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LADDER

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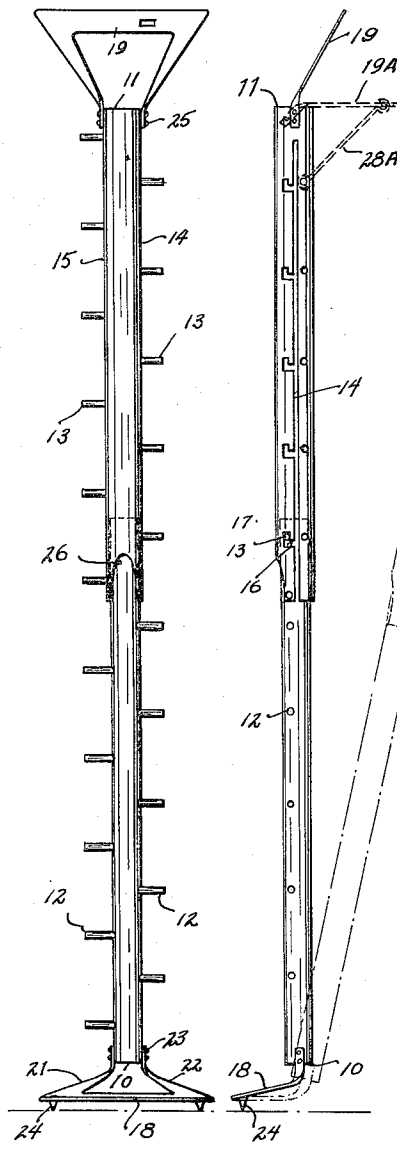


Fig.-1

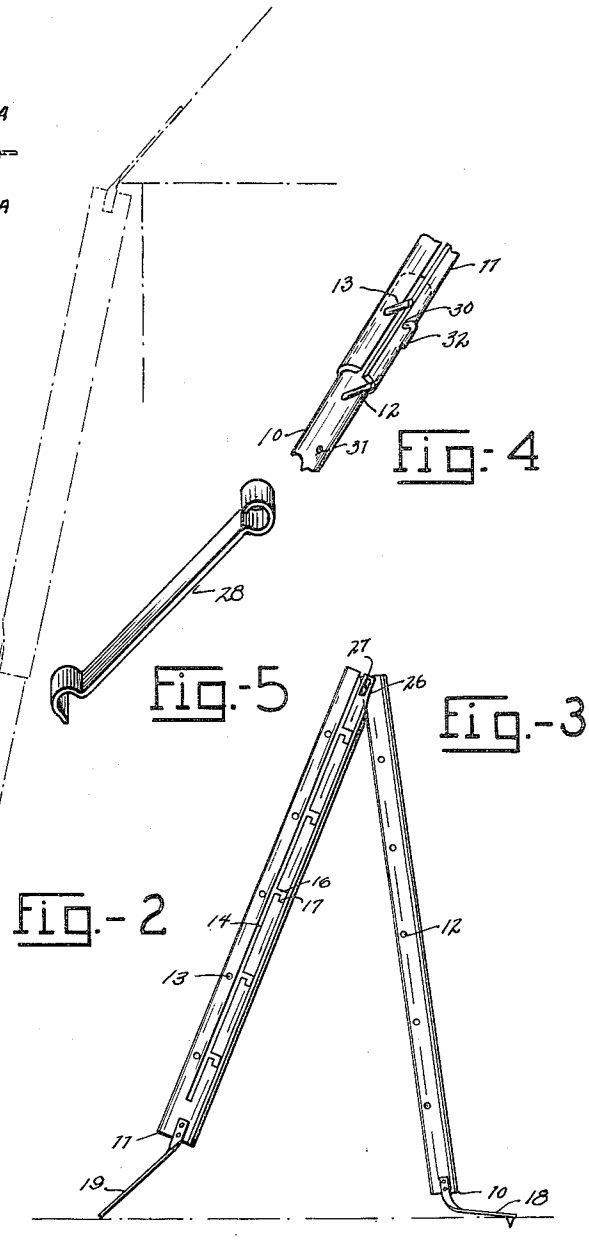


Fig.-4

Fig.-5

Fig.-3

Fig.-2

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LADDER

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This invention relates to ladders generally, and more particularly relates to an improved and simplified extension ladder than can be easily converted into a step ladder.

