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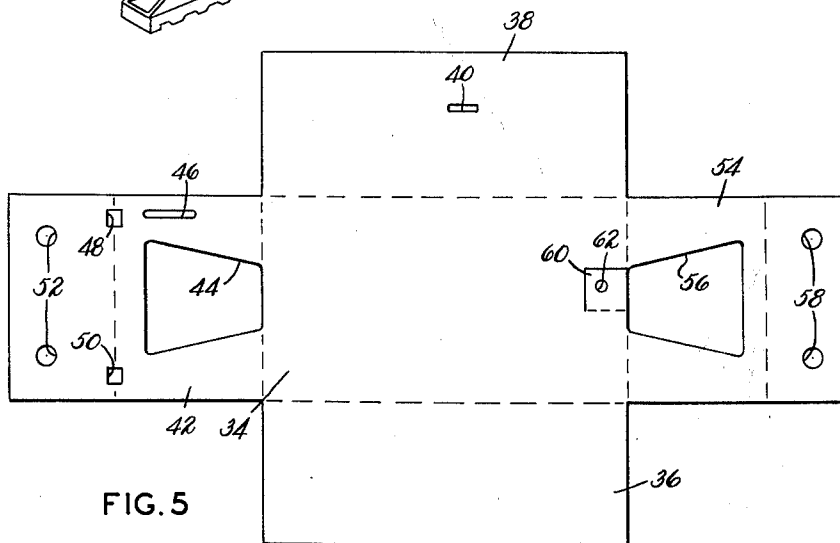
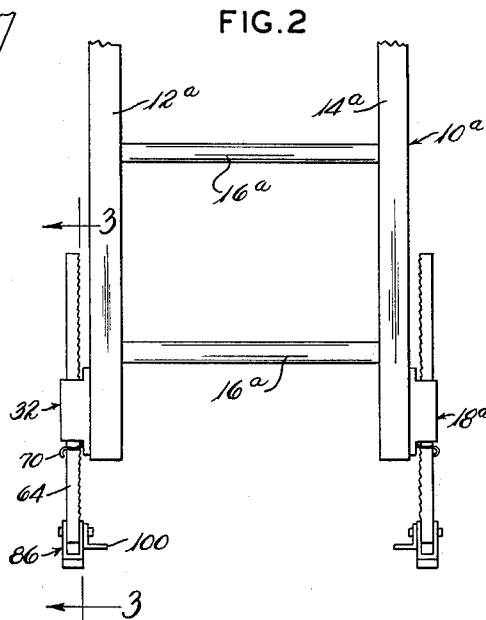
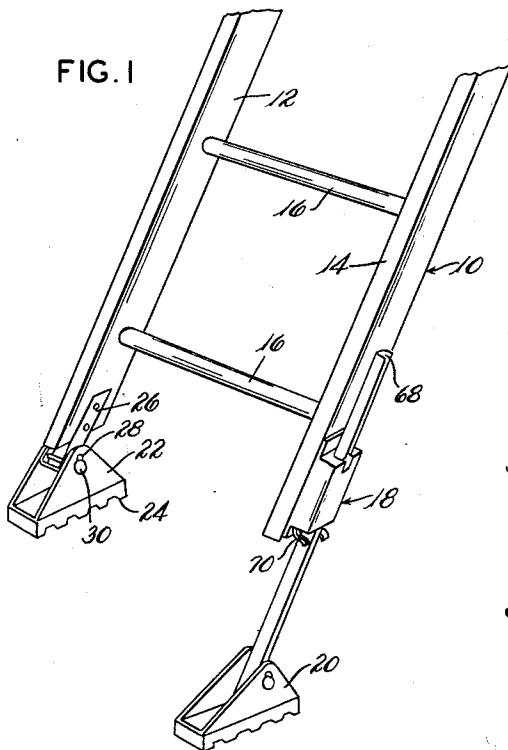
L. O. STUDER

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LADDER LEVELING APPARATUS

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3 Sheets-Sheet 1



INVENTOR.
LEWIS O. STUDER
BY
Oakham & Oakham
ATTYS.

