Dec. 10, 1935. W. HARTING 2,024,039

UNIVERSAL FOLDING LADDER

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Fig. 1.

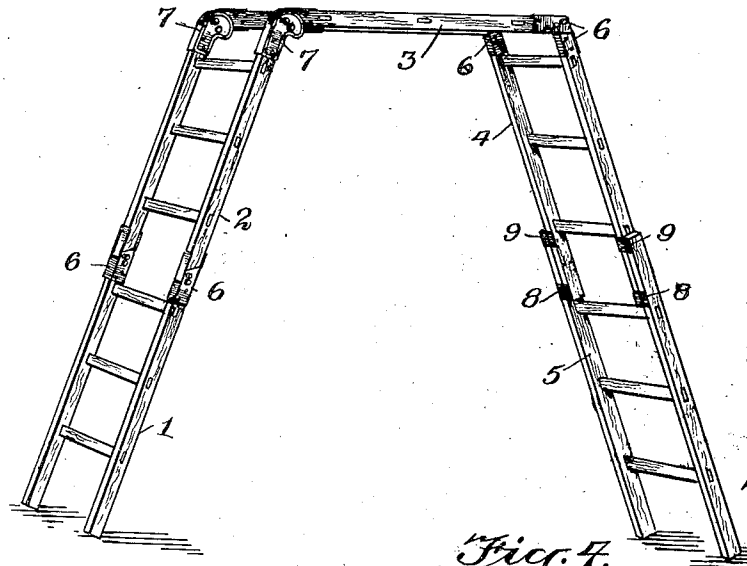


Fig. 2.

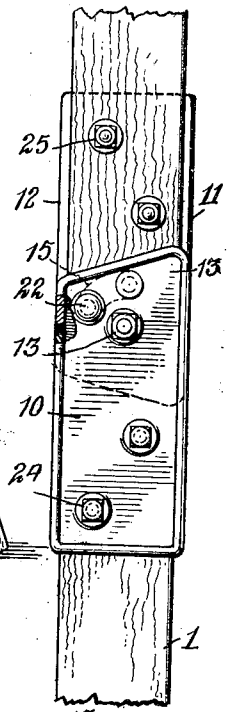


Fig. 4.

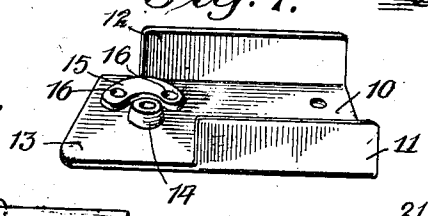


Fig. 3.

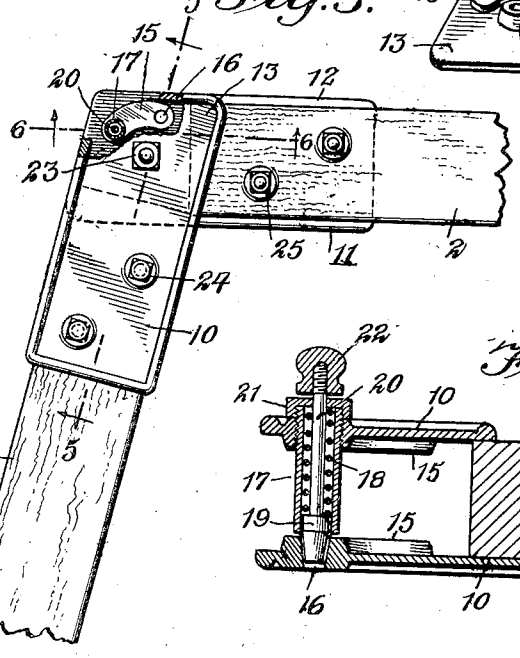


Fig. 5.

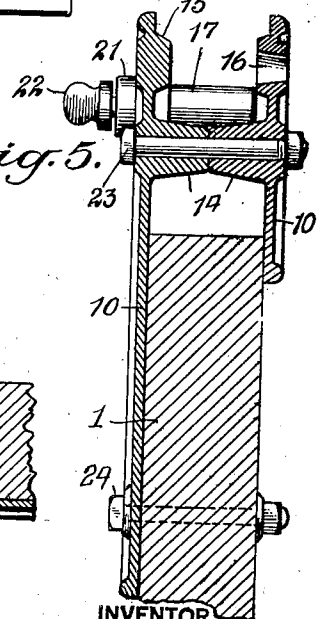


Fig. 6.

