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INDUSTRIAL LIFT TRUCK WITH LOAD CLAMP

Filed Jan. 7, 1955

3 Sheets-Sheet 1

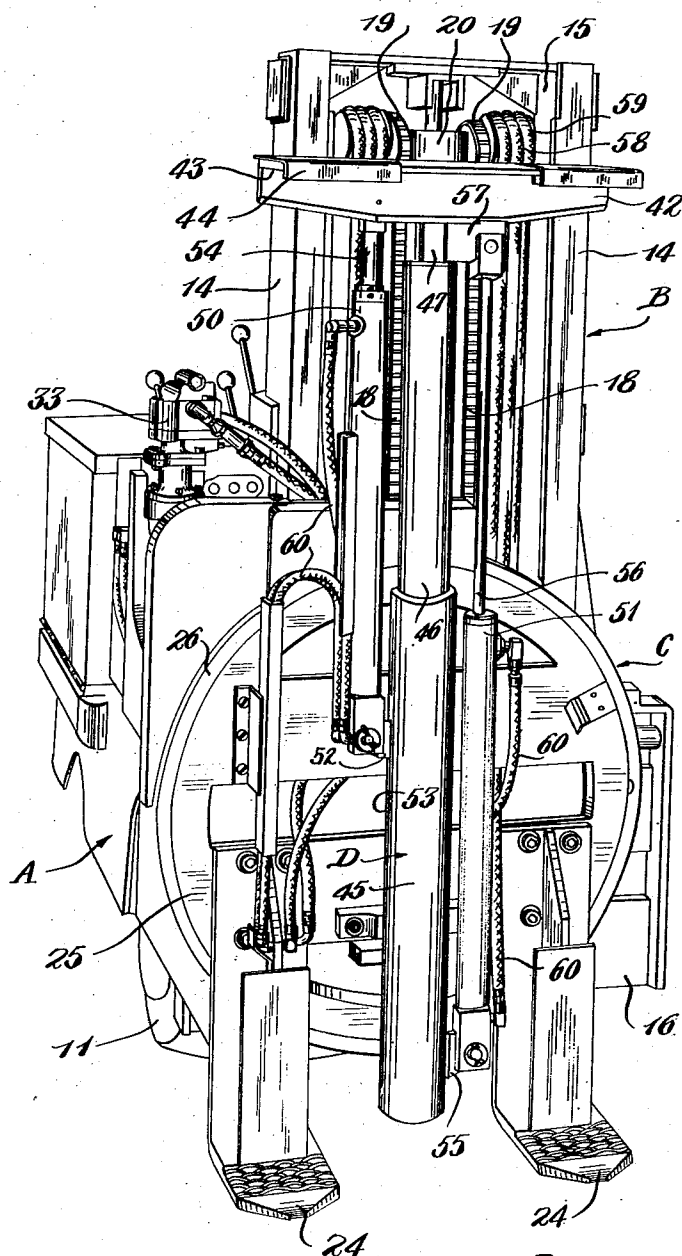


FIG. 1

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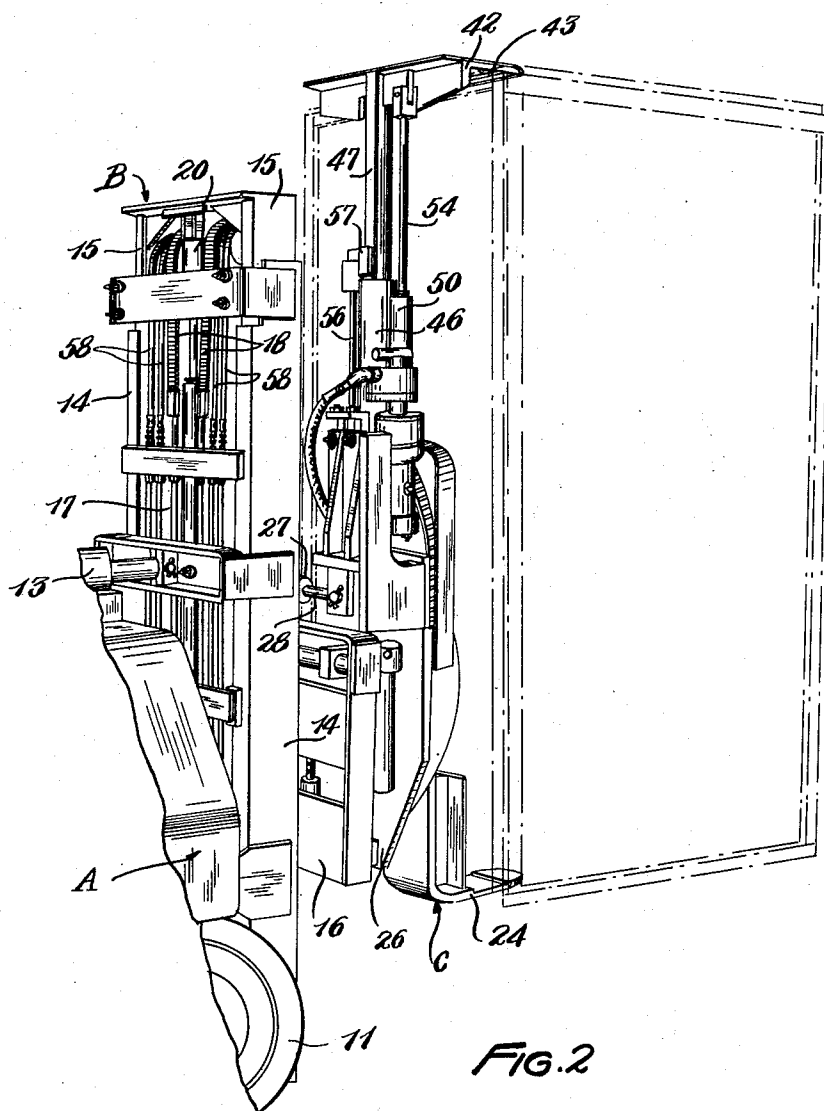
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