L. O. STUDER

LADDER LEVELING APPARATUS

3 Sheets-Sheet 2



INVENTOR.
LEWIS O. STUDER
BY
Orlham & Orlham
ATTYS.

Filed Nov. 24, 1961

LADDER LEVELING APPARATUS

3 Sheets-Sheet 3



BY

Oldham & Oldham
ATTYS.

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LADDER LEVELING APPARATUS

Lewis O. Studer, Barberton, Ohio, assignor to The Bauer Manufacturing Company, Wooster, Ohio, a corporation of Ohio

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This invention relates to ladder leveling apparatus, and, more particularly, to positive lock leveling apparatus secured to the lower portions on the side rails of a ladder.

Heretofore it has been known to provide a ladder with adjustable extensions affixed to each side rail. The extensions are manually adjusted to level the ladder on its supporting surface. Positive locks hold the extensions in adjusted fixed positions relative to the side rails of a ladder. These ladder leveling devices do not cooperate with pivotal ladder supporting shoes which are capable of conforming to the slope of the ladder supporting surface. Moreover, known ladder leveling devices are complicated and expensive, and/or are not safe, or are difficult to operate because the locking mechanism cannot be readily released and the extensions cannot be readily readjusted in length.

It is the general object of the invention to avoid and overcome the foregoing and other difficulties of and objections to prior art practices by providing a ladder with a safe, simple, inexpensive, and easily operable leveling apparatus.

Another object of the invention is to provide a ladder with a leveling apparatus which will variably adjust the length of one or both side rails of the ladder.

Another object of the invention is to provide a ladder with a leveling apparatus which may be fixed to a variety of conventional ladders without modification of the ladder.

Another object of the invention is to provide the leveling apparatus for a ladder with a foot-operated positive lock.

Another object of the invention is to provide a ladder with a leveling apparatus which upon release of the positive lock retracts to an initial short position.

Another object of the invention is to provide a ladder with a leveling apparatus capable of being extended by force derived from the foot of the operator.

A further object of the invention is to provide a ladder with supporting shoes that contact the supporting surface in a plane irrespective of the slope of the surface.

A further object of the invention is to provide a ladder with a leveling apparatus constructed from the minimum number of structural components.

The aforesaid objects of the invention, and other objects which will become apparent as the description proceeds, are achieved by providing on the lower end of the side rails of a ladder a leveling apparatus which has a housing secured to the side rail, a ratchet rod vertically extending through said housing, a locking detent pivotally mounted on the housing and engageable with the ratchet teeth of the ratchet rod to prevent upward movement of the rod in the housing, shoe means pivotally mounted on the lower end of the ratchet rod and resilient means connected to the ratchet rod and the housing to bias the ratchet rod in an upward direction. A leveling apparatus can be secured to the lower portion of each side rail of a ladder. Alternatively, a leveling apparatus can be secured on the lower end of one of the side rails of a ladder and a pivotal shoe secured on the other side rail of the ladder.

Other objects and many of the attended advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the

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accompanying drawings in which like reference numerals designate like parts throughout the figures thereof and wherein:

FIG. 1 is a perspective view of a ladder having a pivotal shoe and a leveling apparatus attached thereto.

FIG. 2 is an elevation view of a ladder having leveling apparatus secured to each side rail thereof.

FIG. 3 is an elevation view of the leveling apparatus taken along the line 3-3 of FIG. 2.

FIG. 4 is a vertical sectional view of the leveling apparatus taken along the line 4-4 of FIG. 3.

FIG. 5 is a plan view of the housing blank of the leveling apparatus.

Referring now to the drawings, wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in FIG. 1 a ladder 10 having vertically extending side rails 12 and 14 laterally spaced and interconnected by horizontal rungs 16. A ladder leveling apparatus 18 is secured to the lower portion of the side rail 14. A ladder supporting shoe 20 is pivotally mounted on the leveling apparatus. The details of the leveling apparatus and shoe will be subsequently set forth.

