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[54] **MECHANICAL LIFT TRUCK**

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[51] **Int. Cl.** **B66b 9/20**

[58] **Field of Search** 187/9; 212/35, 43, 145; 280/34, 35, 150.5; 214/750

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Assistant Examiner—Jeffrey V. Nase
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[57] **ABSTRACT**

A manually operable material handling and lifting vehicle capable of lifting loads, supporting them during transport and raising them to an elevated position. The vehicle comprises a wheeled base member having a vertical upright, and a first telescoping member extendable to approximately twice the height of the vertical upright, and a carriage slidably secured to the first telescoping member movable the entire vertical distance of the telescoping member whereby when the first telescoping member and the carriage are at their uppermost position the load has been lifted to a position approximately two times the height of the vertical upright. The carriage and first telescoping member are moved by the interaction of a winch and a single cable.

6 Claims, 7 Drawing Figures

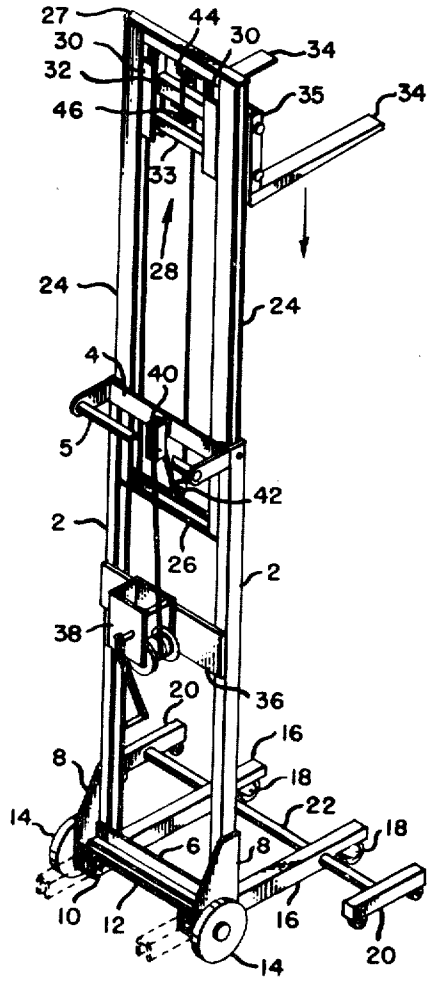

FIG. 1

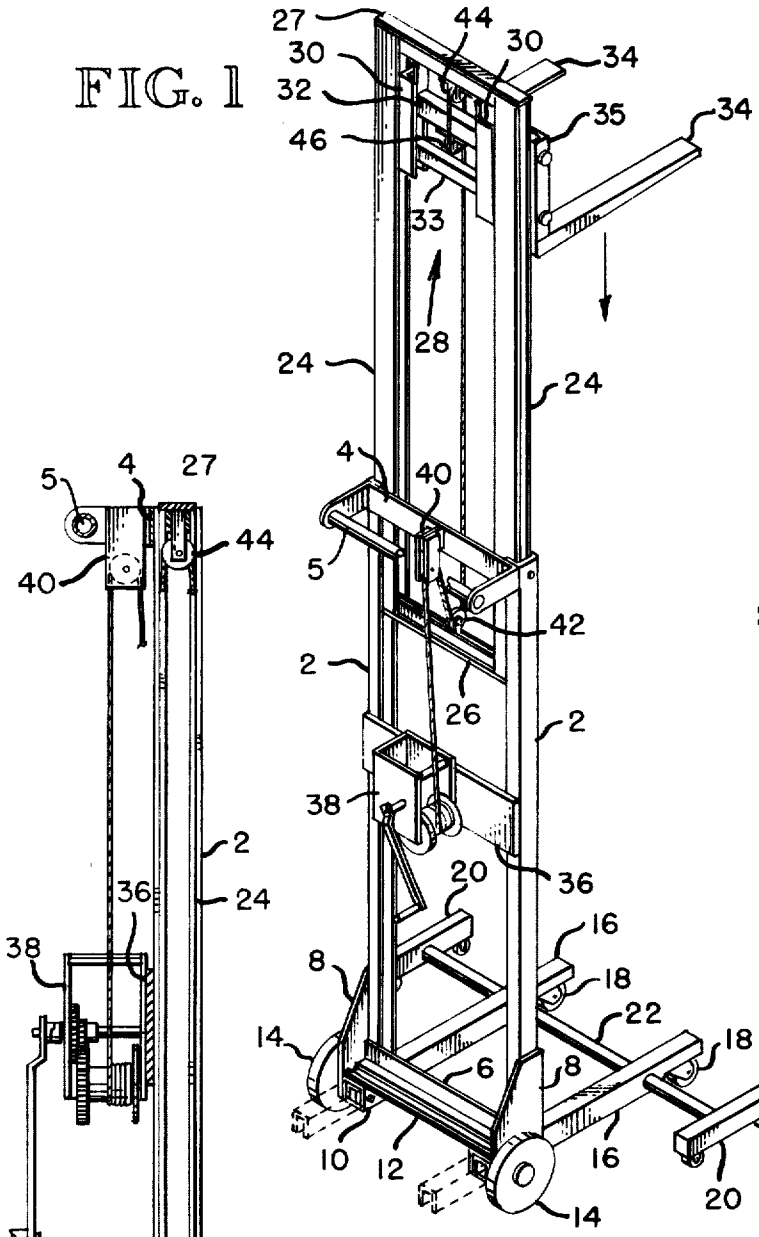

FIG. 3

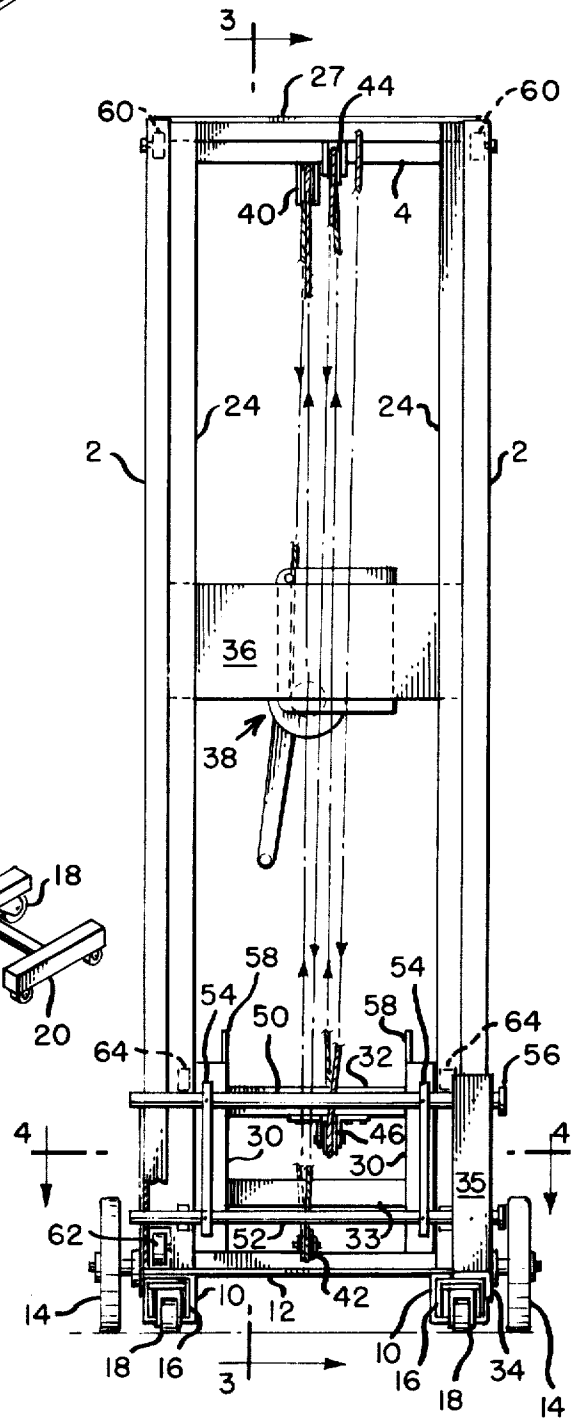

FIG. 2

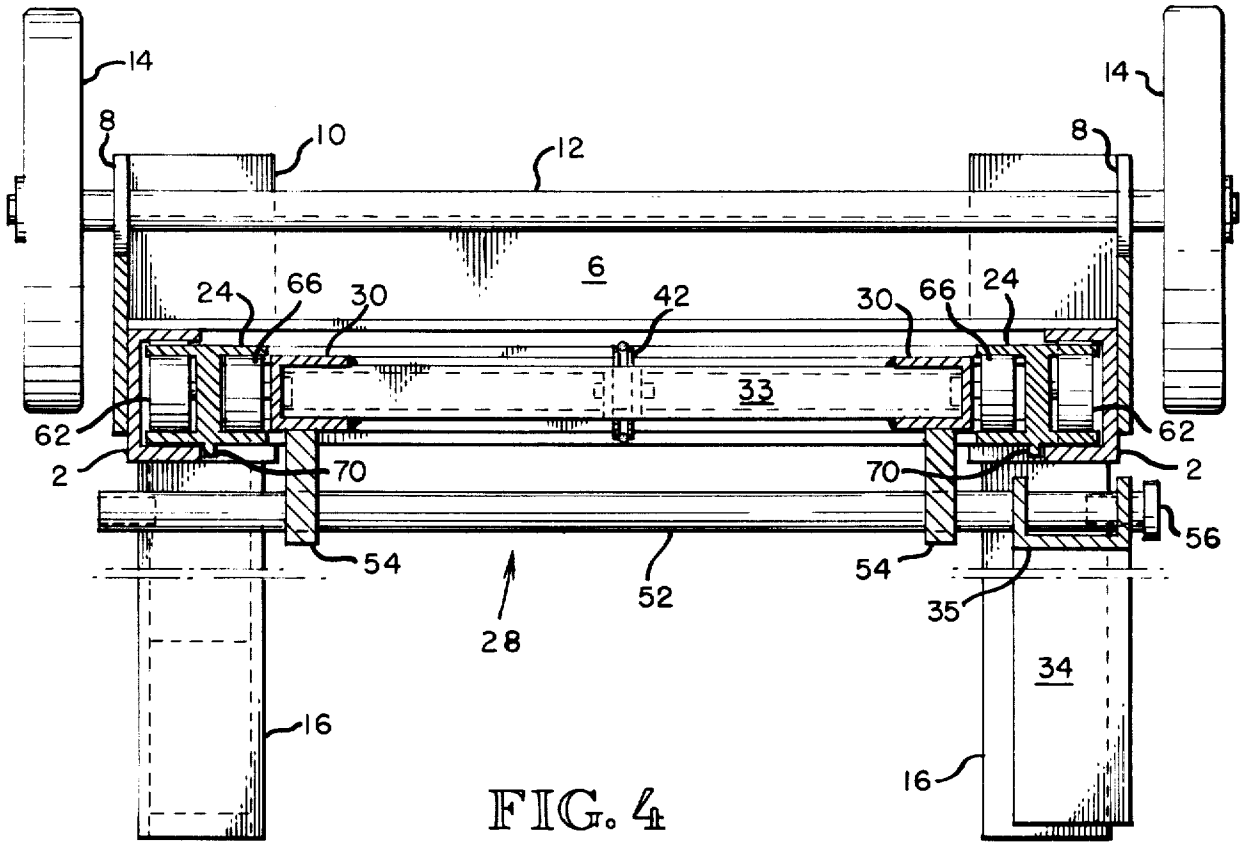