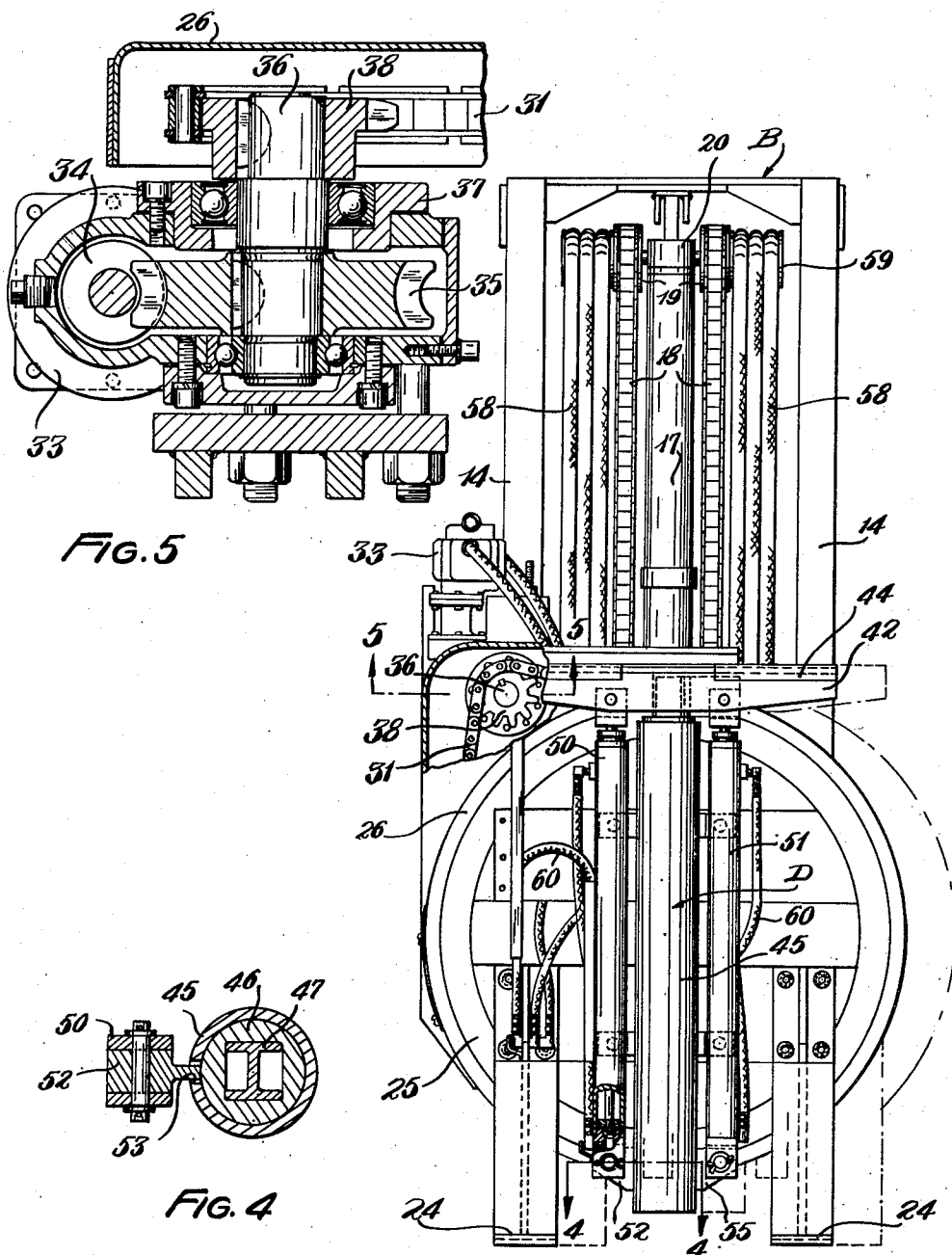


FIG. 3 INVENTOR.
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INDUSTRIAL LIFT TRUCK WITH LOAD CLAMP

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8 Claims. (Cl. 214—652)

The present invention relates to material handling apparatus and, more particularly, to an industrial lift truck having an elevatable load carrier comprising clamp means for securing the load in position on the carrier.

One of the objects of the present invention is the provision of a new and improved material handling apparatus having a load carrier including a member for engaging a load to be handled and a hydraulically operated clamp adapted to secure the load in position against the member, the clamp being so constructed and arranged that large loads may readily be handled.

Another object of the present invention is the provision of a new and improved material handling apparatus, particularly an industrial lift truck having an elevatable load carrier having opposed hydraulically operated clamp members for engaging a load to be handled, one of the clamp members being supported by telescoping means having a plurality of movable sections adapted to be expanded and telescoped by hydraulic means including a hydraulic cylinder and cooperating piston connected between the section supporting the movable clamp member and an intermediate telescoping section, whereby the clamp formed by the opposite clamp members may be expanded to accommodate relatively large loads and yet be of a simple, rigid, trouble-free construction.

Another object of the present invention is the provision of a new and improved industrial lift truck having an elevatable load carrier including a member for engaging the underside of a load and a hydraulically operated clamp for securing the load in position on the carrier, the clamp preferably being so constructed and arranged that relatively large objects, particularly crated refrigerators, may be readily handled.