Mounted on the lower portion of the side rail 12 is a U-shaped supporting shoe 22 having a flat horizontal base and vertically extending triangular-shaped side flanges. A friction sole 24 of rubber or similar material is fastened to the lower surface of the shoe face. A U-shaped bracket 26 is mounted on the lower end of the side rail 12 and extends between the side flanges of the shoe. Each side flange of the shoe has a vertically extending slot 28. A horizontal pivot pin 30 extends through the vertically extending slots and the U-shaped bracket to pivotally mount the shoe on the bracket. The vertically extending slots permit the shoe to have limited vertical movement and to cant both laterally and front to back enabling the friction sole to conform with the slope of the supporting surface.

As shown in FIG. 2, the ladder 10a has secured to the lower portions of the side rails 12a and 14a, a pair of leveling devices 18a and 32. By using a leveling device on the lower portion of each side rail the total length of the ladder can be extended and the ladder can be leveled in the extended position. Since the leveling devices 18, 18a, and 32 are identical, the detailed description will be limited to leveling apparatus 32.

The ladder leveling apparatus 32 has a box-shaped housing 34 secured to the side rail 12a. As shown in FIG. 5, the housing 34 is formed from a unitary flat plate which is folded along the indicated dotted lines into a box configuration. The box housing has side walls 36 and 38. The side wall 38 includes a spring holding punched eye 40. Lower end wall 42 has a trapezoidal-shaped opening 44 and a longitudinal slot 46. Laterally spaced from the trapezoidal-shaped opening are a pair of rectangular hinge orifices 48 and 50, the purpose of which become apparent as the description proceeds. Bore 52 receive the bolts which secure the housing to the lower portion of the side rail. The upper end wall 54 has a trapezoidal-shaped opening 56 which is in alignment with the trapezoidal-shaped opening 44. Bores 58 receive the bolts which secure the housing to the lower portion of the side rail. A spring-supporting tab 60 having a bore 62 is bent up into the box chamber.

A hollow vertically extending ratchet rod 64 trapezoidal in cross section, extends through the trapezoidal-shaped openings in the end walls of the housing. Formed on the side of the ratchet rod facing the side rail are a plurality of vertically spaced, upwardly faced and horizontally extending ratchet teeth 66. The side of the ratchet rod opposite the ratchet teeth has a vertically extending groove

68 which permits the housing tab 60 to extend into the hollow interior of the ratchet rod.

As shown in FIGS. 3 and 4, a detent 70 has a pair of vertically extending dogs 72 and 74 which extend into the rectangular hinge orifices 48 and 50 to pivotally or rockably mount the detent on the housing end wall 42. The detent is formed with an edge 76 adapted to engage the ratchet teeth 66 of the ratchet rod 64. A pair of curved arms 78 and 80 having hooked ends 82 extend around and slightly beyond the ratchet rod 64. An important safety feature of the apparatus is that the detent 70 extends only about 1/8 to 1/4 inch laterally beyond the laterally outer surface of the housing 32, so that in combination with the hooked ends 82, and the close position to the bottom of the housing 32, it makes it difficult to accidentally depress the detent 70. As shown in FIG. 3, a tension spring 84 is connected to the punched eye 40 in the side wall 38 of the housing, extends through the slot 46 in the lower end wall 42 and connects with the arm 78 of the detent 70 biasing the detent in an upward direction holding the edge 76 into engagement with the teeth 66. The detent and ratchet teeth form a positive one-way lock which permits the ratchet rod to move in a downward direction and prevents the rod from moving in an upward direction. Pivoting the detent 70 in a downward direction will release the edge 76 from engagement with the ratchet teeth 66 and thereby allow the rod to be moved in either vertical direction. The spring 84 retains the ratchet rod in the locking position. The position of the pivot of the detent and the length of the detent is such that the upward thrust or load on the ratchet rod wedges the detent still more tightly into engagement thereby preventing slippage.