WITNESSES

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UNIVERSAL FOLDING LADDER

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Fig. 7.

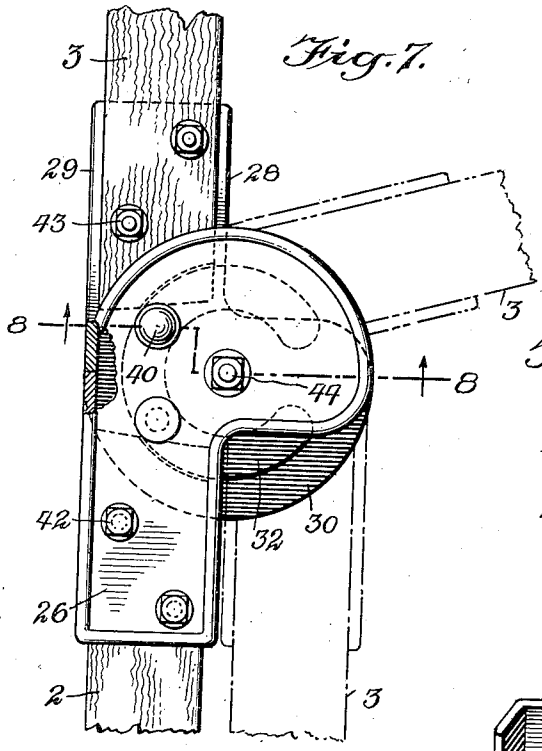


Fig. 11.

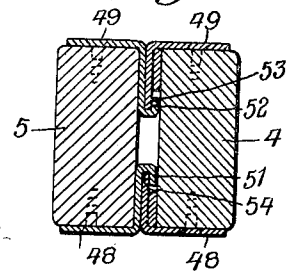


Fig. 10.

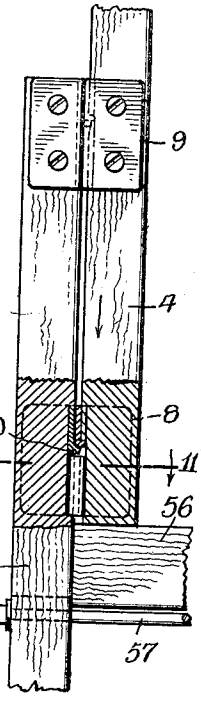


Fig. 12.

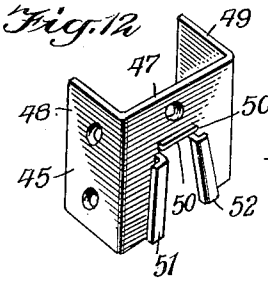


Fig. 9.

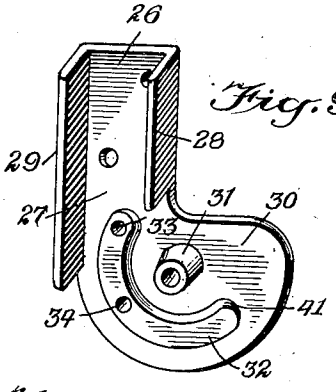


Fig. 13.

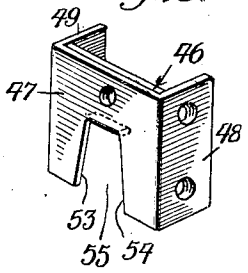


Fig. 8.

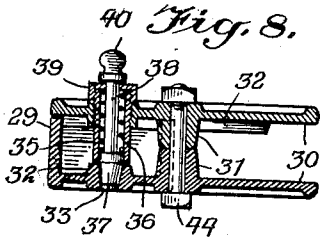
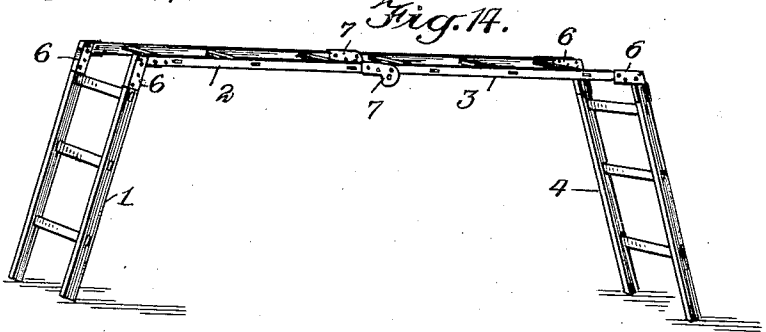


Fig. 14.