Another object of the present invention is the provision of a new and improved industrial lift truck having an elevatable load carrier including an abutment member for engaging the underside of the load, a clamp member for securing the load in position on the abutment member, the clamp member being supported for movement toward and away from the abutment member by telescoping means having a plurality of movable sections and a plurality of hydraulic cylinders connected between adjacent telescoping sections, whereby the carrier may be readily used in handling large-sized loads.

The invention resides in certain constructions and combinations and arrangements of parts, and further objects and advantages will be apparent to those skilled in the art to which it relates from the following description of the preferred embodiment described with reference to the accompanying drawings forming a part of this specification, in which:

Fig. 1 is a front perspective view of an industrial lift truck embodying the present invention;

Fig. 2 is a perspective view of the front end of the lift truck of Fig. 1 showing the back side of the mast assembly;

Fig. 3 is a front elevational view of the truck of Fig. 1;

Fig. 4 is a sectional view taken approximately along line 4—4 of Fig. 3; and

Fig. 5 is a fragmentary, sectional view, with portions shown in elevation, on the line 5—5 of Fig. 3.

Although the present invention is susceptible of various modifications and of use with various types of material handling apparatus, it is herein shown and described as embodied in an industrial lift truck having an elevatable load carriage provided with a revoluble apron and particularly designed for the handling of large packages such as crated refrigerators.

Referring to the drawings, the industrial lift truck shown comprises a chassis A supported on front and rear wheels 11, only one of which appears in the drawings. The front wheels are preferably driven by suitable means, such as an electric motor, and the rear wheels are preferably dirigibly connected to the chassis so as to be directed by a steering wheel, not shown in the drawings, supported on the chassis adjacent the operator's position.

