

[54] MOBILE LEVER ARRANGEMENT

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[58] Field of Search 182/63, 141, 148, 127,
182/2, 67

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[57] ABSTRACT

The invention relates to a mobile lifter arrangement having a plurality of concentric telescoping tubes, the outermost telescope tube being connected to an undercarriage and pivotable between raised and lowered positions by means of a lifting device which is connected to and acts upon the outermost tube. The tubes are raised and lowered by hydraulic pressure applied to only one of the tubes, telescoping motion being transmitted between the tubes by mechanical means, such as pulley and chain arrangements.

19 Claims, 8 Drawing Figures

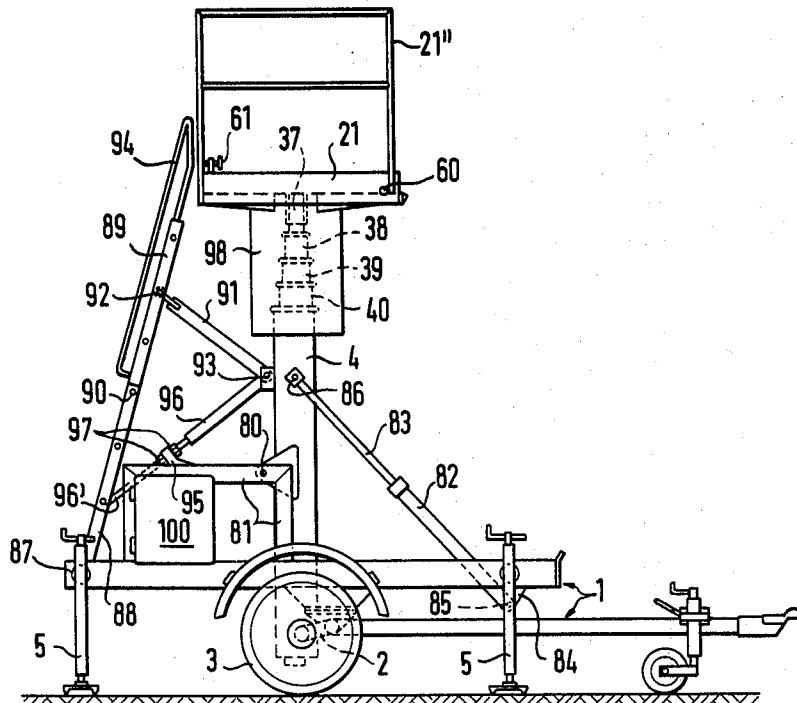


Fig.1

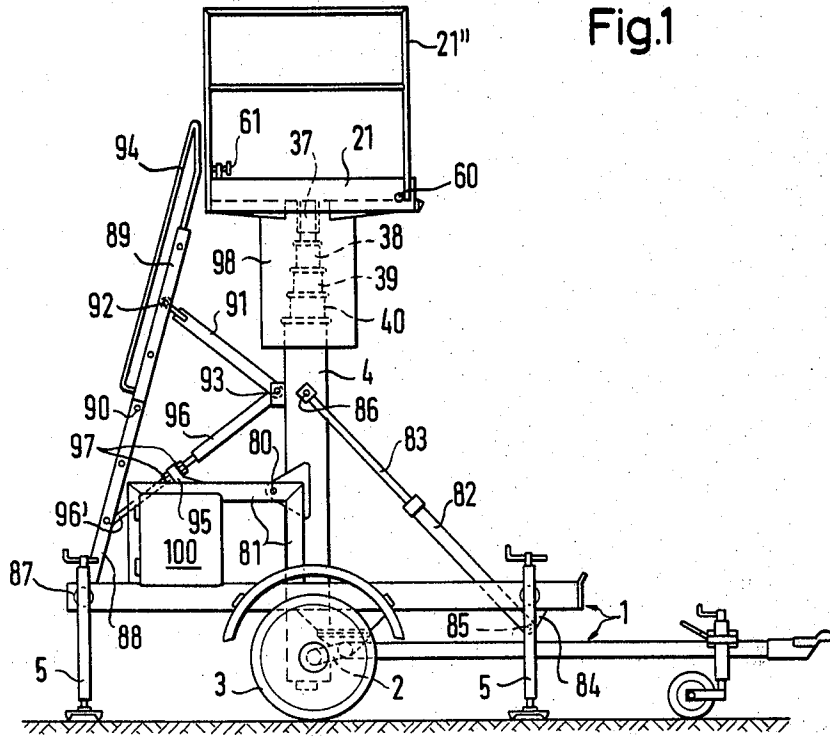


Fig.2

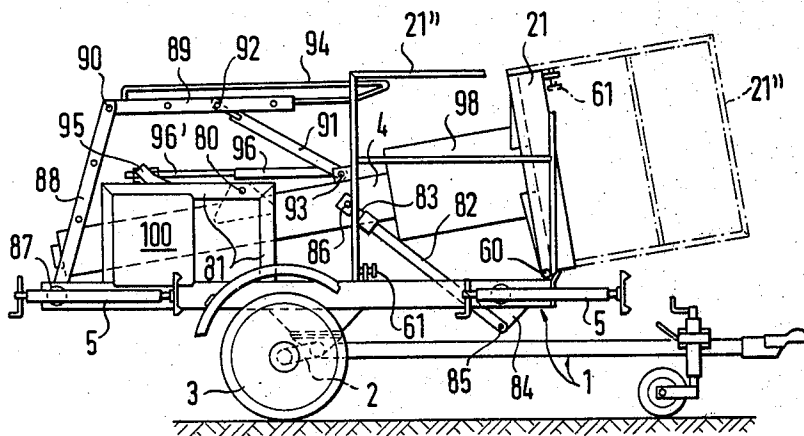


Fig.3

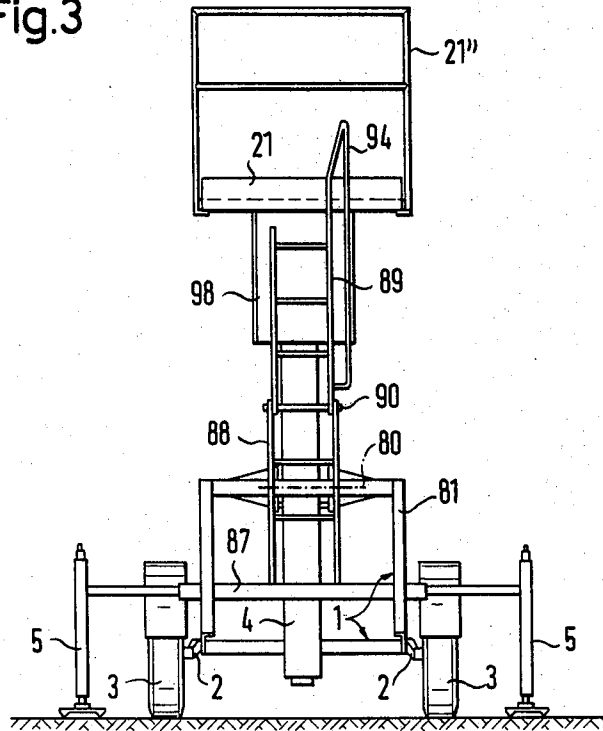
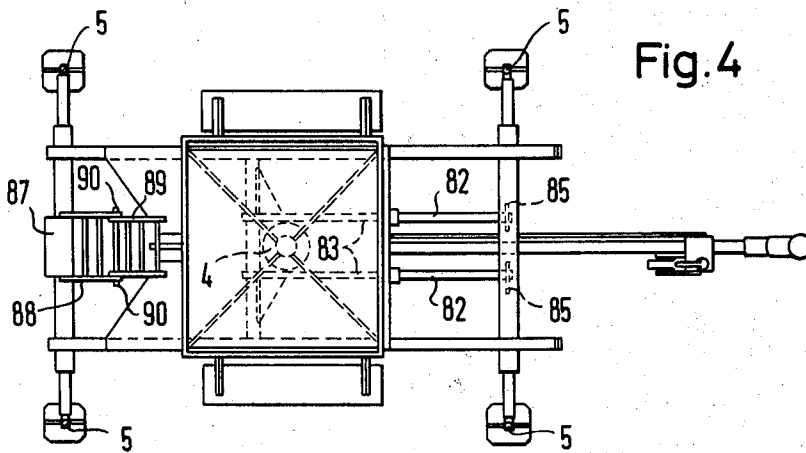
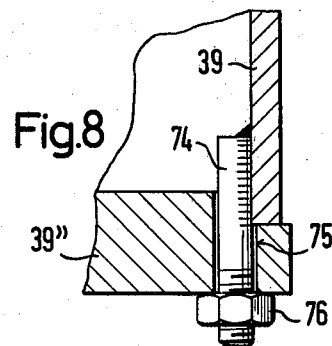
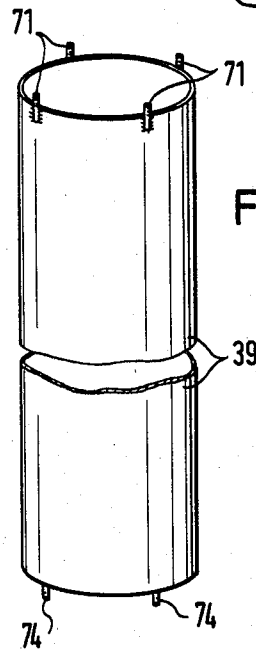
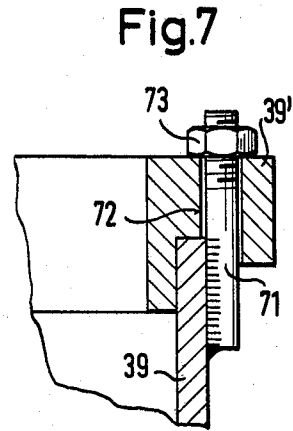
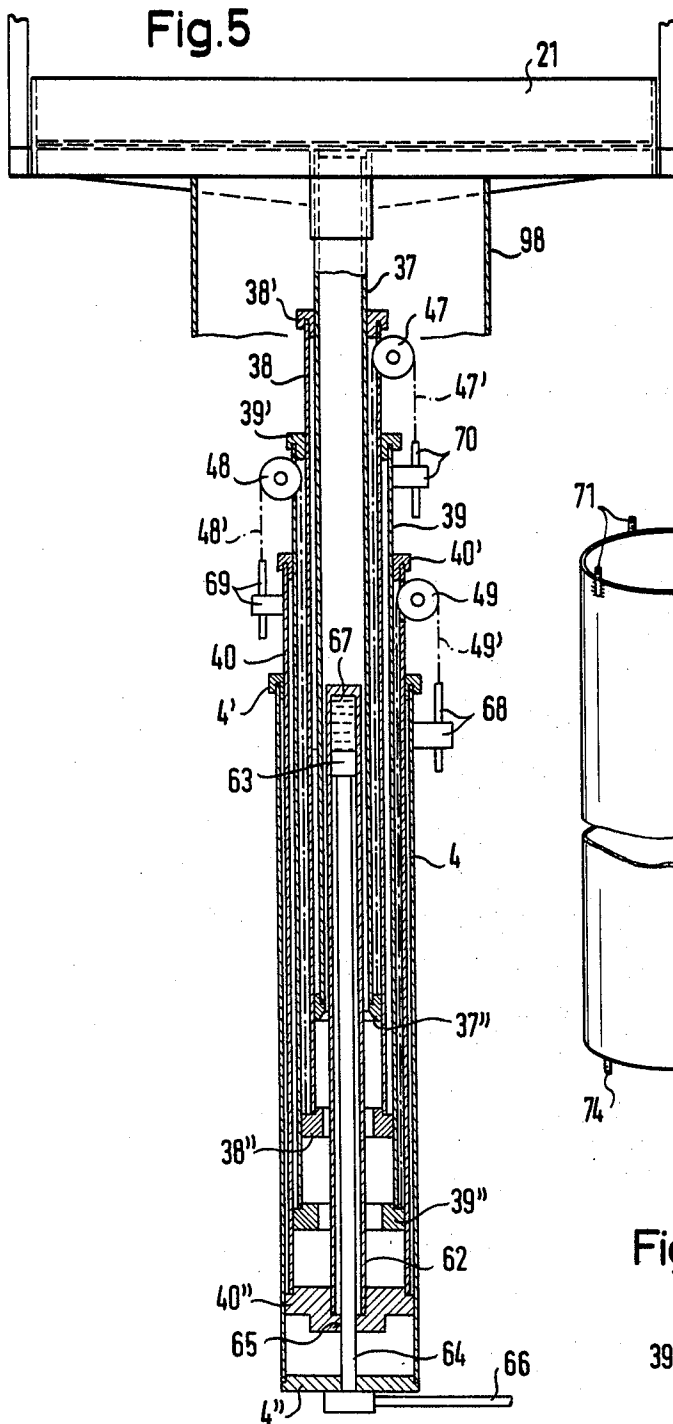