Various types of ladder equipment have been designed to provide access to remote places on or in buildings or the like which are normally accessible from the ground or the floor level. These ladders may be sectional and extensible or may take the form of step ladders which embody a self-supporting frame. Conventional extension ladders and step ladders are usually cumbersome in use and too bulky for easy storage. Furthermore, both types of ladders are ordinarily essential to have a complete line of equipment for a particular job.

Accordingly, it is the principal object of this invention to provide an improved and simplified construction for an extensible ladder that in neither bulky nor cumbersome and can be easily stored in a small space.

Another object of this invention is the provision of an improved and simplified extensible ladder construction that can be readily converted into a step ladder for use at intermediate heights.

A further object of the invention relates to the provision of a simplified construction for a combined extension and step ladder that is economical to produce and easily handled.

Briefly, in accordance with this invention, the foregoing objectives are attained by providing a pair of hollow tubular telescoping ladder sections which when assembled provide an extensible column with the lower section having alternately spaced ladder rungs extending in opposite directions along its length and with the upper section having similarly disposed rungs and vertical slots along each side extending upwardly from the section base to a point short of its other end to permit the upper section to be telescoped over the lower section with the slots accommodating the rungs of the lower section. The slots in the upper section are provided with alternately spaced transverse grooves each of which are adapted to engage the corresponding lower section ladder rungs when the upper section is rotated relative to the lower section to selectively lock the upper section in any one of a number of selected extended positions. In addition, the upper section may be extended to its furthest extent and tilted about a pivot at the upper end of the lower section to form a slef-supporting frame with the lower section to provide a step ladder. The lower end of the lower section and the upper end of the upper section are each provided with suitable brackets so formed that they will readily support the ladder in either its extended position against a building or the like as well as in its converted position. A modified form of the ladder utilizes a plurality of apertures extending transversely through the upper and lower sections and a removable pin which is adapted to extend through aligned apertures in place of the transverse grooves.

In the drawings:

FIG. 1 is a front elevation of the ladder in extended position;

FIG. 2 is a side elevation of the ladder in the extended position of FIG. 1 with a dotted line indication of the disposition of the ladder against a building;

FIG. 3 is a side elevation of the ladder when converted to a step ladder;

FIG. 4 is a partial view of the upper and lower ends of a modified ladder construction.

FIG. 5 is a perspective view of an optional bracing member that may be employed in conjunction with the ladder.

Referring now more particularly to FIGS. 1 and 2 of the drawings, there is shown an extension ladder in accordance with this invention which embodies a lower tubular section **10** telescopically supporting thereon an upper tubular section **11**. These sections and other components of the ladder are preferably constructed from any lightweight rigid material having sufficient structural strength to support the loads. The lower ladder section **10** is provided with a plurality of ladder rungs **12** spaced alternately on opposite sides of the lower section throughout its length. As best shown in FIG. 2 of the drawings, the upper section **11** is also provided with rungs **13** and with longitudinally extending slots **14** and **15** extending upwardly along both sides from its lower extremity to a point adjacent its upper extremity which slots are adapted to accommodate and be guided by the longitudinally spaced ladder rungs **12** on lower ladder section. The slots **14** and **15** are provided with transverse grooves **16** spaced alternately throughout the length of the slots at distances equivalent to the spacing of the ladder rungs **12** on the lower section **10**. These transverse grooves **16** are adapted to receive the ladder rungs **12** when the upper tubular ladder section **11** is rotated about the common axis so that the upper section may be secured in any selected extended position relative to the lower section **10**. Each of the transverse grooves **16** is provided with an upwardly turned portion **17** so that after the upper section **11** is rotated to engage the corresponding ladder rungs **12** it is displaced downwardly slightly to lock each of the rungs **12** in the corresponding upwardly turned portions **17** of each groove **16**.