Secured to the lower end of the ratchet rod is a shoe 86, U-shaped in cross section, having triangular-shaped vertically extending flanges 88 and 90 and a horizontal base 92. A friction sole 94 of hard rubber, nylon, or the like, is fastened to the lower surface of the base 92. Each side flange of the shoe has a vertically extending slot 96 and 98 which enables the shoe to have a limited degree of lateral tilting movement. A foot pedal 100 having a vertical flange 102 is secured to the shoe flange 90 by means of rivets or the like 104. The vertical flange of the foot pedal includes a vertical slot 106 which is complementary to the vertical slot 98. A horizontal pivot pin 108 extends through the vertically extending slots and the ratchet rod to pivotally secure the shoe about a horizontal axis on the lower end of the ratchet rod. A spring positioned in the hollow ratchet rod is secured at one end to the tab 60 and at the other end to the mid-portion of the pivot pin 108. The spring 110 biases the rod 64 in an upward direction. It is to be particularly noted that a second positive locking action is achieved between the detent 70 and the teeth 66 of ratchet rod 64 by the upward bias action effected on the rod 64 by the spring 110.

Even though it is believed the operation of the apparatus will be apparent from the foregoing description, a brief review thereof will now be made for purposes of summary and simplification. After the ladder has been placed in the desired vertical position, it is often necessary to level the ladder so that the rungs are in a horizontal plane. The appropriate side rail can be extended by placing a foot upon the foot pedal 100 and forcing the ratchet rod down out of the housing 34. The detent 70 slips over the teeth 66 when the rod is moved in the downward direction. When the desired length of the side rail is attained, the spring biased detent 70 wedges between the teeth 66 and the lower end wall 42 preventing the ratchet rod from moving upward in the housing. The ladder is now in the leveled position.

When the ladder is moved to a second position, which requires a readjustment of the leveling device, the opera-

tor places his foot upon one of the release arms 78 or 80 of the detent forcing it downward out of engagement with the teeth 66. The tension spring 110 quickly moves the ratchet rod 64 up into the housing to the initial retracted position. The leveling device may be readjusted by placing the foot of the user on the pedal 100 and forcing the ratchet rod downwardly out of the housing.

It should be understood that the foregoing disclosure relates to only a preferred embodiment of the invention and that it is intended to cover all changes and modifications of the examples of the invention herein chosen for purposes of the disclosure which do not constitute departures from the spirit and scope of the invention.

What is claimed is:

1. For use on a ladder, a leveling means including a housing, a ratchet rod having at least one row of spaced teeth, said rod extending through the housing, a detent having dog means for rockably mounting the detent on the housing adjacent the teeth of the rod, said detent having arm means which extend around the rod underneath the housing, said arms being curved to position the ends thereof slightly below and slightly laterally beyond the laterally outer surface of the housing, said ends of the arms being hooked downwardly to substantially a right angle in relation to the arms, a first resilient means connected to the detent and the housing biasing the detent into one-way locking engagement with the teeth of the ratchet rod, a second resilient means connected to the housing and the ratchet rod for biasing the rod upward against the detent, and a foot pedal secured to the lower end of the rod adapted to receive sufficient force to move the ratchet rod downward against the tension of the second resilient means.

2. Ladder leveling apparatus including a hollow box-like housing adapted to be secured to the outside of the lower end of a ladder side rail, the housing having aligned trapezoidal-shaped openings in its top and bottom, a hollow rod having a trapezoidal shape in cross section slidably received in the openings, a plurality of upwardly directed vertically spaced ratchet teeth extending the full width of the side of the rod towards the side rail, a U-shaped detent, the legs of the U straddling the rod, dogs pivotally securing the outside of the bottom of the U to the outer and under side of the housing adjacent the side rail, the inside of the bottom of the U having an edge engaging over the full width of any selected ratchet tooth, means inside the housing biasing the detent upwardly, coil-spring means inside the rod and secured at its lower end to the lower end of the rod, and means extending through a vertical slot in the rod and secured between the upper end of the housing and the upper end of the spring means to bias the rod upwardly.

3. Ladder leveling apparatus including a rod, a plurality of upwardly directed, vertically spaced ratchet teeth on an outer surface of the rod, means slidably mounting the rod for vertical movement on the lower outside rail of a ladder with the teeth facing and closely parallel to the rail, detent means pivotally mounted adjacent the ladder rail on the underside of the rod mounting means and adapted to wedge between the rod and rail and against a selected ratchet tooth, resilient means holding the detent against the ratchet teeth, integral leg means on the detent extending by the rod for moving the detent away from the teeth, and resilient means holding the rod upwardly in its mounting means.

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