WITNESSES

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Patented Dec. 10, 1935 2,024,039

UNITED STATES PATENT OFFICE

2,024,039

UNIVERSAL FOLDING LADDER

Walter Harting, New York, N. Y.

Application March 6, 1934, Serial No. 714,309

3 Claims. (Cl. 228—2)

This invention relates to ladders, and particularly to ladders which may be extended or folded, the object of the invention being to provide an improved construction over my prior United States Patent No. 1,942,210, issued January 2nd, 1934.

Another object of the present invention is to provide a ladder which is formed of sections and which may be extended or folded, with means between certain of the sections capable of being swung pivotally to produce a folding action between the sections.

Another object of the invention is to provide a ladder formed of a plurality of sections, some of which are foldable and others of which are disengageable, whereby various arrangements may be presented including a straight extension of all the sections, a high platform arrangement, and a low and wide platform arrangement.

An additional object, more specifically, is to provide in a folding ladder a series of fittings which connect the parts of the ladder together, and which may be swung so that the parts of the ladder will be in a straight line position, or at an angle from a straight line.

In the accompanying drawings—

Figure 1 is a perspective view of a ladder disclosing an embodiment of the invention;

Figure 2 is a side view of parts of two ladder sections disclosing certain features of the invention;

Figure 3 is a view similar to Figure 2 but showing one section bent almost at right angles and locked in the bent or shifted position;

Figure 4 is an interior perspective view of half of one of the members of the fitting shown in Figure 3;

Figure 5 is a sectional view through Figure 3 on the line 5—5, the same being on an enlarged scale;

Figure 6 is a sectional view through Figure 3 on the line 6—6, the same being on an enlarged scale;

Figure 7 is a view similar to Figure 2 but showing another form of fitting to that illustrated in Figure 3;

Figure 8 is a sectional view through Figure 7 on the line 8—8;

Figure 9 is an interior perspective view of one of the members of the fitting shown in Figure 7;

Figure 10 is a front view of part of two sections of the ladder shown in Figure 1, with certain parts broken away and illustrating a sliding connector embodying certain features of the invention;

Figure 11 is a sectional view through Figure 10 on the line 11—11, the same being on a somewhat enlarged scale;

Figure 12 is a perspective view of one of the members of the fitting shown in Figure 10;

Figure 13 is a perspective view similar to Figure 12 but showing the opposite fitting member to that illustrated in Figure 10 and

Figure 14 is a view similar to Figure 1 but showing the ladder adjusted to present a very wide platform or table.

Referring to the accompanying drawings by numeral, 1, 2, 3, 4, and 5 indicate sections of the ladder, the respective sections being of the same effective size. As shown in Figure 1, the sections 1 and 2 are connected by suitable secondary fittings 6, while the sections 2 and 3 are connected by primary fittings 7. Sections 3 and 4 are connected by secondary fittings 6 and the section 5 is connected to section 4 through sliding fittings 8 and 9. All of the fittings 6 are of identical construction, (so that a description of one will apply to all. Fittings of this kind are shown in detail in Figures 2 to 5, inclusive. Each fitting has two fitting members 10 as shown in Figure 4, each fitting member having upstanding flanges 11 and 12 with a portion 13 extending beyond the flanges. An apertured boss 14 is formed preferably integral with the other parts of the fitting and, in addition, an arc-shaped guide 15 is likewise formed integral with the remaining parts of the member. The entire member 10 is preferably formed by casting, though it could be made by forging or otherwise, if desired. Both members 10 are formed with apertures 16 in the raised guide 15, and as illustrated in Figure 6 the aperture 16 in one member is tapered, while one of the apertures in the other member is enlarged and threaded to receive the threaded end of the guiding sleeve 17. This sleeve carries a spring 18 acting on the bolt 19, which bolt is tapered at the end to fit the tapering bore 16. A rod 20 is connected with the bolt 19 and extends through the removable screw cap 21 so that the knob 22 may be secured thereto. The spring 18 tends continually to hold the parts as shown in Figure 6, but whenever it is desired to swing one section in respect to the other, knob 22 is pulled manually against the action of spring 18 until the bolt 19 is free from this aperture 16. The sections are then started on a swinging movement, and once started the knob 22 may be released and the end of bolt 19 will strike against the top surface of the guide 15. For further movement of the sections with respect to each other will merely cause