The chassis A has a vertically extending mast assembly B mounted on the front end thereof for limited tilting movement about a horizontal axis upon the operation of a hydraulic cylinder 13. The mast assembly B is of conventional construction and will not, therefore, be described in detail. Suffice it to say that the assembly comprises, in the illustrated embodiment, upright, laterally spaced primary guides 14 of channel shape, secondary guides 15, also channel shaped and adapted to telescope, respectively, into the primary guides 14, an elevatable carriage 16 movable vertically with respect to the guides and having rollers (not shown) adapted to operate in the channels of the secondary guides, and a vertical hydraulic cylinder 17 operable to raise and lower the elevatable carriage 16 through chains 18 trained over sprockets 19 mounted on a cross head 20 adapted to be raised and lowered by the cylinder 17. Since the mast assembly per se forms no part of the present invention, it is to be understood that other conventional elevating means may be substituted for that shown.

The elevatable load carriage 16 mounts a grab or load carrier C which comprises a pair of abutment or fork members 24 having generally flat surfaces for engaging the bottom of a load to be handled, or the underside of a horizontal portion of the load to be handled. The fork members are preferably mounted on a revolving apron or head 25 rotatably supported by a base member 26. The base member 26 is supported by the elevatable carriage 16 preferably for movement transversely of the chassis A to permit side shifting of the load upon operation of a hydraulic cylinder 27 having its cooperating piston connected to the load carrier C by rod 28.

The mechanism shown for supporting and revolving the apron or head 25, per se, forms no part of the present invention, is of conventional construction, and is similar to that shown and described in U. S. Patent No. 2,599,524 to Lehmann. The supporting and revolving mechanism will, therefore, not be described in detail, but suffice it to say that the head 25 is adapted to be rotated by a chain 31 encircling a portion thereof and driven by suitable power means comprising, by preference, a reversible hydraulic motor 33 operatively connected to the chain 31 by a worm gear 34 mounted on the shaft of the motor 33 and a worm wheel 35 in mesh with the worm gear and keyed to a shaft 36 which supports a sprocket adapted to mesh in driving relationship with the chain 31. Operation of the hydraulic motor 33 causes rotation of the sprocket 38 to revolve the head 25.

The operation of the truck, including the hydraulic devices for elevating the load carrier and for rotating the revolving head, is preferably controlled from the driver's position by control means well known to those skilled in the art.

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According to the present invention, to carrier C is provided with a movable, hydraulically operated clamp member 42 having a generally flat, load engaging surface 43 adapted to cooperate with the generally flat, load engaging surface of the fork members 24 in a clamping manner to positively secure a load thereon. The leading edge of the clamp member 42 may be provided with spaced, depending portions 44 to overlap a vertically extending portion of the load or crate.

The clamp member 42 is supported on the load carrier C for movement toward and away from the fork members 24 by a telescoping support means D comprising an outer, tubular member 45 connected to the head 25 and forming a first section of the telescoping means, a tubular member 46 adapted to telescope into the outer member 45 and forming a floating, intermediate section of the telescoping means, and an inner member 47 adapted to telescope within the intermediate member 46 and connect at its outer end to the movable clamp member 42 and constituting the movable end section of the telescoping means. The configuration of the inner member 47 is preferably non-circular, as shown, to prevent rotation thereof with respect to intermediate member 46.

The telescoping means D is adapted to be expanded or contracted to move the clamp member 42 toward or away from the fork members 24 by a plurality of hydraulic cylinders 50, 51 each connected between different adjacent sections of the telescoping support means. The hydraulic cylinder 50 is provided with bifurcated arms at its lower end for connecting it to the intermediate member 46 at a point adjacent the lower end of the latter, i. e., the end remote from the clamp member 42. The arms of the cylinder 50 straddle a bracket 52 which extends through a slot 53 in the outer member 45. The slot 53 permits relative vertical movement between the bracket 52 and the outer member 45. The piston rod 54 of the cylinder 50 is connected to the clamp member 42 and the cylinder 50 is of the double-acting type so that the inner member 47 may be telescoped into or withdrawn from the intermediate member 46 by the introduction of fluid pressure into the cylinder.