FIG. 4

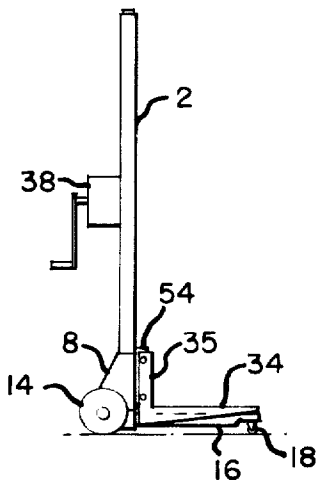

FIG. 5

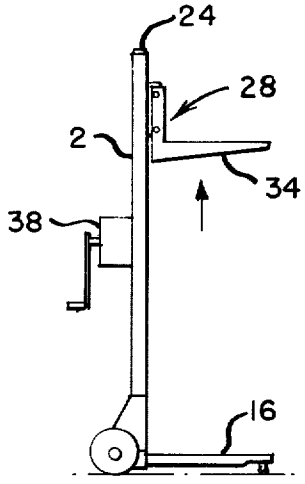

FIG. 6

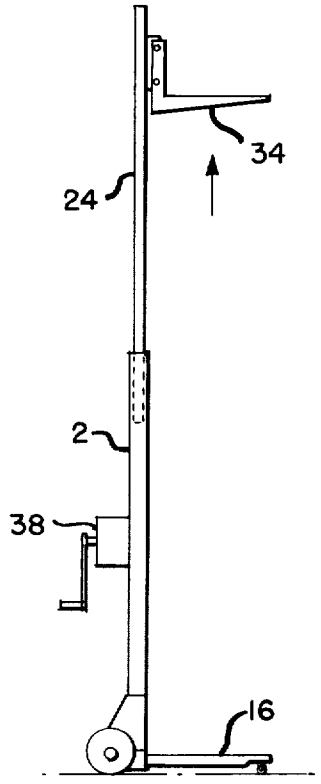

FIG. 7

MECHANICAL LIFT TRUCK

BACKGROUND OF THE INVENTION

For construction and warehouse work it is often necessary that relatively heavy material be transported from one position to another and either raised to or lowered from an elevated location. Forklift trucks provide the majority of service necessary for large scale moving, stacking and lifting. However, there is a need for a more portable lift unit which performs much the same function as the forklift truck without the expense and bulk involved with a forklift vehicle.

