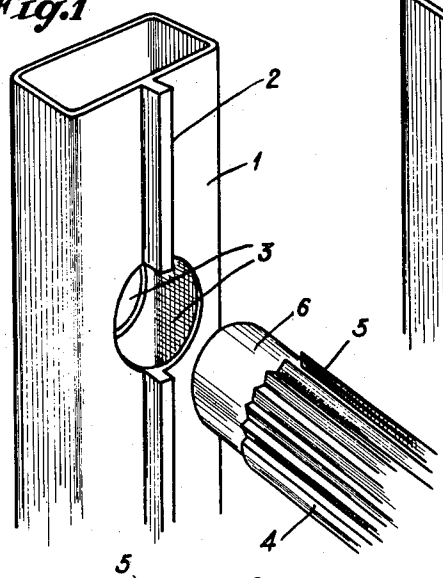
Oct. 3, 1961 J. J. MARCELIS 3,002,582

LADDERS AND IMPROVED LADDER ELEMENTS

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Fig.1



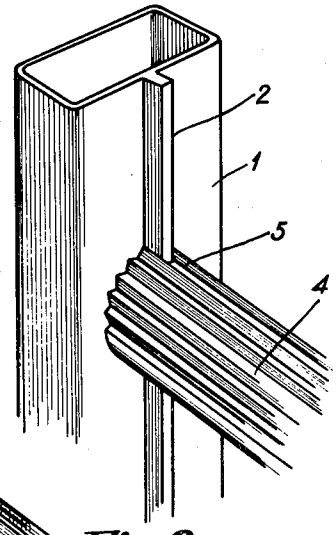


Fig.2

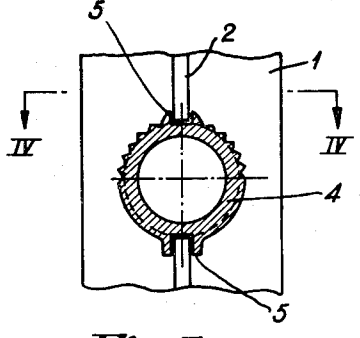


Fig.3

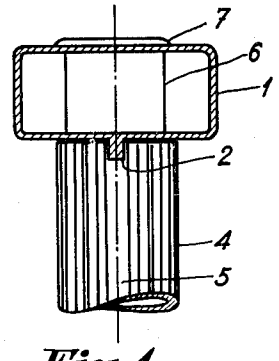


Fig.4

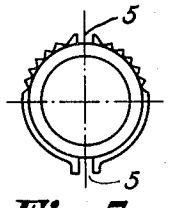


Fig.5

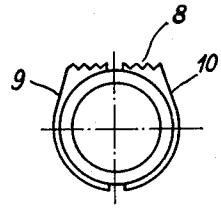


Fig.6

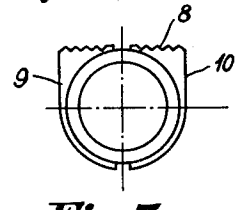


Fig.7

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LADDERS AND IMPROVED LADDER ELEMENTS

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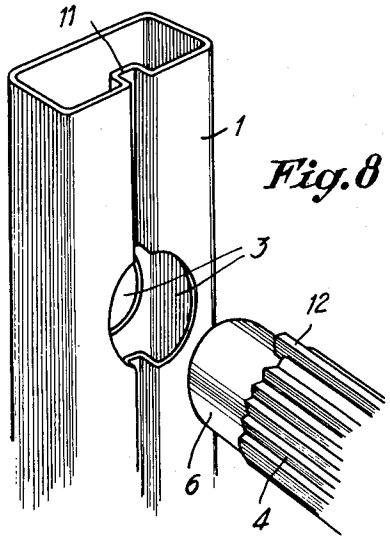