Suitable supporting brackets **18** and **19** are secured to the lower end of the ladder section **10** and to the upper end of the ladder section **11** respectively. The lower supporting bracket **18** is preferably in the form of a trapezoidal member having a pair of integral arm portions **21** and **22** whose extremities are secured by suitable bolts or the like **23** to the lower end of the ladder section **10**. These arm portions **21** and **22** extend outwardly and in a plane that is disposed at an obtuse angle relative to the ladder axis. The extremities are then integrally joined through a common transverse portion to complete the bracket **18**. The bracket may also be provided with ground engaging teeth **24** to prevent slipping when the ladder is in use. The upper ladder bracket **19** is similar in construction to the lower ladder bracket and may be secured by suitable fasteners **25** to the upper end of the ladder section **11**; the principal difference in the drawings being that the upper ladder bracket **19** is mounted in a reverse direction so that it forms an obtuse angle extending in the opposite direction from the ladder axis. The dash-dotted line position of the ladder in FIG. 2 illustrates the extended ladder in use against the roof of a building or the like. The dotted line position **19A** of the bracket **19** represents the manner in which the bracket may be mounted to support a portion of a platform (not shown) to form together with another similar supporting

ladder a scaffold for workmen and materials adjacent a building wall or the like. The fasteners **25** can be readily disassembled to permit selective adjustment of the bracket **19** to the position **19A**. If desired, an additional bracing member **28** (FIG. 5) may be employed when the bracket **19** is in the position **19A**.

Referring now to FIG. 3 of the drawings, the extension ladder of FIGS. 1 and 2 is shown converted into a step ladder. This is accomplished by constructing the upper ladder section **11** with at least a portion of its lower extremity cut out as shown at **26** to permit the upper end of the lower section **10** to clear the lower end of the upper section **11** when the upper section is tilted in a vertical plane about a pivot pin **27** extending through aligned apertures in the adjacent ends of the upper and lower sections respectively. The supporting brackets **18** and **19** are provided with a sufficiently wide base to provide a self-sustaining support for the resulting A-frame step ladder. Although, if desired, the pivot pin **27** can be provided with removable extensions which can be pivotally connected to swing outwardly from each side of the ladder frame and engage the supporting surface or ground for additional anchorage.

In FIG. 4 of the drawings there is shown a modified form of the extension ladder of FIGS. 1 and 2 where, instead of providing transverse grooves **16** to receive and lock the ladder sections in selected extended positions, the upper and lower ladder sections are each respectively provided with a series of longitudinally spaced apertures **30** and **31** which are adapted to be selectively aligned to receive a transverse locking pin **32**. Thus, with the modified form of the extension ladder, the longitudinal slots **14** and **15** of the upper ladder section **11** still receive and are guided by the spaced ladder rungs **12** on the lower section **10**, but the sections are locked together by means of the removable pin **32**.

Thus, there has been provided an improved and simplified construction for an extension ladder which embodies a pair of telescoping tubular ladder sections that can be selectively secured in any extended position by simply rotating one section relative to the other or, otherwise in the modified form, by inserting a locking pin through aligned apertures between the sections. Each of the ladder sections are provided with upper and lower supporting brackets which are designed to adequately support the ladder and prevent twisting or rotation of the ladder when in use. Either section may be employed as the upper or lower section. The extension ladder can be readily converted into an A-frame step ladder which is self-supporting. The simplified construction is economical to produce and, because it is less cumbersome than conventional-tye ladders, can be readily stored in a relatively small space.

I have shown and described what I consider to be the preferred embodiments of my invention along with suggested modified forms, and it will be obvious to those skilled in the art, that other changes and modifications may be made without departing from the scope of my invention as defined by the appended claims.

I claim:

1. An extensible ladder assembly comprising in combination, a pair of telescoping tubular members coacting to provide a single continuous extensible tubular assembly having outer and inner tubular ladder sections, each of said sections having outwardly extending rungs disposed in spaced axial relation along opposite sides, guide means on said outer ladder section for simultaneously receiving and guiding the rungs on said inner section to any selected extended position, and integral means coacting in releasable engagement between said guide means and the rungs on said inner section to secure them in any selected extended position.

