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REPLACEABLE LADDER RUNG

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2 Sheets-Sheet 1

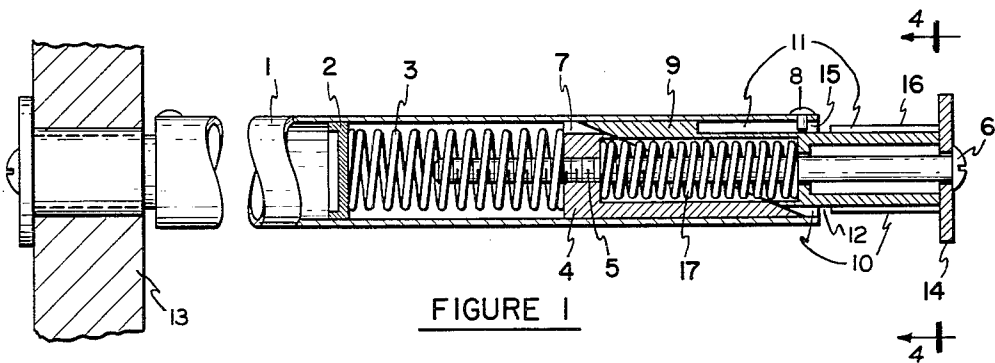


FIGURE 1

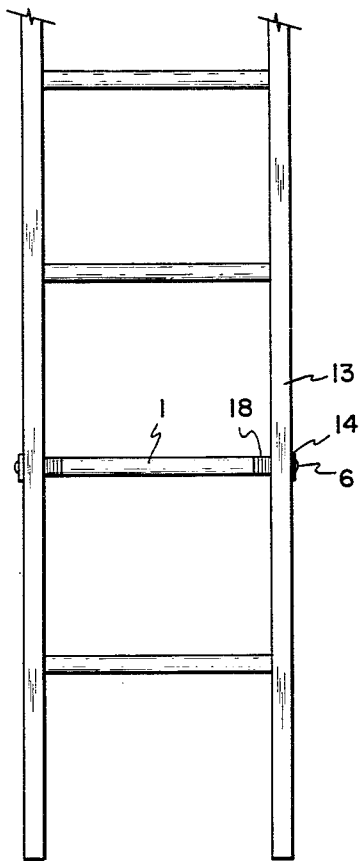


FIGURE 2

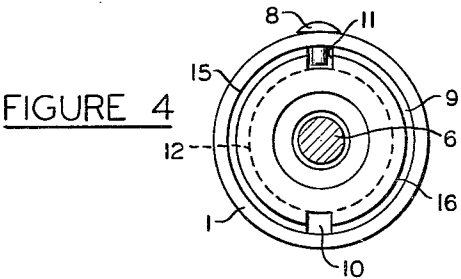


FIGURE 4

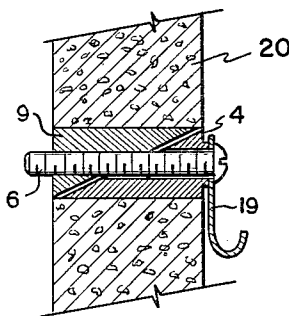


FIGURE 3

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REPLACEABLE LADDER RUNG

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The present invention is generally concerned with an improved expandable toggle joint whereby units or elements may be rigidly affixed or positioned as desired. The invention is more specifically concerned with expandable fasteners which may be utilized particularly as, for example, in rungs for ladders and for other purposes such as fasteners for utilization in a drilled hole in concrete, wood, and similar "solid body" materials other than plaster.

In the art there exist many mechanical units and assemblies adapted to securely affix one element to another as, for example, methods of affixing replaceable ladder rungs to the side rails. Also, many suggestions have been made as to how tools and other items may be securely affixed to a concrete or equivalent wall surface other than by the utilization of screws and nails which become loose in time. Also, in many instances, rungs of ladders, including extension ladders, become weakened or broken, and it is a necessary safety measure to replace these rungs and fasten them rigidly to the side rails. Thus, in its more specific aspect, the present invention is concerned with improved replaceable ladder rungs and the like as a replacement element for a worn or defective wooden or metallic rung.

The present invention may be readily understood by reference to the drawings illustrating some embodiments of the same.

