United States Patent [19]

Sturm

[11] **3,794,141**

[45] **Feb. 26, 1974**

[54] **DEVICE FOR ADAPTING THE LENGTHS OF A PAIR OF LEGS, SUCH AS THOSE OF A LADDER, TO UNEVENNESS OF A SUPPORTING SURFACE**

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[22] Filed: **Oct. 24, 1972**

[21] Appl. No.: **300,349**

[30] **Foreign Application Priority Data**

Feb. 10, 1972 Germany ..... P 22 06 326.9

[52] **U.S. Cl.** **182/202**

[51] **Int. Cl.** **E06c 7/44**

[58] **Field of Search** 182/202

[56] **References Cited**

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[57] **ABSTRACT**

A device is provided which can be mounted at the lower end of a ladder for adapting the legs of the ladder to the unevenness of the ground. The device comprises two extension legs which are mounted for telescoping movement into and out of the respective ends of a U-shaped tubular member which is fastened to the ladder. The extension legs are interconnected through the tubular member by means of a longitudinal flexible member having a series of longitudinally spaced recesses on its outer surface. The U-shaped tubular member has an expanded portion midway between its legs so that the longitudinal flexible member will bulge into the expanded portion when pressure is applied to both extension legs. A number of mutually spaced projections are provided inside the expanded portion for fitting into the recesses on the flexible member when it bulges into the expanded portion to lock the flexible member in position relative to the tubular member.

5 Claims, 4 Drawing Figures

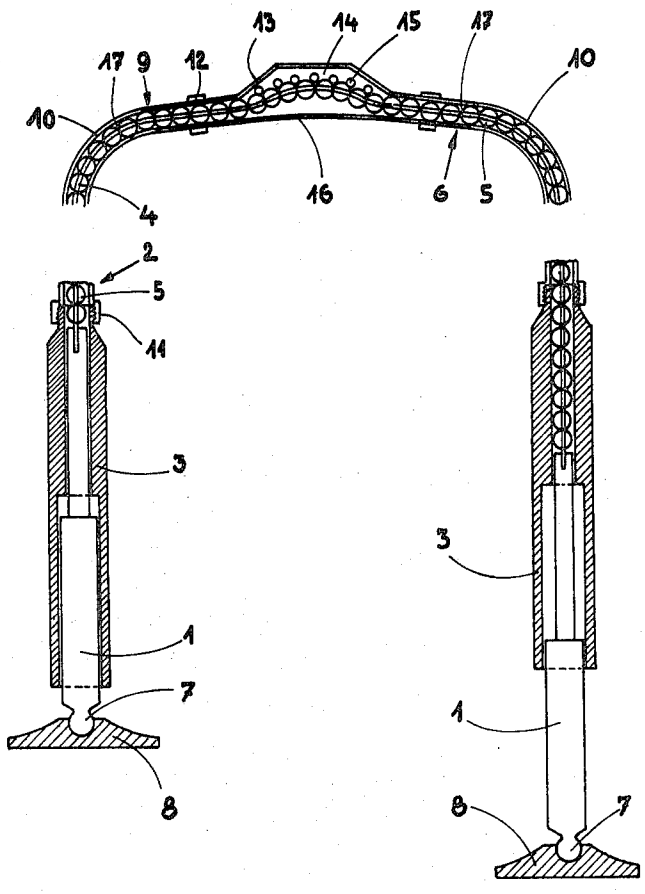
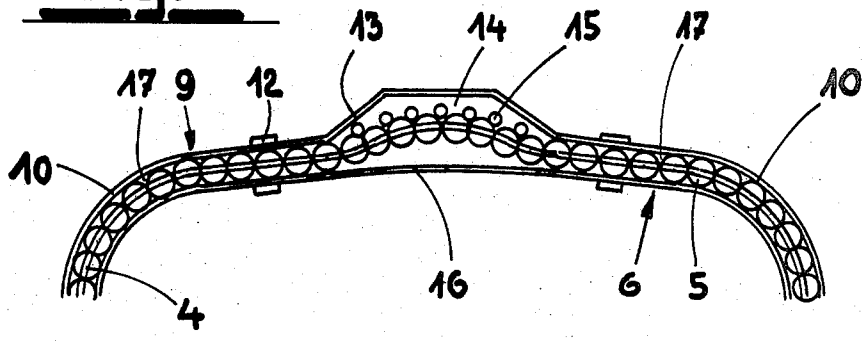
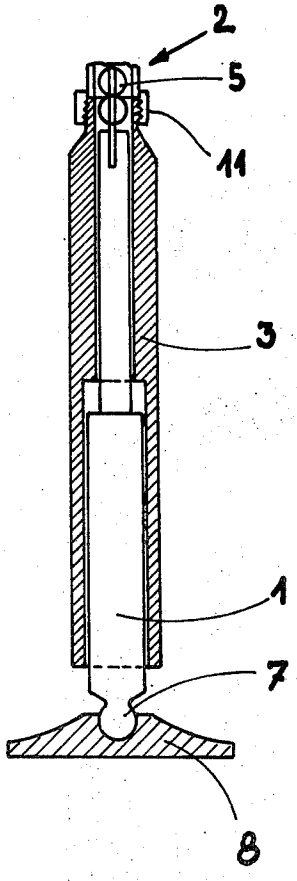