Fig.4





MOBILE LEVER ARRANGEMENT

The present invention relates to a mobile lifter arrangement of the type comprising a plurality of telescoping tubes adapted to support the structure to be raised and lowered — for example, a platform or the like.

Various lifting arrangements employing telescoping tubes are known in the art. For example, Swiss Pat. No. 504,379 teaches a purely mechanical arrangement for actuating the tubes, whereby a shaft is rotated by a motor and co-operates with a threaded member located at the base of one of the telescope tubes. Such a purely mechanical means of actuating the telescope assembly has various disadvantages, particularly from a maintenance viewpoint. Conversely, the various purely hydraulic mechanisms proposed by the prior art for imparting telescoping motion to the tubes generally suffer from relatively high manufacturing and installation costs.

It is therefore an object of the present invention to provide a simple and efficient lifter arrangement which does not suffer from the disadvantages of the purely mechanical and purely hydraulic arrangements of the prior art, but which combines the advantages of such arrangements in a particularly efficient and economical manner.

Thus, according to the present invention there is provided a mobile lifter arrangement comprising: a telescope assembly including a plurality of concentric telescoping tubes; an undercarriage connected to the outermost said tube; lifting means for pivoting said tubes between raised and lowered positions, said lifting means connected to said outermost tube; mechanical means interconnecting said tubes for translating telescoping motion therebetween; a cylinder and a piston slidable therein, said cylinder closed at one extremity thereof to enclose the space above said piston; a first base ring for said outermost tube; a piston rod attached to and extending between said piston and said first base ring; a second base ring for said tube adjacent said outermost tube, said cylinder attached to an extending from said second base ring into said telescope assembly and said piston rod passing through and freely slidable within a bore through said second base ring; said first base ring, said piston rod and said piston having intercommunicating bores therethrough, and means for supplying hydraulic fluid under pressure through said intercommunicating bores into said space above said piston.

The invention will now be described further by way of example only and with reference to the accompanying drawings, wherein:

FIG. 1 is a side view of a mobile lifter arrangement according to one embodiment of the invention, shown with the telescope assembly in its upright position;

FIG. 2 is a side view of the mobile lifter arrangement of FIG. 1 with the telescope assembly shown in its lowered position;

FIG. 3 is a rear view of the assembly shown in FIG. 1;

FIG. 4 is a plan view of the assembly shown in FIG. 1;

FIG. 5 is a section through the telescope assembly of FIG. 1;

FIG. 6 is a perspective view of portions of a tube of the telescope assembly shown in FIG. 5; and

FIGS. 7 and 8 show details of the portions shown in FIG. 6.

Referring to the drawings and particularly to FIGS. 1 to 4 thereof, there is shown a mobile lifter arrangement comprising an undercarriage 1 provided with spring-mounted swing-axes 2, having located thereupon wheels 3. A telescope assembly, having an exterior telescope tube 4 is mounted upon a subframe 81 for rotation about an axis 80 between raised and lowered positions. The telescope assembly is raised to its upright position by means of hydraulic piston and cylinder assemblies 82, 83. The hydraulic cylinders 82 of the assemblies 82, 83 are rotatably connected by means of bearing supports 84 to the undercarriage 1 while the piston rods 83 thereof are connected by pegs 86 to the telescope tube 4.