FIGURE 1 illustrates the expandable toggle joint of the present invention utilized in conjunction with a replaceable rung for a ladder.

FIGURE 2 shows the rung and an extension collar in use with respect to a ladder.

FIGURE 3 illustrates the expandable toggle joint for utilization as a holding assembly in a solid wall, ceiling, floor or equivalent.

FIGURE 4 is a cross-sectional view of the toggle joint taken on the line 4-4 of FIGURE 1 with the bolt removed.

FIGURE 5 shows a modified severable rung and two severable collar extensions.

FIGURE 6 illustrates a simplified version of FIGURE 1 made largely from conventional sized pipe.

FIGURE 7 is an enlarged view of one end of FIGURE 6.

Referring specifically to FIGURE 1, the mechanism or assembly is shown positioned in one end of hollow cylindrical rung 1. The rung may have a plain outer or inner surface or may be formed with longitudinal or vertical ribs or embossed areas for increased strength as illustrated by ribs 24 of rung 23 in FIGURE 6. It is to be understood that, for the sake of simplicity, the mechanism is described only with respect to one end of rung 1, but that preferably a similar mechanism may be placed in the other end of cylindrical rung 1.

The length of rung 1 may vary from about 6 to 30 inches, but is usually in the range from about 10 to 16 inches. Likewise the diameter of the rung may vary in the range from ¼ to 3 inches, but preferably is in the range from about ¾ to 1½ inches. The thickness of the casing of rung 1 will depend upon the type of metal utilized and is generally in the range from about ¼ to ¾ inch.

Positioned within rung 1 is a stop 2 which may be affixed by any means, but is preferably a friction type stop

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bearing against the inner surface of rung 1. If desired, stop 2 may be staked in any suitable manner to the rung 1.

Positioned within rung 1 is a first coil spring or equivalent means 3 which seats against stop 2 and is designed to exert a horizontal force against the assembly base through the base of a substantially hollow diagonally cut-away base element 4. The spring 3 exerts a thrust against the solid bottom of base element 4, which bottom at the center thereof contains a threaded screw hole 5 adapted to receive the threads of elongated screw or bolt 6. When there is no obstruction in the way, spring 3 will force the entire assembly from the rung.

Threaded bolt or screw 6 is preferably sharply pointed at its end (see 26) in order to pierce the outer surface of the ladder rails 13 and to more easily find the hole 5. Base element 4, on the short or top side thereof, contains a notch or channel 7 which is adapted as hereinafter described to by-pass a downwardly extending screw or rivet 8, which extends through the shell of rung 1.

A top substantially hollow diagonally cut-away cylindrical element 9 is also positioned within rung 1 and spaced from 4 by spring 17 to prevent binding except when bolt 6 is tightened. When said bottom cylindrical element and said top cylindrical element contact each other on their shoulders, these cylindrical elements tend to slide with respect to each other and thereby obtain an enlarged diameter and bear tightly against the rung. In other words, when the cylindrical elements are moved, they make rigid contact with an inner area of rung 1 over a relatively wide area and thereby materially enhance the strength of the connection between the rung and the top and bottom cylindrical elements.

The short or lower side of top element 9 contains a channel or notch 10 extending therethrough. The long or top side of cylindrical element 9 contains a channel or notch 11 which extends through 9 and also through bearing 16. This channel is designed to act as a stop in cooperation with rivet 8. Immediately behind shoulder 15 of element 9 is a circumferential channel 12 which is designed to permit the assembly as follows.

Rivet 8 passes through channel 7, thence, as the assembly is turned, the rivet follows the split area between elements 9 and 4 to circumferential groove 12. Here the assembly is turned 180° to position rivet 8 in notch 11 as in FIGURE 1. The assembly and rung would be shipped as shown in FIGURE 1. Hence, to install the rung, the bolt 6 and washer 14 would be removed, the assembly, including bearing 16, forced further into the rung against spring 3 by means of rivet 8 passing through the washer end channel 11 whereby the rail of the ladder would be cleared. Bearing 16 would then enter the hole in the rail, after which the bolt will serve to expand the elements 4 and 9 against the rung and cause a tight fit.