2. The extensible ladder assembly of claim 1 wherein said rung guide means includes a pair of slots respectively extending axially along opposite sides of said outer section from one end thereof to receive the correspondingly disposed rungs of the lower section in guiding relation therein.

3. The extensible ladder assembly of claim 2 wherein said rung engaging means includes a plurality of circumferentially disposed slots extending from one side of each axial slot and in spaced axial relation from each other corresponding to the spaced disposition of the rungs on said inner section, and each of said circumferential slots terminating in an axially extending portion adapted to receive a correspondingly disposed rung of the inner section in seating engagement therein.

4. The extensible ladder assembly of claim 1 wherein the rungs on each side of said sections are disposed in alternate spaced axial relation to each other to provide a regularly staggered rung disposition on each section.

5. An extensible ladder assembly comprising in combination, a pair of telescoping tubular members coacting to provide a single continuous extensible tubular assembly having outer and inner ladder sections, each of said sections having outwardly extending rungs disposed in spaced axial relation along opposite sides thereof, substantially rigid support means on the free extremity of each section adapted to coact when assembled with a corresponding supporting surface to restrict free movement of said ladder assembly relative to said surfaces, guide means on said outer section for simultaneously receiving and guiding the rungs on said inner section to any selected extended position, and integral means coacting in releasable engagement between said guide means and the rungs on said inner section to secure them in any selected extended position.

6. The extensible ladder assembly of claim 5 wherein said movement-restraining means includes substantially rigid arms extending in diverging spaced relation from the free extremity of each section.

7. The extensible ladder assembly of claim 6 wherein the diverging arms extending from the free extremity of each section are each respectively interconnected by a substantially rigid member.

8. The extensible ladder assembly of claim 6 wherein the arms extending from at least one free section extremity include means for pivotally supporting the arms at one end on said one free section extremity and other means for adjustably securing said arms in any selected pivoted position thereon.

9. The extensible ladder assembly of claim 8 wherein said adjustable securing means includes a brace member adapted to coact between the supporting section and the extended arms to maintain said arms in at least one selected pivoted position.

10. An extensible ladder assembly comprising in combination, a pair of telescoping tubular members coacting to provide a single continuous extensible tubular assembly having outer and inner ladder sections, each of said sections having outwardly extending rungs disposed in spaced axial relation along opposite sides thereof, guide means on said outer section for simultaneously receiving and guiding the rungs on said inner section to any selected extended position, integral means coacting in releasable engagement between said guide means and the rungs on said inner section to secure them in any selected extended position, means pivotally coupling the sections together at their adjacent extremities, and complementary surfaces coacting in engagement at adjacent extremities to support the pivoted assembly in predetermined angular relation on the free extremities of the outer and inner sections.

11. The extensible ladder assembly of claim 10 wherein said pivotal coupling means includes diametrically opposed aligned apertures through the adjacent telescoping extremities of the sections and a removable pin coacting as a pivot axis therein.

12. The extensible ladder assembly of claim 11 wherein said pivotal coupling means also includes a cut-out portion in the tubular wall of one section adjacent its tele-

scoping extremity and adapted for clearing and supporting coaction with the adjacent telescoping extremity of the other section.

13. An extensible ladder assembly comprising in combination, a pair of telescoping tubular members coacting to provide a single continuous extensible tubular assembly having outer and inner ladder sections, each of said sections having outwardly extending rungs disposed in spaced axial relation along opposite sides thereof, substantially rigid support means on the free extremity of each section adapted to coact when assembled with a corresponding supporting surface to restrict free movement of said ladder assembly relative to said supporting surfaces, guide means on said outer section for simultaneously receiving and guiding the rungs on said inner section to any selected extended position, integral means coacting in releasable engagement between said guide means and the rungs on the inner section to secure them in any extended position, means pivotally coupling the sections together at their

adjacent extremities, and complementary surfaces coacting in engagement at adjacent extremities to support the pivoted assembly in predetermined angular relation on the free extremities of the outer and inner sections.

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