Fig. 1





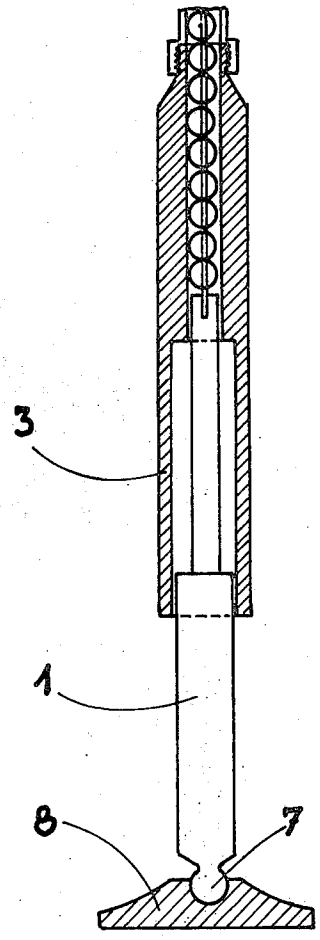


Fig. 2

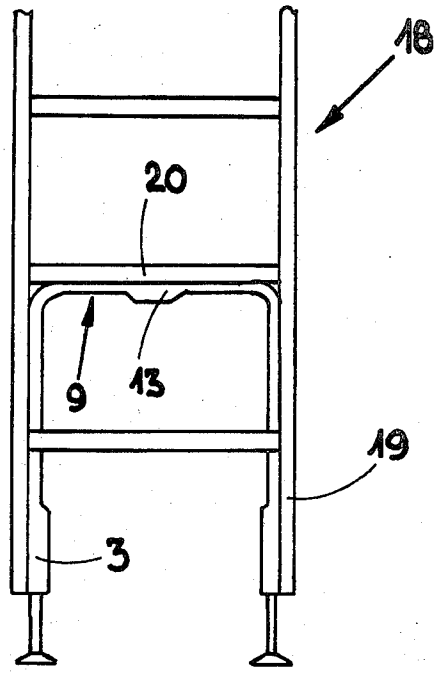


Fig. 3

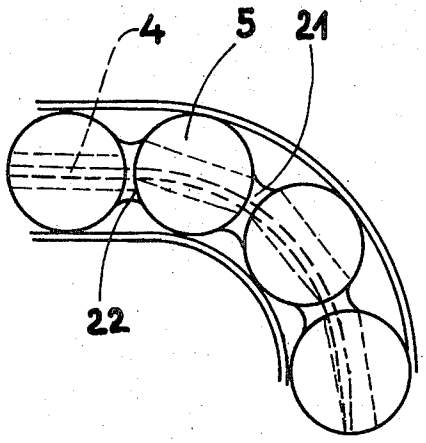
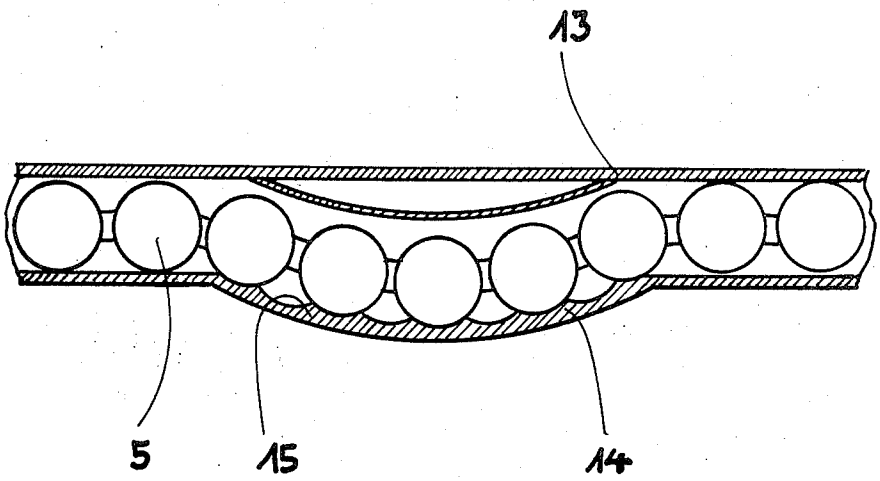


Fig. 4



DEVICE FOR ADAPTING THE LENGTHS OF A PAIR OF LEGS, SUCH AS THOSE OF A LADDER, TO UNEVENNESS OF A SUPPORTING SURFACE

BACKGROUND OF THE INVENTION

The invention relates to a device for adapting the lengths of a pair of legs, such as those of a ladder, to the unevenness of a supporting surface.

PRIOR ART

In a known device of this kind, an upper portion of the device comprises a supporting beam to each end of which is attached a blade and in which two screw bolts is provided, each supporting a winged nut, and each projecting through a slot in the blade. When the nuts are loosened, the blades, which represent the extension legs, can be moved up and down. The extension legs are fastened by tightening the nuts.

In a disadvantageous manner, each time the pair of legs provided with this device is to be used, this known device must be operated by hand by adjusting at least one of the two extension legs to any unevenness in the ground by loosening and tightening the screw bolts.

Therefore, it is an object of the invention to provide a device of the kind initially mentioned which automatically becomes adapted to any unevenness in the ground by simply placing the pair of legs provided with the device in the desired position on the uneven ground.

SUMMARY OF THE INVENTION

The present invention provides a device for adapting the lengths of a pair of legs, such as those of a ladder, to unevenness of a supporting surface, comprising a substantially U-shaped tubular member, a pair of extension legs mounted for telescoping movement into and out of the respective ends of the tubular member, the extension legs being interconnected by connecting means extending through said tubular member for effecting interdependent reciprocal telescoping movement of the extension legs relative to the tubular member, and locking means for the legs for preventing telescoping movement of the legs when pressure is applied to both legs.

The connecting means may comprise a flexible longitudinal member having a plurality of longitudinally spaced recesses or protrusions on its outer surface, with the U-shaped tubular member having an expanded portion on one side thereof between its legs for receiving a bulged portion of the longitudinal member when pressure is exerted on the extension legs, and said locking means comprising a plurality of projections within said expanded portion, said projections being spaced from each other for fitting into the recesses or engaging between the protrusions when said bulged portion of the longitudinal member enters the expanded portion and lock the longitudinal member in position relative to the tubular member.