The bottom section 88 of a ladder is fastened to a portion 87 of the undercarriage 1, the upper part 89 of the ladder being hingedly connected to the bottom portion 88 thereof so as to be automatically collapsible as the telescope assembly is lowered (see FIG. 2). For the purpose of folding down of the upper part 89, a link 91 is provided, having one end connected by means of a hinge 92 to the upper part 89 of the ladder and the other end connected by means of a hinge 93 to the telescope tube 4. A railing 94 is mounted at the upper part 89 of the ladder.

A metal yoke 95 is provided upon the undercarriage 81, to which a support member 96 is connected, the other end of which is fastened to the hinge 93 on the telescope tube 4. The free end part 96' of the support 96 forms a threaded rod, having threadedly located thereupon lock nuts 97, by means of which the telescope tube 4 may be secured in an upright position.

The innermost telescope tube 37 supports the platform 21, on the underside of which is located a protective covering 98, which covers the openings of the telescope tubes 4, 40, 39, 38 and 37 when the tubes are retracted and extends downwardly to surround the upper extremity of the inner tube 37.

Jacks for solidly supporting the lifter arrangement are designated at 5 in the drawings, such jacks being rotatable between operable and inoperable positions, as shown in FIGS. 1 and 2, respectively. A motor and pump for supplying hydraulic power to the lifter arrangement is enclosed within a housing, designated by the reference numeral 100.

After lowering of the telescope assemblies, 4, 40, 39, 38 and 37, the platform 21, and the upper part 89 of the ladder into the position illustrated in FIG. 2, the railing 21'', shown in its initial lowered position by means of the dotted lines in FIG. 2, can be swivelled about a transverse axis 60 to an upright position on the undercarriage 1. In this position, the railing can be compactly stored during transportation, unaffected by vibrations and shocks by virtue of its firm support by the undercarriage.

The railing 21'' is detachably connected to the platform 21 by means of latching members 61. The members 61 may be, for example, locks or clasps attached laterally to the platform 21, the latching pins of which are arranged to interlock with openings in the base of the railing when in the position of FIG. 1. With the opening of the locks the pins are released, so that the railing can be turned over. For holding the folded back railing in a horizontal position, stops attached to the

undercarriage may be provided (not shown in the drawings).

FIGS. 5 to 8 show in greater detail the telescope assembly of the embodiment of the invention described above. The assembly comprises a tube 40 within the outermost telescope tube 4 having a base ring 40''. A hydraulic cylinder 62, concentric with the tube 40, is attached to and extends upwardly from the ring 40''. The hydraulic cylinder 62 is provided with a piston 63 therein having a piston rod 64, which slidably passes through the middle opening 65 of the ring 40''. The piston rod 64 is hollow and passes through and is securely fastened to a base ring 4'' of the tube 4. The piston rod 64 is also fastened to and communicates with a feed pipe 66, for supplying oil under pressure into the space 67 above the piston 63, by means of which the cylinder 62 is raised. As the cylinder 62 rises, the tube 40 also rises by virtue of the base ring 40'' connecting the elements 40 and 62 for mutual motion therebetween.