Fig.8

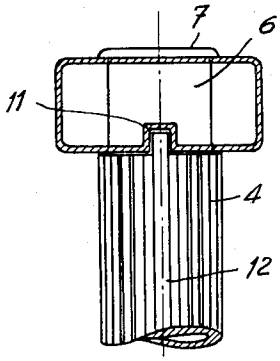


Fig.9

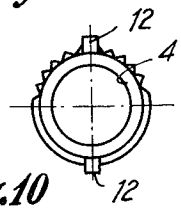


Fig.10

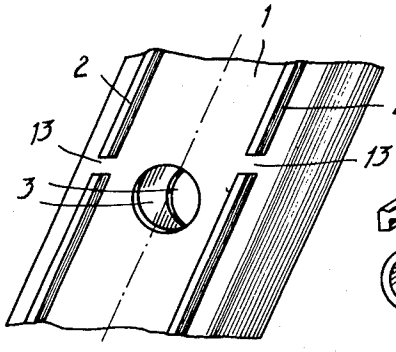


Fig.11

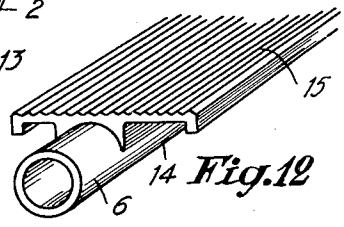


Fig.12

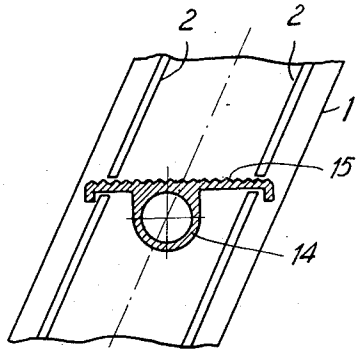


Fig.13

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LADDERS AND IMPROVED LADDER ELEMENTS

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3 Claims. (Cl. 182—194)

It is a well known fact, that one of the chief difficulties encountered in the technique of ladder construction consistent with economical production is that of maintaining, even after prolonged use, the original rigidity of the spokes in their side members. It has indeed been observed that, in consequence of the method used for fixing the spokes in the side members, the former show a tendency to turn about their longitudinal axis and often work loose from their means of attachment with those side members and thus become totally free to rotate about their axis, especially under the stress of the weight of the user. Besides the fact that this loosening weakens the ladder considerably, it also gives a sense of insecurity to the user and in certain circumstances may even cause accidents.

The subject of the present invention is a proposed improvement in the construction of ladders, especially metal ladders and most particularly ladders made of light metal and light metal alloys. These improvements are such, that they systematically prevent the spokes rocking or turning about their longitudinal axis, even if their means of tightening or fixing in the side members were to weaken or to work loose.

The object of the invention is to secure a positive and permanent stability of the spokes, irrespective of the length of use or of the condition of the constituent parts of the ladder.

Substantially, these improvements consist in providing, either as a part of, or as a complement to, the traditional means of fixing the spokes to the side members, between aforesaid spokes and aforesaid side members, at least one mutual mortise-joint, so that the spokes are positively prevented from turning about their longitudinal axis.

A further object of the invention concerns the particularities which have to be provided in the construction of the side members and of the spokes in order to establish systematically aforementioned mortise-joints. In view thereof and according to the invention, the side members are provided with at least one longitudinal web or groove along the inside face of the ladder, which web or groove is generally continuous so that it might be made integral with the side member during the process of manufacture of the part itself, generally by extrusion of the metal. In a preferred form of embodiment, such a side member according to the invention shall consist of a tubular element of appropriate cross section, rectangular, oval, circular or other, provided along its complete length and in the central longitudinal plane of the ladder with a continuous web.

The spokes, in order to be used in conjunction with aforementioned side members as described above, shall be provided, at least at their ends, but preferably along their complete length, with either webs or grooves, the size and position of which are determined by the characteristic groove or web of the side members, in such a way that aforementioned spokes, when normally fitted and fixed with their ends in the side members, will be locked to the latter so that any rotation about their longitudinal axis is made impossible.

The characteristics of aforementioned spokes can be maintained independently of the shape of the spokes, which may consist of simple tubular elements with circular cross section, or tubular elements with a mixed cross

section, or even tubular elements solidly fixed to platforms, thus in a way transforming the spokes into steps.

The invention concerns all ladders incorporating these improvements as well as the side members and the spokes specially conditioned in view of the construction of such improved ladders.

Without implying any limitation, some typical embodiments are described hereafter in greater detail, reference being made to the attached drawings of which:

FIGURE 1 represents a partial perspective view of a side member and a spoke conditioned in accordance with the invention;

FIGURE 2 represents the elements of FIGURE 1 mutually locked together;

FIGURE 3 represents a transverse section of a spoke locked into a side member in accordance with the invention;

FIGURE 4 is a cross section of FIGURE 3 along line IV—IV;

FIGURES 5, 6 and 7 represent transverse cross sections of three particular forms of tubular spokes;

FIGURES 8, 9 and 10 schematically represent a first alternative embodiment;

FIGURES 11, 12 and 13 schematically represent a second alternative embodiment.

