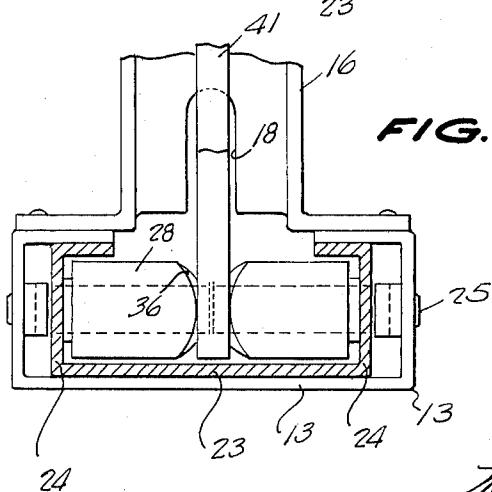
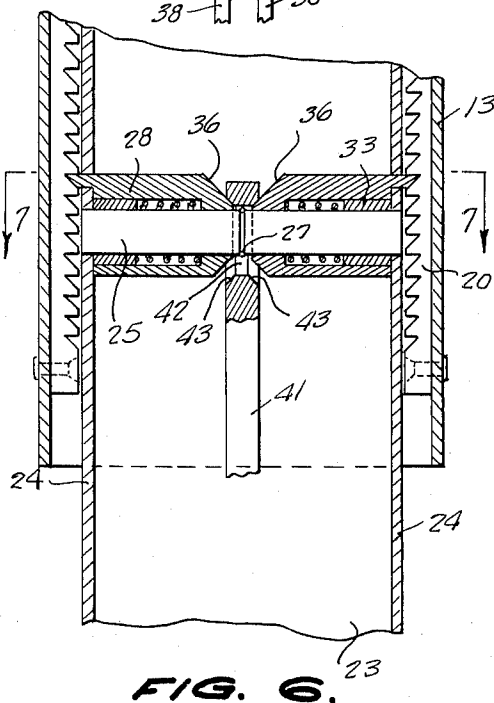
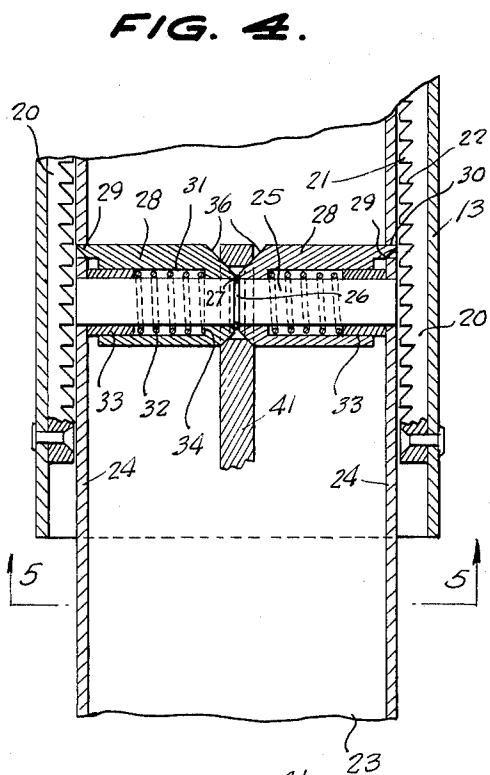
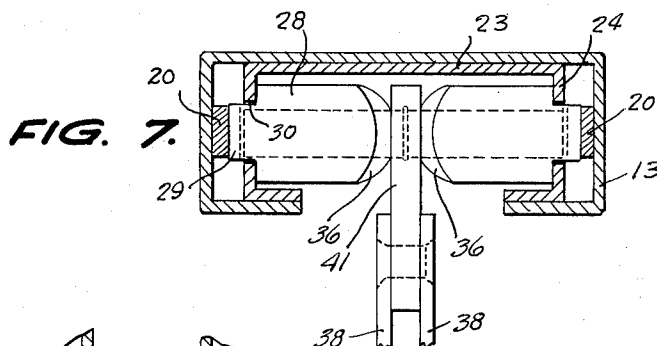
F. L. FELTROP

3,233,702

SELF-LEVELING LADDER

Filed May 8, 1964

2 Sheets-Sheet 2



INVENTOR.
FLOYD L. FELTROP,
BY

McMorrow, Berman & Davidson
ATTORNEYS.

1

3,233,702
SELF-LEVELING LADDER
Floyd L. Feltrop, Eldon, Mo.
Filed May 8, 1964, Ser. No. 365,948
8 Claims. (Cl. 182-202)

This invention relates to ladders, and more particularly to a ladder of the type in which the supporting leg portions of the ladder can be automatically adjusted to conform with irregular subjacent supporting surfaces whereas the steps of the ladder remain substantially horizontal or level.