The hydraulic cylinder 51 is secured to the lower end of the outer member 45 by a bracket 55 and has its piston rod 56 connected to the intermediate member 46 at the upper end thereof by a bracket 57. The hydraulic cylinder 51 is double-acting and fluid pressure may be admitted to the opposite sides of the piston to move the intermediate member 46 into or out of the outer member 45. The above-described construction is such that the hydraulic cylinder 51 is operated to move the intermediate member 46 into and out of the outer member 45 and the hydraulic cylinder 50 is operated to move the inner member 47 into and out of the intermediate member 46. It will be noted that the intermediate member 46 carries the cylinder 50 upwardly when it is being moved out of the outer member 45 by the hydraulic cylinder 51. The hydraulic cylinders 50, 51 are of approximately the same length as the telescoping sections, thereby providing maximum extendability.

Pressure fluid is supplied to the hydraulic cylinders 50, 51 and other hydraulic devices on the load carrier C from a suitable and conventional source on the chassis A through flexible conduits 58 reeved over sheaves 59 mounted on the crosshead 20. One of the conduits 58 is connected to flexible hoses 60 supported on the revolving apron 25 in a conventional manner, there being a flexible hose 60 connected to each of the opposite ends of each of the cylinders 50, 51. The means for controlling the flow of fluid pressure to and from the cylinders 50, 51 is preferably such that when the telescoping means D is in its contracted position shown in Fig. 3 and is to be expanded, the intermediate member 46 is moved to its extended position by hydraulic cylinder 51 before the inner member 47 is moved with respect to the intermediate member 46 by cylinder 50. Likewise, the inner member

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47 is preferably retracted from an extended position into the intermediate member 46 prior to the retraction of the intermediate member 46 into the outer member 45. The preferred manner of operating the hydraulic cylinders may be effected by any conventional means, such as by using spring-loaded valves in the supply and exhaust lines to the cylinder, which valves are set to operate at different pressures so that the valve in the supply and exhaust lines of the cylinder which is to operate last does not open until the cylinder which is to operate first reaches the limit of its upward travel.

As is illustrated in Fig. 2, a load carrier constructed according to the present invention is particularly suitable for handling large loads such as crated refrigerators. The clamp member 42 may be extended to a point which enables the height of the refrigerator crate to be accommodated between the clamp member 42 and the fork members 24. Pressure may then be applied to the double-acting hydraulic cylinders 50, 51 to exert a clamping pressure between the clamp member 42 and the fork members 24, thereby securing the crated refrigerator in place on the load carrier C. If necessary, the load may be rotated from the vertical position shown in Fig. 2 by revolving the apron 25.

From the foregoing, it will be apparent that the objects of the present invention have been accomplished and that a new and improved industrial lift truck has been provided having a load carrier so constructed and arranged that the handling of large loads is facilitated by the provision of a movable clamp member adapted to cooperate with fork or other type members for lifting the load, the clamp member being supported by novel power actuated telescoping means of simple, rigid, trouble-free construction.

While a preferred form of the invention has been described in considerable detail, it will be apparent that the invention is not limited to the particular construction shown or the uses referred to, and it is my intention to cover all adaptations, modifications and changes which come within the practice of those skilled in the art to which the invention relates and the scope of the appended claims.

Having thus described my invention, I claim:

1. In an industrial truck, a load carrier including fork members for engaging a load to be handled, a clamp member for securing a load in position on said fork members, telescoping means having a first section, a second section adapted to telescope into the first section and a third section adapted to telescope into the second section for supporting said clamp member for movement toward and away from said fork members, means connecting the outer end of said third section to said clamp member, and means for expanding and contracting said telescoping means comprising a double-acting hydraulic cylinder operatively connected to said second section for telescoping said second section into and out of said first section and a double-acting hydraulic cylinder operatively connected between said second section and said third section for telescoping said third section into and out of said second section.

2. In an industrial truck, a load carrier having fork members for liftingly engaging the load to be handled, a clamp member adapted to secure a load on said fork members, telescoping means including a first tubular section having a longitudinally extending slot therein, a second tubular section adapted to telescope into said first section, and a third section adapted to telescope into said second section for supporting said clamp member for movement toward and away from said fork members, means connecting said third section to said clamp member, means connecting said first section to said load carrier, and means for expanding and contracting said telescoping means comprising first double-acting hydraulic fluid pressure responsive means connected to said second section and second double-acting fluid pressure responsive means having cylinder and piston elements, means con-

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necting one of said elements to said third section adjacent said one clamp member, and a bracket connecting the other of said elements to said second section adjacent the end thereof remote from said clamp member, said bracket passing through said slot in said first tubular section.