A chain 49' is provided and is fastened at one end to a member 68 fastened to the upper end of the telescope tube 4 and at the other end to the base ring 39'' of the third telescope tube 39, the chain 49' passing over a wheel 47 mounted at the upper end of the second telescope tube 40. Through the action of the chain 49', raising of the telescope tube 40 causes the third telescope tube 39 to rise. A second chain 48', which is fastened at one end to a member 69 at the upper end of the second telescope tube 40 and at the other end to the base ring 38'' of the fourth telescope tube 38, extends over a wheel 48 mounted at the upper end of the third telescope tube 39. Through this second chain 48', the rising movement of the third telescope tube 39 is transferred to the fourth telescope tube 38. A third chain 47', which is fastened at one end to a member 70 at the upper end of the third telescope tube 39 and at the other end to the base ring 37'' of the fifth telescope tube 37, extends over a wheel 47 mounted at the upper end of the fourth telescope tube 38. Through this third chain 47', the rising movement of the fourth telescope tube 38 is transferred to the fifth telescope tube 37. At the upper end of the telescope tubes 4, 40, 39 and 38, there are provided guide rings 4', 40', 39' and 38' respectively, each said ring accommodating the inner tube adjacent thereto in a sliding fit. The manner in which these rings are fastened to the tubes is shown in detail in FIG. 7, with reference to the ring 39'. To facilitate assembly, the upper ends of the telescope tubes 4, 40, 39, 38 have bolts 71 welded to their outer surfaces. These bolts pass through boreholes 72 provided in the guide rings 4', 40', 39', and 38' and allow the clamping of the guide rings to the tubes by means of nuts 73 threadably engageable with the bolts 71. A similar technique is used to fasten the base rings 4'', 40'', 39'', 38'' and 37'' to the telescope tubes 4, 40, 39, 38 and 37 respectively whereby the screw bolts 74 (see FIG. 8) are welded to the inner surface of each tube and pass through boreholes 75 in the base rings 4'', 40'', 39'', 38'' and 37'', to which they are fastened by means of nuts 76, screwed onto the bolts 74. Each base ring 40'', 39'', 38'' and 37'' protrudes radially outwards to a small extent from the respective telescope tube 40, 39, 38 and 37 and therefore also serves as a guide ring for the respective adjacent outer tube.

Thus, it will be appreciated that for operation of the telescope assembly, only one hydraulic cylinder arrangement 62 is required, conveniently communicating

with hydraulic pressure fluid supply means through the bore of the piston rod 64. The telescoping movement of the tubes are translated from one tube to the next very simply and effectively by means of the chains 49', 48' and 47' and wheels 49, 48, 47.

By locating the cylinder 62 inside the tubes an extremely safe and compact arrangement is provided, which has the further merit of simplicity and structural robustness. Also, the fluid transmission to the interior of the cylinder is greatly facilitated by arranging the piston rod 64 to be fixed to the base ring 4'' of the outer tube 4 and to be hollow, whereby the fluid may be introduced therethrough without the need for external piping.

A further advantage of the arrangement described is the compact and secure manner in which the platform, railing and ladder elements fold down upon the undercarriage when such elements are not in use.

Therefore, it may be seen that a novel and extremely simple manner of combining the advantages of the conventional hydraulic and mechanical actuation systems for the telescope tubes, without incurring the various aforementioned disadvantages thereof, has been provided. The neat and compact manner in which the platform 21 and the telescope tubes may be rotated downwards into a stored position upon the undercarriage 21, the ladder sections 88 and 89 automatically folding to permit such movement and the railing 21'' being foldable back to a stored position, further enhance the clear and apparent advantages of the novel structure described.

It is apparent that within the scope of the invention modifications and different arrangements may be made other than herein disclosed. The disclosure is merely illustrative, the invention comprehending all variations thereof.

I claim:

1. A mobile lifter arrangement comprising:
 - a telescope assembly including a plurality of concentric telescoping tubes;
 - an undercarriage connected to the outermost said tube;
 - means for pivotally supporting said telescope assembly on said undercarriage for pivotable movement about a first axis extending transversely of said telescope assembly;
 - lifting means for effecting pivotation of said tubes about said first axis between raised and lowered positions;
 - a platform supported by said telescope assembly;
 - a railing structure around said platform;
 - pivot means connecting said railing structure to said platform for allowing pivotation of said railing structure relative to said platform about a second axis adjacent and substantially parallel to one edge of said platform, whereby when said tubes are in their lowered position as aforesaid, said railing structure is pivotable about said second axis onto said undercarriage; and
 - means for releasably securing said railing structure to said undercarriage.

2. The mobile lifter arrangement of claim 1 further comprising a latching means for said railing structure, said latching means latching said railing structure in up-standing relationship to said platform and releasable to permit said railing structure to pivot as aforesaid.