A main object of the invention is to provide a novel and improved self-adjusting ladder which is simple in construction, which is easy to set up for use, which provides a safe and reliable support for the user, and which is provided with locking means which becomes automatically effective responsive to the weight of the ladder itself so as to lock the ladder in an adjusted upright position.

A further object of the invention is to provide an improved self-adjusting ladder which automatically is adjustable to provide a positive and firm support for the ladder on irregular or uneven surfaces and to permit the ladder to be adjusted to a safe upright position, the ladder being relatively inexpensive to fabricate, being durable in construction, and requiring no manipulations on the part of the user of the ladder when setting the ladder up for use.

Further objects and advantages of the invention will become apparent from the following description and claims, and from the accompanying drawings, wherein:

FIGURE 1 is a fragmentary perspective view showing the lower portion of a ladder constructed in accordance with the present invention, shown mounted on a stairway and illustrating the manner in which the supporting leg portions of the ladder adjust themselves to the adjacent respective steps of the stairway on which they are supported.

FIGURE 2 is a vertical cross sectional view taken through the lower portion of the ladder, shown in FIGURE 1, substantially in the main plane thereof.

FIGURE 3 is a fragmentary front elevational view of the lower portion of the ladder of FIGURES 1 and 2 with the bottom supporting element thereof shown in normal positions with their feet at the same level.

FIGURE 4 is an enlarged fragmentary vertical cross sectional view taken substantially on the line 4-4 of FIGURE 2, showing the locking dogs associated with the locking mechanism of the ladder in retracted positions such as they would assume when the ladder is manually supported off the ground.

FIGURE 5 is a horizontal cross sectional view taken substantially on the line 5-5 of FIGURE 4.

FIGURE 6 is a vertical cross sectional view, similar to FIGURE 4, but showing the locking dog elements forced outwardly into locking position under the weight of the ladder.

FIGURE 7 is a horizontal cross sectional view taken substantially on the line 7-7 of FIGURE 6.

Referring to the drawings, the improved self-adjusting ladder is designated generally at 11 and comprises a main body 12 consisting of a pair of opposed parallel generally C-shaped side channel bars 13, 13 between which are secured a series of vertically spaced tubular rungs 14, serving as supporting steps, separated by substantially uniform intervals. The side bars 13 are provided beneath the lowermost tubular rung 14 with inturned inner flanges 15, 15 and secured to said flanges in spaced parallel relationship to the lowermost tubular rung 14 and spaced below said lowermost rung by substantially the same spacing as provided between the rungs is a channel-shaped bottom step bar 16 which faces downwardly, as

2

is clearly shown in FIGURES 1 and 2. Thus, the top wall of the channel-shaped step bar 16 may be formed at its ends with outwardly projecting flanges 17, 17 which are rigidly secured to the respective inwardly extending flanges 15 of the side bars 13. The ends of the top wall of bar 16 are further formed with longitudinal slots 18 for a purpose presently to be described.

Rigidly secured to the flanges of respective channel-shaped side bars 13, 13 are longitudinally extending ratchet bars 20, 20, said ratchet bars having the inwardly directed ratchet teeth 21 having horizontal downwardly facing locking surfaces 22. Slidably engaged in the lower portions of the side bars 13, 13 are respective C-shaped channel bars 23, 23 whose flanges 24 extend parallel to the flanges of the side bars 13 and are spaced inwardly therefrom, as shown in FIGURE 5. As shown in FIGURE 4, the flanges 24 are located inwardly adjacent the rack bars 20 and are slidable relative thereto.

Rigidly secured between the opposing flanges 24, 24 of each channel-shaped inner bar member 23 is a rod member 25 having an annular center groove 26 in which is mounted a stop ring 27. Slidably engaged on each rod 25 on opposite sides of its stop ring 27 are the respective oppositely directed locking sleeves 28, 28 having beveled outer end lugs 29 slidably engaged in slots 30 provided therefor in the flanges 24 of the channel-shaped inner bars 23. The sleeves 28 have cylindrical inner bores 31 containing coiled springs 32. The coiled springs 32 surrounded the rod member 25, bearing between respective collar members 33 on the rod member 25 and disposed in the outer end portions of the bores 31 and the inner walls 34 of the bores 31. Thus, the springs 32 bias the locking sleeves 28 inwardly, namely, to the positions shown in FIGURE 4, wherein the lugs 29 are retracted in the slots 30 and do not engage with the locking notches of the ratchet bars 20.

The inner ends of the sleeves 28 are biased into engagement with the stop ring 27. Said inner ends are formed with frusto conical cam surfaces 36, 36.