The connection means is only longitudinally displaceable in the tubular member apart from the expanded portion, i.e., it is not movable transversely to the central axis of the tubular member, but is flexible such that it can move around curves or bends of the tubular member when it is moved in the direction of its longitudinal extension. The longitudinal connecting member is fixed in the direction of its longitudinal extension, i.e., it is not compressible. If the longitudinal connecting member is now moved in the direction of its longitudinal extension, the distance measured along the longitudinal connecting member still remains constant. If the pair of extension legs is placed on uneven ground, at first one of the two extension legs will rest on the ground and will consequently slide upwards. The other extension leg will consequently slide downwardly by virtue of the connecting member until it likewise rests on the ground. Since the extension legs now exert opposing pressures on the longitudinal connecting element, said element bulges into the extended portion towards the projections and lies adjacent thereto, whereby the projections engage in the recesses in the longitudinal connecting element. The two extension legs, which support at least the weight of the pair of legs and the device according to the invention, can now no longer be moved, since the longitudinal connecting element is locked by the projections so as to be axially immovable. This immobilization can be terminated again when the pair of legs, and thus the device, is raised from the ground.

The side of the tubular member opposite said expanded portion may comprise an arch directed towards said expanded portion. This arch assists the deflection or bulging of the longitudinal connecting member towards the projections when the two extension legs rest on the ground.

The tubular member may further be flexible on either side of the expanded portion. Due to this flexibility of the tubular member, the spacing between the extension legs can be altered and the entire device can be adapted to pairs of legs having various leg spacings.

The connecting member may comprise a continuous core having a plurality of bead elements threaded thereon. Such a connecting member is characterized by its particularly favorable stability, load capacity and flexibility.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional view of a device for adapting the lengths of a pair of legs of a ladder to uneven ground;

FIG. 2 illustrates a slightly modified form of the embodiment of the device according to FIG. 1 on a ladder;

FIG. 3 is a plan view of part of a flexible longitudinal connecting member in a tubular member; and

FIG. 4 is a cross-sectional view through a housing provided with projections which are designed differently from projections in the device according to FIG. 1.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 illustrates two extension legs 1, which are round in cross-section, are made of metal and are attached to an upper part 2 which has two tubular guides 3 of metal each of which receives one of the two extension legs. The diameter of the bore of each of the tubular guides 3 is smaller at the top than at the bottom and the narrower bore section passes over a shoulder into the wider bore section.

The two upper ends of the extension legs 1 are connected together via a core 4. The core 4 consists of three or four solid steel wires (not a multiplicity of fine

wires) that are very flexible, adaptable and because they are solid, can only be damaged with difficulty and are very resistant. The core **4** runs through bored steel balls **5** which are arranged close together in a row and of which the two outermost tightly abut the two upper ends of the extension legs so that a firm direct connection is produced between the two extension legs **1.** The steel wires of the core **4** are welded to the extension legs **1** and the diameter of the bore of each steel ball **5** is larger than the diameter of the core.

The core **4** and the steel balls **5** form a longitudinal flexible connecting member **6,** the diameter of which corresponds to the diameter of the upper part of the extension leg **1** since both parts must be received by the narrower bore section of the tubular guides **3** with the same amount of play. A round cast plate **8** is attached as a foot to the lower end of each extension leg **1** by way of a ball-and-socket joint **7,** and which cast plate **8** has, at the bottom, a hard rubber insert with star-shaped supports for providing a good grip or hold on the ground in each position of the foot.

The upper part of the device comprises a tubular member **9** which includes two curved steel tubes **10** of which one is fastened at one of its two ends by means of a screw coupling **11** to the upper end of one of the two tubular guides **3.** The two other ends of the curved steel tubes **10** are fastened by means of screw couplings **12** to a tubular end of a steel housing **13.** This housing **13** is provided with an expanded portion **14** in an upper wall thereof. A number of steel pins **15** projecting into the housing **13** to form projections are riveted in the expanded portion **14.** The spacing of the pins **15** from each other from center to center corresponds to the diameter of the steel balls **5.** The housing **13** forms an arch **16** or curve on the side opposite the pins **15.** The connecting member **9** has recesses **17** or notches between adjacent steel balls **5,** whereby the pins **15** can fit into said recesses or notches.