the bolt 19 to slide along on the guide until it reaches the next aperture 16, whereupon it will snap into this aperture and lock the sections against further swinging movement.

As shown in Figures 3 and 6, section 2 has been swung to a position almost, though not quite, at right angles to section 1. When it is desired to swing section 2 back into alignment with section 1, the action above described takes place. It will be observed that one member 10 is arranged on the outside of section 1 and the other member 10 is arranged on the opposite side or inside section 2, and are connected together by a pivotal bolt or rivet 23 which extends through the respective bosses 14, as shown in Figure 5, said bosses frictionally contacting so that the rivets or bolts clamp the respective members as sections 1 and 2, while the flanges 11 and 12 fit snugly over the sides of these two sections. The outer end of the extension 13 of each member 10 is at such an angle that when the sections are in the position shown in Figure 3 they will be in the new position and will overlap the respective opposite sections when in alignment as shown in Figure 1.

In addition to the secondary fittings 6 as shown in Figures 3 to 6, the primary fittings 7 as shown in Figures 7 to 9, inclusive, function to secure the sections 2 and 3 together to allow a swinging movement from a straight line position to an angle which is almost a right angle but is ordinarily not quite a right angle, whereby the section 3 may be horizontal while the sections 2 and 4 and the remaining sections are at an angle to the vertical, thus providing what may be termed a high platform. The primary fitting 7 shown in Figures 7 to 9 is formed in two parts, each part being constructed as shown in Figure 9, and preferably formed with a casting whereby all the castings may be in the same mold. As illustrated in Figure 9, the fitting member 26 is provided with what may be termed a base 27 having upstanding flanges 28 and 29 for straddling certain parts of the ladder sections, and an extension 30 which is slightly more than semi-circular with a hollow integral boss 31 arranged in the center thereof, and an integral guide 32, said guide having apertures 33 and 34. As illustrated in Figure 5, one of the members 26 is formed so that the apertures 33 and 34 will taper while the opposite member 26 has an aperture in the guide sleeve 35. This sleeve accommodates a spring 36 which continually acts on the tapering bolt 37 to cause the same to engage the walls of the tapering aperture in the guide 32. A stem or rod 38 extends from the bolt 37 upwardly and through the removable cap 39, whereby the knob 40 may be secured thereto.

When it is desired to shift one of the fitting members in respect to each other, knob 40 is raised and the fittings are shifted, first slightly, and then the knob 40 is released. This will cause the end of bolt 37 to rest on the guide 32 and the bolt will slide along this guide as the fitting is moved to its new position. If the parts are to be swung so that the bolt is moving from aperture 33 to aperture 34, the sliding movement will continue until bolt 37 snaps into the aperture 34. If the movement is such that bolt 37 is moving from aperture 34 towards the end 41, for instance, (Fig. 9), the bolt will slide along the guide until the section 3 is in parallelism with section 2, as indicated by dotted lines in Fig. 7. It will be noted from Figure 7 that the respective members 26 are clamped to their respective ladder sections by bolts 42 and 43, and the respective members 26 are connected together by a pivotal bolt 44, said bolt extending through the respective bosses 31 as indicated in Figure 8, said bosses contacting.

When the parts are adjusted to the position shown in Figure 1, the extension 20 will act to brace and stiffen the section 3 so that it will remain rigid and firm in the position shown. When defining a rather high scaffold the arrangement shown in Figure 1 is used. However, if a comparatively low scaffold is desired, the structure shown in Figure 14 is used, section 5 being eliminated and the other sections adjusted to the position shown. It will be understood that all of the sections are of the same length so that this adjustment may be made quickly and easily and will give a horizontal position to the platform portion, which consists of the members 2 and 3.