Secured to the inside surfaces of and depending from the respective side flanges of the channel-shaped step bar 16 are triangular gusset plates 37, 37 which extend parallel to each other. Pivoted between the bottom apex portions of the plates 37, 37 are a pair of parallel lever bars 38, 38. Thus, a pivot pin 39 extends through the intermediate portions of the lever bars 38, 38 and through the apex portions of the plates 37, 37, an annular spacer ring 40 being provided between the lever bars 38. Pivotaly connected between the end portions of the lever bars 38, 38 are respective link bars 41, 41, which extend upwardly and are formed at their top ends with apertures 42 receiving the intermediate portions of respective rod members 25, the link bars 41 being formed adjacent the apertures 42 with frusto conical camming surfaces 43, 43 which are cammingly cooperable with the frusto conical surfaces 36, 36 of the locking sleeves 28, 28 to wedge the locking sleeves apart when tension is exerted on the link bars 41 by the application of the weight of the upper portion 12 of the ladder on the pivot bolt 39, as will be presently described.

The slots 18 provide clearance for the link bars 41 when said link bars are in relatively elevated positions, for example, in the case of the left link bar 41 in FIGURES 1 and 2.

Spacer rings 45 are provided between the lever bars 38, 38 inwardly adjacent the bottom pivotal connections 46 of link bars 41.

The gusset plates 37, 37 are of substantial height to provide ample clearance for the lever bars 38, 38, and to provide for a wide range of adjustment of the extension bars 23 relative to the side bars 13 of the ladder.

Pivoted to the bottom ends of the channel-shaped extension bars 23 are respective channel-shaped foot members 47, 47 provided with serrated bottom feet 48 of rubber or other similar resilient deformable material adapted to provide a frictional grip on a subjacent surface engaged thereby.

In using the ladder, it is first placed on the surface on which it is to be supported, for example, on the stairway 50 illustrated in FIGURE 1, with the main ladder portion 12 held by the user while the foot members 47 are located on the surface on which they are to be supported, for example, on the adjacent steps of the stairway 50 shown in FIGURE 1. Since no tension exists in the link bars 41 under these conditions, the locking sleeves 28, 28 are biased to their innermost positions into engagement with the stop ring 27 and the detent lugs 29 are retracted to the positions shown in FIGURE 4. When the main portion 12 of the ladder has been adjusted to a vertical upright position, said main portion 12 is released and the weight thereof is allowed to engage on the pivot pin 39, whereby downward force is transmitted through lever bars 38, 38 to the bottom ends of the link bars 41, developing tension in said link bars and urging the frusto-conical surfaces 43 of their top apertures 42 downwardly against the frusto conical surfaces 36, 36 of the adjacent locking sleeves 28, 28. This forces the locking sleeves outwardly by the wedging coaction between the conical surfaces 43 and 36, whereby the detent lugs 29 are moved into locking engagement with the notches of the ratchet bars 20, 20, thus locking the extension bars 23 against movement relative to the side bars 13, 13 of the ladder. The ladder now may be safely used, since the main portion 12 thereof will be held in a substantially vertical position until another adjustment is required, in which case the portion 12 of the ladder is raised manually, removing the tension on the link bars 41, which allows the biasing springs 32, 32 to retract the locking sleeves 28, 28. This allows the extension bars 23 to be readjusted, if so desired. As shown in FIGURE 3, when the ladder is used on a level surface, the lever bars 38 are substantially horizontal with their ends received in the extension bars 23, 23, and equal lengths of the extension bars 23 project from the bottom ends of the side bars 13 of the ladder.

While a specific embodiment of an improved self-leveling ladder has been disclosed in the foregoing description, it will be understood that various modifications within the spirit of the invention may occur to those skilled in the art. Therefore, it is intended that no limitations be placed on the invention except as defined by the scope of the appended claims.

What is claimed is:

1. In a ladder having side bars and a plurality of spaced rungs connecting said side bars, respective bottom extension bars slidably connected to said side bars, a horizontal rod rigidly secured on at least one of the extension bars, a locking sleeve slidably mounted on said rod and having a locking lug lockingly engageable with the adjacent side bar, means biasing the locking sleeve to retracted non-locking position, and means to apply the weight of the side bars and rungs to said locking sleeve in opposition to said biasing means to move the locking lug into locking position.
2. In a ladder having side bars and a plurality of spaced rungs connecting said side bars, respective bottom extension bars slidably connected to said side bars, ratchet teeth on at least one of the side bars, a horizontal rod rigidly secured in the adjacent extension bar, a locking sleeve slidably mounted on said rod and having a locking lug lockingly engageable with said ratchet teeth, means biasing the locking sleeve to retracted non-locking position, and means to apply the weight of the side bars and rungs to said locking sleeve in opposition to said biasing means to move the locking lug into locking position.
3. In a ladder having side bars and a plurality of spaced rungs connecting said side bars, respective bottom

extension bars slidably connected to said side bars, a bottom step member connected between the side bars, ratchet teeth on at least one of the side bars, a horizontal rod rigidly secured in the adjacent extension bar, a locking sleeve slidably mounted on said rod and having a locking lug lockingly engageable with said ratchet teeth, means biasing said locking sleeve to retracted non-locking position, a depending support on the bottom step member, lever means pivoted to the lower portion of said support, and means connected to said lever means to apply the weight of said side bars and elements attached thereto to said locking sleeve in opposition to said biasing means to move the locking lug into locking position.