As shown schematically in FIGURES 1–5, a first application of the improvements, subject of the invention, consists in starting off with side members 1 of various but appropriate shape, essentially characterized by the fact that they are provided with at least one external longitudinal web 2. In these side members the holes 3 for the fitting and for fixing of the spokes may be made in the usual manner. The latter also have an appropriate cross section which may assume various shapes. In this case, the spokes 4 are provided with at least one longitudinal groove 5, the cross section of which is such that it fits and locks perfectly with the web 2 of the side member. The ends 6 of the spokes are smooth and their outer diameter is such as to fit rather tightly into the holes 3 of the side members. In the example of FIGURES 1–5, the spokes are provided with two such grooves 5. Preferably, these spokes are fluted, grooved or made rough or adherent in any appropriate manner at least upon part of their periphery adjacent to and at either side of one of the grooves 5. Provided the above characteristics are maintained, the spokes 4 may be fitted and/or fixed in the side members 1 in the traditional manner. In the present case, as specially represented in FIGURE 4, the protruding end 6 of the spokes is peened over against the side member 1. so as to form a fixing and tightening bead 7. FIGURES 2, 3 and 4 in particular show clearly how the spokes are in a way positively locked-in by the side members, so that they are unable to turn about their longitudinal axis. FIGURE 5 represents the cross section of a spoke of the type also represented in the embodiment according to FIGURES 1–4; FIGURE 6 represents an alternative to this cross section wherein a flat, grooved surface 8 is joined to the actual tubular part by means of converging surfaces 9–10; FIGURE 7 represents a very similar alternative to that of FIGURE 6, but wherein the flat grooved surface 8 is joined unto the tubular portion by means of two parallel lateral surfaces 9—10.

FIGURES 8, 9 and 10 schematically represent an alternative to the embodiment of FIGURES 1–5, wherein the side members 1 are fitted with at least one longitudinal groove 11, whilst the spokes 4 are each fitted with at least one longitudinal web 12. In the example shown the spokes have two such longitudinal webs 12 each. The remaining particulars of the spokes and side mem-

bers are identical or equivalent to those of the previous example.

Another alternative is represented by the FIGURES 11, 12 and 13, particularly for the construction of ladders with flat or step shaped spokes. In this embodiment the side members 1 have two longitudinal webs 2 which are afterwards interrupted at intervals to provide free spaces 13 for the flat portion of the spokes. In this case, the latter are made-up of an assembly of a tubular element 14 and a flat part 15 the top face of which is generally grooved. Such spokes can be constructed either as two separate elements which are subsequently assembled, or preferably as one single extruded element. In suitable locations along the side members 1, openings 3 are provided for the smooth ends 6 of the tubular parts 14 of the spokes. The fitting and fixing of the spokes in the side members is carried-out in the manner indicated for the previous examples.

As shown more particularly in FIGURE 13, the flat portion 15 of the spokes is at each end positively engaged into the thickness of the webs 2, thus being systematically prevented from rocking. A similar condition could be brought about by the locking of spoke webs into grooves in the side members.

These various improvements can be applied to any sort of ladder, of any size, single or double, as well as to elements of scaffoldings, the constituent elements of the ladders being made of any appropriate material, but preferably of light metal alloys.

What I claim is:

1. A ladder comprising a pair of spaced longitudinal members with each member having on its inner face a longitudinally extending rib, each of said members having a series of transversely extending circular bearing apertures intersecting said rib and interrupting the continuity of the same, with corresponding apertures of said members being in registration, a series of spoke members each having opposite end portions of circular cross-section, the intermediate portion of each spoke member having a pair of spaced longitudinally extending embossings, each end portion of a spoke member being received in a respective bearing aperture with a portion of rib adjacent an aperture being received between the spaced embossings thereby to lock said spoke member against rotation relative to the longitudinal members.

2. The invention as defined in claim 1 in which the intermediate portion of each spoke member has two pairs of spaced longitudinally extending embossings with one pair being disposed diametrically opposite the other.

3. A ladder comprising a pair of spaced longitudinal members having a series of transversely extending circular bearing apertures with corresponding apertures being in registration, each longitudinal member having on its inner face longitudinally extending rib portions adjacent said apertures, a series of spoke members each having opposite end portions of circular cross-section, the intermediate portion of each spoke member having a pair of spaced longitudinally extending embossings, each end portion of a spoke member being received in a respective bearing aperture with an end portion of a rib portion being received between the spaced embossings thereby to lock said spoke member against rotation relative to the longitudinal members.

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