3. In an industrial truck, a load carrier having fork members for liftingly engaging the load to be handled, a clamp member adapted to secure a load on said fork members, telescoping means including a first tubular section having a longitudinally extending slot therein, a second tubular section adapted to telescope into said first section and a third section of noncircular cross-section adapted to telescope into said second section for supporting said clamp member for movement toward and away from said fork members, means connecting said third section to said clamp member, means connecting said first section to said load carrier, and means for expanding and contracting said telescoping means comprising first double-acting fluid pressure means connected to said second section and second double-acting fluid pressure responsive means having cylinder and piston elements, means connecting one of said elements to said third section adjacent said one clamp member, and a bracket connecting the other of said elements to said second section adjacent the end thereof remote from said clamp member, said bracket passing through said slot in said first tubular section.

4. In a material handling apparatus, a load carrier, a load engaging member mounted on said carrier, a clamp member for clamping a load against said load-engaging member and movable independently thereof, telescopic support means mounting said clamp member for movement toward and away from said load-engaging member, said telescopic support means comprising a plurality of telescoping members providing an end section fixed to said carrier, a movable end section fixed to said clamp member and at least one movable section intermediate said end sections, all of said movable sections being movable in a direction away from said load engaging member to expand said support means and in the opposite direction to contract said support means, and fluid pressure operated means for expanding and contracting said support means comprising a hydraulic cylinder formed of a member separate from said telescoping sections for each movable section of said support means and operatively connected between the respective movable section and the adjacent section of the support means disposed in the direction of movement for contracting the support means.

5. In an industrial truck, an elevatable load carrier, fork members mounted on said carrier for engaging and lifting a load, a clamp member for clamping a load against said fork members, telescopic support means mounting said clamp member for movement toward and away from said fork members, said telescopic support means comprising a plurality of telescoping members providing an end section fixed to said carrier, a movable end section fixed to said clamp member and at least one movable section intermediate said end sections, all of said movable sections being movable in a direction away from said fork members to expand said support means and in the opposite direction to contract said support means, and fluid pressure operated means for expanding and contracting said support means comprising a hydraulic cylinder formed of a member separate from said telescoping sections for each movable section of said support means and operatively connected between the respective movable section and the adjacent section of the support means disposed in the direction of movement for contracting the support means.

6. In a material handling apparatus, a load carrier including a load engaging-and-supporting member, a clamp member for holding a load against said load engaging-and-supporting member, telescoping means com-

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prising a plurality of telescoping members providing a first end section and an intermediate movable section adapted to telescope into said first end section and a second end section adapted to telescope into said intermediate section for supporting said clamp member for movement toward and away from said load supporting-and-engaging member, means connecting the outer end of one of said end sections to said clamp member, means connecting the other of said end sections to said load carrier, and means for expanding and contracting said telescoping means comprising a first double acting hydraulic cylinder operatively connected to said intermediate section for telescoping said intermediate section into and out of said first end section and a second double acting hydraulic cylinder operatively connected between said intermediate section and said second end section for telescoping said second end section and said intermediate section.

7. In an industrial lift truck, an elevatable load carrier, a revoluble head member on said carrier, a fork member mounted on said head, a clamp member for clamping a load against said fork member and movable independently thereof, telescopic support means mounting said clamp member for movement toward and away from said fork member, said telescopic support means comprising a plurality of telescoping members providing an end section fixed to said head member, a movable end section fixed to said clamp member and at least one movable section intermediate said end sections, all of said movable sections being movable in a direction away from said fork member to expand said support means and in the opposite direction to contract said support means, and fluid pressure operated means for expanding and contracting said support means comprising a hydraulic cylinder formed of a member separate from said telescoping sections for each movable section of said support means and operatively connected between the respective movable section and the adjacent section of the support means disposed in the direction of movement for contracting the support means.

8. In an industrial lift truck, a load carrier including a revoluble head member, a fork member mounted on said head member, a clamp member for clamping a load against said fork member, telescopic support means mounting said clamp member for movement toward and away from said fork member, said telescopic support means comprising a plurality of telescoping members providing an end section fixed to said head member, an end section fixed to said clamp member and at least one movable section intermediate said end sections, all of said movable sections being movable in a direction away from said fork member to expand said support means and in the opposite direction to contract said support means, and fluid pressure operated means for expanding and contracting said support means comprising a double acting hydraulic cylinder formed of a member separate from said telescoping sections for each movable section of said support means and operatively connected between the respective movable section and the adjacent section of the support means disposed in the direction of the fixed end section.

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