4. In a ladder having side bars and a plurality of spaced rungs connecting said side bars, respective bottom extension bars slidably connected to said side bars, a bottom step member connected between the side bars, ratchet teeth on at least one of the side bars, a horizontal rod rigidly secured in the adjacent extension bar, a locking sleeve slidably mounted on said rod and having a locking lug lockingly engageable with said ratchet teeth, means biasing said locking sleeve to retracted non-locking position, release camming means engageable with said locking sleeve to move the locking lug into locking position responsive to force exerted thereon, lever means pivoted to said bottom step member, and means, connecting said lever means to said camming means to exert locking force on said camming means responsive to the weight of the side bars and the elements attached thereto.

5. In a ladder having side bars and a plurality of spaced rungs connecting said side bars, respective bottom extension bars slidably connected to said side bars, a bottom step member connected between the side bars, ratchet teeth on at least one of the side bars, a horizontal rod rigidly secured in the adjacent extension bar, a locking sleeve slidably mounted on said rod and having a locking lug lockingly engageable with said ratchet teeth, means biasing said locking sleeve to retracted non-locking position, downwardly movable release camming means engageable with said locking sleeve to move the locking lug into locking position responsive to downward force exerted thereon, lever means pivoted to said bottom step member, and means connecting said lever means to said camming means to exert locking force on said camming means responsive to the weight of the side bars and the elements attached thereto.

6. In a ladder, a pair of side bars, a plurality of rungs secured between said side bars in spaced parallel relationship, said side bars having channel-shaped lower portions, respective extension bars slidably disposed in said channel-shaped lower portions, means on the lower ends of said extension bars engageable with a subjacent supporting surface, a bottom step member secured between said channel-shaped lower portions, a depending support member secured to said bottom step member, ratchet teeth in at least one of the side bars, a horizontal rod rigidly secured in the adjacent extension bar, a locking sleeve slidably mounted on said rod and having a locking lug lockingly engageable with the ratchet teeth, means biasing the locking sleeve to retracted non-locking position, downwardly movable cam means engageable with the locking sleeve to oppose said biasing means and move the locking lug into locking engagement with the ratchet teeth responsive to downward movement of the cam means, lever means pivoted to the lower portion of said depending support member, and means connecting said cam means to the lever means to exert downward force on the cam means responsive to the weight of the side bars and the elements attached thereto.

7. In a ladder, a pair of side bars, a plurality of rungs secured between said side bars in spaced parallel relationship, said side bars having channel-shaped lower portions, respective extension bars slidably disposed in said channel-shaped lower portions, means on the lower ends of said extension bars engageable with a subjacent support-

5

ing surface, a bottom step member secured between said channel-shaped lower portions, a depending support member secured to said bottom step member, ratchet teeth in at least one of the side bars, a horizontal rod rigidly secured in the adjacent extension bar, a locking sleeve slidably mounted on said rod and having a locking lug lockingly engageable with the ratchet teeth, means biasing the locking sleeve to retracted non-locking position, lever means pivoted to the lower portion of said depending support member, link means connected to said lever means, and cam means on the link means engaged with the locking sleeve and moving said locking lug into locking engagement with the ratchet teeth responsive to downward force exerted on the lever means by the weight of the side bars and elements attached thereto.

8. In a ladder having side bars and a plurality of spaced rungs connecting said side bars, respective bottom extension members slidably connected to said side bars, a horizontal rod rigidly secured on at least one of the extension members, a locking sleeve slidably mounted on said rod and having a locking lug lockingly engageable

6

with the adjacent side bar, means biasing the locking sleeve to retracted non-locking position, lever means, means pivotally connecting said lever means to the lowermost rung at a point spaced a substantial distance therebelow, and means connected to said lever means to apply force to said locking sleeve in opposition to said biasing means and to move the locking lug into locking position responsive to the weight of the side bars and the elements attached thereto.

References Cited by the Examiner

UNITED STATES PATENTS

1,516,988	11/1924	Redman	182—202
2,476,650	7/1949	Biery	182—202
3,016,103	1/1962	Studer	182—202
3,027,969	4/1962	Erickson	182—202
3,037,581	6/1962	Feltrop	182—202

HARRISON R. MOSELEY, *Primary Examiner*.

REINALDO P. MACHADO, *Examiner*.