3. The mobile lifter arrangement of claim 1 wherein:

said lifting means is connected to said outermost tube;

hydraulic means for relatively telescopically extending said outermost tube and a second one of said tubes, said second tube being the next adjacent one of said tubes;

mechanical means for telescopically extending the remainder of said tubes;

said mechanical means comprising tensile members connecting said outermost tube and said second tube and guide means for guiding said tensile members;

a cylinder and a piston slidable therein, said cylinder being closed at one extremity thereof to enclose a space above said piston;

said cylinder extending co-axially with and within said telescope assembly;

a first base ring for said outermost tube;

a piston rod attached to and extending between said piston and said first base ring;

a second base ring for said third tube, said cylinder being attached to and extending from said second base ring into said telescope assembly and said piston rod passing through and freely slidable within a bore through said second base ring;

said first base ring, said piston rod and said piston having intercommunicating bores therethrough, and means for supplying hydraulic fluid under pressure through said intercommunicating bores into said space above said piston.

4. The mobile lifter arrangement of claim 1 wherein said latter sections comprise first and second pivotably interconnected ladder sections, said first section rigidly attached at an extremity thereof remote from said second section to a support member located upon said undercarriage and said second section pivotably connected to said support means pivotably connected to said outer tube as aforesaid.

5. The mobile lifter arrangement of claim 1, wherein each said tube except the innermost tube is provided with a guide ring extending interiorly thereof, within which the inner adjacent said tube is a sliding fit.

6. The mobile lifter arrangement of claim 5, wherein said guide rings are mounted at adjacent extremities of the respective telescope tubes by means of bolts welded to the exterior surface of each said tube and extending beyond the extremity thereof and passing through boreholes in the respective guide ring, and nuts threadedly engaged with said bolts and securely retaining said guide rings upon said tubes.

7. The mobile lifter arrangement of claim 1, wherein each said tube except the outermost said tube is provided with a guide ring extending exteriorly thereof and which is a sliding fit in the outer adjacent said tube.

8. The mobile lifter arrangement of claim 7 wherein said guide rings are mounted at adjacent extremities of the respective telescope tubes by means of bolts welded to the interior surface of each said tube and extending beyond the extremity thereof and passing through boreholes in the respective guide rings, and nuts threadedly engaged with said bolts and securely retaining said guide rings upon said tubes.

9. The mobile lifter arrangement of claim 1 wherein: each said tube except the outermost tube is provided at a first extremity with a guide ring extending exteriorly thereof and which is a sliding fit in the outer adjacent said tube;

each said tube except the innermost tube is provided at a second extremity with a guide ring extending interiorly thereof, within which the inner adjacent said tube is a sliding fit;

said first and second extremities being respectively co-adjacent.

10. The mobile lifter arrangement of claim 9, wherein:

said first guide rings are mounted at said first adjacent extremities of said tubes by means of bolts welded to the exterior surface of each said tube adjacent said first extremity thereof;

said second guide rings are mounted at said second adjacent extremities of said tubes by means of bolts welded to the interior surface of each said tube adjacent said second extremity thereof;

said bolts extending through boreholes in said guide rings, and nuts threadedly engaged upon said bolts and securely fastening said guide rings upon said tubes.

11. The mobile lifter arrangement of claim 1, wherein said means interconnecting said tubes comprises a chain fastened at one end to the exterior of a first of said tubes, passing over a pulley means located upon a second inner said tube adjacent said first tube, and fastened at the opposite end to the exterior surface of a third inner said tube adjacent said second tube.

12. A mobile lifter arrangement comprising:

a telescope assembly including a plurality of concentric telescoping tubes;

an undercarriage connected to the outermost tube; means for pivotably supporting said telescope assembly on said undercarriage for pivotable movement about an axis extending transversely of said telescope assembly;

lifting means for effecting pivotation of said tubes about said axis between raised and lowered positions, said lifting means being connected to said outermost tube;

mechanical means interconnecting said tubes for translating telescoping motion therebetween;

said mechanical means comprising tensile members connecting said outermost tube and a second one of said tubes, and guide means for guiding said tensile members;

said guide means being mounted on a third one of said tubes and said third tube being disposed between said outermost tube and said second tube;

a cylinder and a piston slidable therein, said cylinder being closed at one extremity thereof to enclose a space above said piston;

said cylinder extending co-axially with and within said telescope assembly;

a first base ring for said outermost tube;

a piston rod attached to and extending between said piston and said first base ring;