According to FIG. **2,** a device slightly modified with respect to the device of FIG. **1** is shown fastened to a ladder **18** which has two legs **19,** by attaching the tubular guides **3** to the legs **19** by means of screws or clamps so that the lower ends of the tubular guides **3** terminate with the lower ends of the legs **19.** A flattened surface of the housing **13** is placed against the lower side of a penultimate rung **20** and is attached thereto by means of a clamp. As indicated in FIG. **2,** the housing **13** is designed in the opposite way to that shown in FIG. **1** so that the arch **16** is located at the top, with the expanded portion **14** and pins **15** being at the bottom. The tubular member **9** then forms on its upper side a straight line which tightly adjoins the lower side of the rung **20.**

As shown in FIG. **3,** an insert **21** may be provided on the core **4** between adjacent steel balls **5.** The insert **21** has two cup-shaped recesses **22** for receiving the balls **5.** The bores in the inserts **21** or spacers correspond to the diameter necessary for the core **4,** while the bores in the balls are larger in order to enable the necessary displacement of the inserts **22** during bending of the connecting member **9.** The outer diameter of the inserts **22** is larger than the diameter of the bores of the balls so that the inserts have a sufficient support against the balls in any position.

The device according to FIG. **4** includes a housing **13** which has a straight upper portion and an expanded portion **14** below said straight upper portion. Projections **15***a* are provided in the expanded portion **14** which projections are integral with the housing **13** and located at equal distances from each other, with the spacing of two adjacent projections corresponding to half the spacing between the centers of two adjacent balls. Therefore, the balls **5** can be engaged between successive pairs of projections in steps of movement which are shorter than their diameters.

The device described here for extending a pair of legs can be detachably or fixedly fastened to the pair of legs. The extension legs may be round or angular in cross-section. The tubular member may be completely rigid per se if it is only to be attached to pairs of legs where the spacing from pair to pair does not alter.

I claim;

1. An apparatus for adjusting the lengths of a pair of legs, particularly of a ladder, to match irregularities in the ground, including two extension legs mounted at a distance from each other, an upper part which can be attached to the pair of legs, the two extension legs being attached to be displaceable up and down on the upper part, the upper part having a tubular structure which begins in the extension of one extension leg, extends across to the other extension leg, and ends in the extension of another extension leg, a chain-like connecting element mounted in the tubular structure to be displaceable in the direction of its longitudinal extension, the connecting member being connected at one of its two ends to one of the two extension legs, having on the outer side recesses provided in series in the direction of its longitudinal extension and consisting of a continuous core and links threaded thereon, projections which are mounted in series at a distance from the chain-like connecting member in the direction of the longitudinal extension of the connecting member fitting into the recesses of the chain-like connecting member, the improvement being that said tubular structure, in its transverse section, defines an expansion directed towards only one side and in which the projections are mounted and opposite the expansion forms a curvature aligned with the expansion in which the chain-like connecting member in the tubular structure, apart from the expansion, is not movable transversely to the center axis of the tubular structure.

2. The apparatus as claimed in claim **1** in which the tubular structure is flexible on either side of the zone having the expansion.

3. The apparatus as claimed in claim **1,** in which the chain-like connecting element has a core of steel wires attached at each end to the extension legs, balls threaded on said steel wires, an insert mounted on the core between each two balls, and a spherical recess facing each of the two balls with the ball housed therein and whose outer diameter across the core is smaller than that of the ball.

4. The apparatus as claimed in claim **1,** in which each extension leg is mounted in a correspondingly shaped bore of a tubular guide and tapers in diameter upwardly above a shoulder and the tapered section of the extension leg as well as the chain-like connecting member being adapted to each other in diameter.

5. The apparatus as claimed in claim **3,** in which the spacing between two adjacent projections corresponds to half the spacing between the centers of two adjacent balls.

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