It will be observed that the fittings 6 and 7 are identical in principle, and only differ slightly in the detailed features, the difference principally being the extension of the guide 32 and the shape of the enlargement 30, though the extension 13 in the fitting 6 functions substantially in the same manner. In both forms of fitting the body or shank straddles part of the ladder section and the remaining parts are pivotally connected together with a permanently positioned spring-pressed bolt which acts to lock the sections either in alignment or at angles to each other, with ample bearing for the pivotal mounting of the bolt 44.

Where an arrangement as shown in Fig. 1 is desired, or where a very tall ladder is required, section 5 is used. This section is slidingly connected with section 4 through certain sliding connectors 8 and 9. As these connectors are identical a description of one will apply to both. Connector 8 is provided with a connector member 45 and a connector member 46, which members are each formed with a body 47, and flanges 48 and 49. The respective bodies 47 are adapted to fit flatwise against the side bars of the ladder sections, while the flanges 48 and 49 overlap the side edges of the side bars to which they are secured by screws or other desired means. The member 45 is provided with a pressed-up stop 50 with hooked members 51 and 52 positioned to interlock with the shoulders 53 and 54 of the socket aperture 55. The members 51 and 52 act in a certain sense as a tongue, and the socket structure acts as a groove for receiving the tongue so as to provide a tongue and groove formation, but by reason of the slight angle or tapering of these members the parts will firmly interlock to present a tight connection between the respective section when in opposite position. In addition the parts are so positioned that the lower end of the side bars of section 4 will rest on the top rung 56 of the section 5, which top rung is reinforced by the bolt or rivet 57. When it is desired to disconnect the section 5 it is merely necessary to raise section 4 and then pull downwardly on section 5. The reverse action will connect the two sections together. While a limited number of sections have been shown, a larger or even a less number may be used without departing from the spirit of the invention. Also, the sections may be adjusted to other positions than that shown in Fig. 14, the structure remaining the same though the adjustment is different.

I claim:

1. A fitting for connecting sections of a ladder,

said fitting comprising two members, each member having a substantially U-shaped body formed with spaced flanges, an arc-shaped extension projecting from one end of the body substantially at right angles thereto, one of said flanges being longer than the other and overlapping somewhat said arc-shaped extension and the other of said flanges being set back from said arc-shaped extension a sufficient distance to permit said two members to swing in respect to each other when in operative position with the extensions overlapping, said extensions being provided with contacting apertured bosses and with an arc-shaped guide; said bosses acting to space said extensions, said guide being provided with a bolt-receiving aperture, and a pivotal bolt extending through both of said apertured bosses for pivotally connecting said members together.

2. A fitting for connecting sections of a ladder together, comprising a pair of members, a connecting pivotal bolt, each of said members having a body substantially U-shaped in cross section merging into an extension, each of said extensions having an apertured boss, said bosses contacting when the members are in operative position, said pivotal bolt extending through said bosses, an arc-shaped guide carried by each of said members, one of said guides having a pair of tapering apertures and the other guide having a threaded aperture, a sleeve screwed into said threaded aperture and extending to a position near the opposite guide, a locking bolt carried by said sleeve, said bolt having tapering ends adapted to fit into either of said tapering apertures, a spring positioned within said sleeve and continually acting on said bolt for urging the same to move in a certain direction, and a manually actuated member for moving the bolt against the action of said spring.

3. A fitting for connecting sections of a ladder together, comprising a pair of members, a connecting pivotal bolt, each of said members having a body substantially U-shaped in cross section merging into an extension, each of said extensions having an apertured inwardly extending boss, said bosses contacting when the members are in operative position so as to present a combined spacing structure and a bolt-receiving bearing, said pivotal bolt extending through said bosses to maintain the extensions in overlapped position and to permit one of said members to swing in respect to the other, one of said extensions having an arc-shaped raised portion provided with a pair of spaced apertures, a spring-pressed locking bolt permanently mounted in and carried by the other of said extensions, said locking bolt being adapted to have one end move into either of said apertures according to the position of said extensions in respect to each other, and a manually actuated member connected to said locking bolt and adapted to be actuated for moving the locking bolt out of either of said apertures in order to turn one of said extensions in respect to the other around said pivotal bolt.

WALTER HARTING.