a second base ring for said third tube, said cylinder being attached to and extending from said second base ring into said telescope assembly and said piston rod passing through and freely slidable within a bore through said second base ring;

said first base ring, said piston rod and said piston having intercommunicating bores therethrough; means for supplying hydraulic fluid under pressure through said intercommunicating bores into said space above said piston;

a platform supported by said telescope assembly;

a railing structure around said platform, pivot means connecting said railing structure to said platform for allowing pivotation of said railing structure relative to said platform about an axis adjacent and substantially parallel to one edge of said platform, whereby when said tubes are in their lowered position as aforesaid, said railing structure is pivotable about said axis onto said undercarriage; and means for releasably securing said railing structure to said undercarriage.

13. The mobile lifter arrangement of claim 12 further comprising a latching means for said railing structure, said latching means latching said railing structure in upstanding relationship to said platform and releasable to permit said railing structure to pivot as aforesaid.

14. The mobile lifter arrangement of claim 12 further comprising a protective covering for said tubes, and a platform attached to and supported by the innermost one of said tubes, said cover extending from a surface of said platform and surrounding at least the upper extremity of said innermost tube.

15. The mobile lifter arrangement of claim 12 further comprising locking means for said telescope assembly structured to lock said tubes in their raised position as aforesaid, said locking means comprising a support member located upon said undercarriage, a rod member slidably received by said support member and pivotably connected to said outermost tube and at least one lock member upon said rod member for rigidly locating said rod member relative to said support member when said telescope assembly is in its raised position.

16. A mobile lifter arrangement comprising:

a telescope assembly including a plurality of concentric telescoping tubes;

an undercarriage connected to the outermost tube; means for pivotally supporting said telescope assembly on said undercarriage for pivotable movement about an axis extending transversely of said telescope assembly;

lifting means for effecting pivotation of said tubes about said axis between raised and lowered positions, said lifting means being connected to said outermost tube;

mechanical means interconnecting said tubes for translating telescoping motion therebetween; said mechanical means comprising tensile members connecting said outermost tube and a second one of said tubes, and guide means for guiding said tensile members;

said guide means being mounted on a third one of said tubes and said third tube being disposed between said outermost tube and said second tube; a cylinder and a piston slidable therein, said cylinder being closed at one extremity thereof to enclose a space above said piston;

said cylinder extending co-axially with and within

said telescope assembly;

a first base ring for said outermost tube;

a piston rod attached to and extending between said piston and said first base ring;

a second base ring for said third tube, said cylinder being attached to and extending from said second base ring into said telescope assembly and said piston rod passing through and freely slidable within a bore through said second base ring;

said first base ring, said piston rod and said piston having intercommunicating bores therethrough; means for supplying hydraulic fluid under pressure through said intercommunicating bores into said space above said piston; and

a ladder structure comprising mutually collapsible ladder sections, and support means therefor extending from said ladder structure to a pivot member located upon said outer tube, whereby said ladder sections are mutually collapsed and erected in response to the pivotation of said telescope assembly.

17. The mobile lifter arrangement of claim 16 wherein said ladder sections comprise first and second pivotably interconnected ladder sections, said first section rigidly attached at an extremity thereof remote from said second section to a support member located upon said undercarriage and said second section pivotably connected to said support means pivotably connected to said outer tube as aforesaid.

18. A mobile lifter arrangement comprising:

a telescope assembly including a plurality of concentric telescoping tubes;

an undercarriage connected to the outermost said tube;

means for pivotally supporting said telescope assembly on said undercarriage for pivotable movement about a first axis extending transversely of said telescope assembly;

lifting means for effecting pivotation of said tubes about said first axis between raised and lowered positions; and

a ladder structure comprising mutually collapsible ladder sections, and support means therefor extending from said ladder structure to a pivot member located upon said outer tube, whereby said ladder sections are mutually collapsed and erected in response to the pivotation of said telescope assembly.

19. The mobile lifter arrangement of claim 18, wherein said latter sections comprise first and second pivotably interconnected ladder sections, said first section rigidly attached at an extremity thereof remote from said second section to a support member located upon said undercarriage and said second section pivotably connected to said support means pivotably connected to said outer tube as aforesaid.

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