Bearing area 16 is designed to be passed through the side rail 13 as illustrated in FIGURE 2. Flange 14 is designed to be placed against the outer surface of rail 13 and contains a hole therethrough for the passage of bolt 6. Thus, in operation, the hole in the side rail is adapted to receive bearing surface 16.

An intermediate coil spring 17 prevents binding of the inclined edges of elements 4 and 9 and is adapted to be received within the hollow cylindrical areas of the respective base and top cylindrical elements 4 and 9. Spring 17, in compression, seats against the face of the bottom or end section of element 4 and against the top section 9 and tends to thrust these respective elements apart in a manner that, when bolt 6 is unscrewed, the assembly can be easily inserted or removed from within the rung. When the bolt screw 6 is drawn up by means of the screw surface on the bolt and the threaded hole 5 the respective base and top cylindrical elements bear against each other causing an upwardly inclined motion and thereby

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securing rigid attachment between the inner surface of the rung 1 and the cylindrical sides of the base and top cylindrical elements over a relatively wide area. Besides securing the assembly, this greatly enhances the structural strength of the entire assembly.

If the length of the replaceable rung assembly is shorter than the width of the ladder, a series of collars 18 and 22 (FIG. 5) of different lengths may be used in conjunction with the entire assembly. Referring specifically to FIGURE 2, the bearing surface 16 extends through the rail, while collars 18 are utilized on one or both ends of the rung so that the diameter of rung 1 is uniform in thickness between the respective rails and serve to support and strengthen the main rung body and bearing and prevent movement and erosion in the bearing area of the rails.

As shown in FIGURE 5, if desired, the rung 21, long collar 18, and short collar 22 may be notched to facilitate cutting. However, if aluminum or other relatively soft metal is used, this is unnecessary. Collars of up to a total length of 1 inch or 1½ inches are practical.

Referring specifically to FIGURE 3, the assembly of the present invention is shown positioned in a concrete or equivalent (not plaster) wall 20. Thus, as bolt 6 is drawn up in a manner as hereinbefore described, cylindrical elements 4 and 9 will tend to move along the respective shoulders with respect to each other, thereby securing firm frictional bearing over a relatively wide surface. The article to be held on wall 20 can be attached to the outwardly extending hook 19.

FIGURES 6 and 7 illustrate a modified and simplified version largely using conventional pipe. Rung 23 in this case has a series of reinforcing ribs 24 thereon, and a single spring 27 tends to eject both assemblies. The outside diameter of the section of pipe 28 forming the bearing surface, for example, is .340 inch and the inside diameter of element 29 is .825 inch, making a tight force fit. The outside diameter of 29 (and 30) is 1.050 inches, while the inside diameter of the rung is 1.125 inches.

Plug 31 has a threaded central aperture 32 to receive threaded bolt 25 which has a piercing point 26 to help to locate aperture 32. The plug may be secured to 30 by epoxy cement or by welding or any other means.

As can readily be seen, no machining of parts or forming of grooves is necessary either in the assembly or in the rung. Long lengths of commercially available pipe are cut and fitted together thereby making an inexpensive, commercially salable product.

The present invention is broadly concerned with a unique frictional assembly for securing rigid and firm contact between a number of elements. The invention is more specifically concerned with a rung which may be readily positioned in a ladder in order to replace a defective or broken rung. The present invention very effectively and safely provides the replacement for a broken rung which in many cases heretofore has been secured by merely nailing a cleat across the rung where broken, by driving a piece of iron pipe through the ladder from rail to rail, or by repairing the same with wire or the like.

The present invention provides a quick and efficient method of replacing industrial rungs in the ladder which are defective due to adverse cross-graining or which have deteriorated due to exposure to weather or which have become broken due to contact with heavy objects. The present invention provides a flexible rung made largely from commercially available pipe which may be efficiently and effectively used with respect to a wide variety of ladders and with respect to materials and dimensions. As pointed out, the present invention may be installed in any ladder of varying dimensions and saves labor and repair costs. The rung may be locked securely in place and will enhance the strength of any ladder in which it is used. As a matter of fact, the rung of the present invention provides greater strength than the rung being

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replaced. No special tools are required, the repairs can be made on the job, and the replacement is light in weight and may be readily handled.

What is claimed is:

1. A rung assembly designed to replace a defective rung of a ladder which comprises a cylindrical rung containing at least in one end thereof a first diagonally cut-away substantially hollow cylindrical element, a second diagonally cut-away substantially hollow cylindrical element which extends without said rung to a distance equivalent to the width of the rail of a ladder with which it will be used, said first and said second diagonally cut-away cylindrical elements being positioned with respect to each other so that each element comprises one end of a two-piece substantially uniform cylinder, a coil spring under compression positioned between said elements and within the hollow portions thereof, means for moving the respective elements toward each other along the longitudinal axis thereof, whereby said elements will tend to move in a vertical plane with respect to each other and thus secure sufficient contact within said cylindrical rung.

2. Rung assembly as defined by claim 1 wherein said means for moving the respective elements comprises a threaded bolt extending through one of said cylindrical elements and engaging in a threaded hole in the other of said elements.

3. Rung assembly as defined by claim 2 wherein a flange is positioned between the head of the bolt and the one end of one of said elements, said flange being characterized by having a substantially greater diameter than the diameter of said element.

4. A rung assembly designed to replace a defective rung of a step ladder which comprises a cylindrical rung containing at least in one end thereof a first diagonally cut-away substantially hollow cylindrical element, a second diagonally cut-away substantially hollow cylindrical element which extends without said rung to a distance equivalent to the width of the rail of a ladder with which it will be used, said first and said second diagonally cut-away cylindrical elements being positioned with respect to each other so that each element comprises one end of a two-piece substantially uniform cylinder, a coil spring under compression positioned between said elements and within the hollow portions thereof, means comprising a threaded bolt extending through one of said cylindrical elements and engaging in a threaded hole in the other of said elements for moving the respective elements toward each other along the longitudinal axis thereof, whereby said elements will tend to move in a vertical plane with respect to each other and thus secure sufficient contact within said circular rung, a flange positioned between the head of said bolt and the one end of said second element, said flange being characterized by having a substantially greater diameter than the diameter of said element, a stop positioned within said rung and a coil spring positioned between said stop and the one end of said first diagonally cut-away cylindrical element.

5. A rung assembly designed to replace a defective rung of a step ladder which comprises a cylindrical rung containing at least in one end thereof a first diagonally cut-away substantially hollow cylindrical element, a second diagonally cut-away substantially hollow cylindrical element which extends without said rung to a distance equivalent to the width of the rail of a ladder with which it will be used, said first and said second diagonally cut-away cylindrical elements being positioned with respect to each other so that each element comprises one end of a two-piece substantially uniform cylinder, a coil spring under compression positioned between said elements and within the hollow portions thereof, means comprising a threaded bolt extending through one of said cylindrical elements and engaging in a threaded hole in the other of said elements for moving the respective elements toward each other along the longitudinal axis thereof, whereby

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said elements will tend to move in a vertical plane with respect to each other and thus secure sufficient contact within said circular rung, a flange positioned between the head of said bolt and the one end of one of said elements, a similar set of hollow cylindrical elements at the opposite end of said cylindrical rung, and a coil spring positioned between the one end of said first diagonally cut-away cylindrical element and the inner end of said similar set of hollow cylindrical elements positioned at the opposite end of said cylindrical rung.

6. A rung assembly designed to replace a defective rung of a step ladder which comprises a cylindrical rung containing at least in one end thereof a first diagonally cut-away substantially hollow cylindrical element, a second diagonally cut-away substantially hollow cylindrical element which extends without said rung to a distance equivalent to the width of the rail of a ladder with which it will be used, said first and said second diagonally cut-away cylindrical elements being positioned with respect to each other so that each element comprises one end of a two-piece substantially uniform cylinder, means comprising a threaded bolt extending through one of said cylindrical elements and engaging in a threaded hole in

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the other of said elements for moving the respective elements toward each other along the longitudinal axis thereof, whereby said elements will tend to slide diagonally with respect to each other and thus secure frictional contact with said circular rung, a similar set of hollow cylindrical elements at the opposite end of said cylindrical rung, and a coil spring positioned between the one end of said first diagonally cut-away cylindrical element and the inner end of said similar set of hollow cylindrical elements positioned at the opposite end of said cylindrical rung.

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