Small portable hydraulic and pneumatic lift units have been developed but suffer from the fact that they are of relatively high cost and inherently include a fair amount of bulk and weight. The bulk and weight of these hydraulic or pneumatic units makes them relatively impractical from a portability standpoint in that they may not be easily transported from one location to another in a panel or pickup-type truck.

Typical of the lift units presently utilized in the industry are those as shown in U.S. Pat. No. 2,106,878 granted to Sinclair, U.S. Pat. No. 2,702,607 granted to Sokolic, U.S. Pat. No. 2,885,961 granted to Hobfeld May 12, 1959, and U.S. Pat. No. 2,938,595 granted to Miller on May 31, 1960.

Each of the above noted lift vehicles is capable of performing the lift function, but each of them suffer from the above noted disadvantages in that they are not completely portable because of their bulk, they are extremely heavy and further they do not have the capability of raising an object placed on their outwardly extending forks or platforms to a position close in elevation to the top of the uprights. In other words, the prior art lift devices suffer from the fact that they need a fair amount of overhead clearance to allow the upright to pass and this clearance is necessarily, substantially greater than the highest possible elevation to which the load could be lifted, thereby greatly reducing the total lifting capability of the lift.

With the above noted prior art and problems in mind, it is an object of the present invention to provide a lightweight manual lift truck wherein objects placed on the lift platform may be lifted to and stacked in a position very close to the maximum height required by the lift itself.

Another object of the present invention is to provide a lightweight lift which lifts a supported object through a series of stages. The first stage includes lifting the object to the height of a rigid vertical element secured to the base of the lift and, the second stage lifts the object to the height of the telescoping element which is slidably secured to the rigid vertical element thereby raising it to an elevation approximately twice the height of the lift itself.

Yet another object of the present invention is to provide a lightweight lift wherein the lift platform and the horizontally disposed stabilizing means may be quickly and easily dismantled and removed whereby the truck, in the dismantled condition, may be stored in a tool locker or the like.

It is still another object of the present invention to provide a lightweight lift wherein the lifting force is provided by a winch which may be powered either by hand or by an electric or other motor. The winch winds or unwinds a cable which has a unique reeving system

causing the carriage transporting the outwardly extending load supporting platform to be elevated first and then the entire load and a telescoping member to be raised to the maximum position. This unique method of elevation allows the load to be placed very close to the top or uppermost position of the lift itself.

Still another object of the present invention is to provide a portable lift wherein the horizontal loading platform may be used in either a first configuration wherein the platform is disposed reasonably close to the floor or load supporting surface or a second configuration wherein the load supporting platform is inverted thereby allowing the load to be lifted to a position approximately equal to the uppermost extent of the entire lift when extended.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an isometric view of the present inventive lift truck with the carriage in its uppermost position with the lifting forks in their normal configuration.

FIG. **2** is a rear elevational view of the lift truck with the carriage in its lowermost position but with the lifting fork in an inverted configuration.

FIG. **3** is a sectional view along lines **3—3** of FIG. **2.**

FIG. **4** is a horizontal section taken along lines **4—4** of FIG. **2** depicting the interaction of the telescoping support elements.

FIGS. **5, 6** and **7** are schematic representations showing the lift in three of its various infinite positions.

DETAILED DESCRIPTION OF THE DRAWINGS

As seen in FIG. **1** the portable lightweight lift comprises a structural frame element having a pair of normally vertical parallel channel-shaped main side elements **2** interconnected by a crosspiece **4** defining the top of the main frame. A handle **5** is connected to the crosspiece **4** A second crosspiece **6** is located at the bottom of the framework and has interconnected therewith a pair of parallel bracket members **8** extending outwardly from the side elements **2** in a direction normal to their common plane. Brackets **8** support a pair of hollow receiving elements **10** for purposes to be hereinafter described and an axle **12.** A pair of wheels **14** are supported by the axle **12** and enable the lift to be quickly and easily moved from one place to another without special equipment.

Extending through the elements **10** in a direction transverse to the axle **12** are a pair of outriggers **16** having wheels **18** at their outermost end. The outriggers **16** are locked in place within the bracket **10** by means of a pin or the like and may be moved from a position where they extend forwardly as shown in solid providing the maximum support against forward tilting of the mechanism to a more rearward position as shown in phantom allowing the lifting element to have a reach beyond the outriggers which is greater than would normally be expected. As to be explained in greater detail hereinafter, the outriggers **16** may be easily removed for compact storage and ease of transport of the entire structure. If necessary the outriggers **16** may be provided with secondary outriggers **20** which are mounted upon an interlinking element **22** which passes through the outriggers **16** in a direction transverse to the direction of the main outriggers **16.** Together the outriggers provide assurance against tipping to the side.

Mounted within the main frame member and slidably juxtaposed with side elements **2** is a second rectangular

frame member forming the telescopic section. The telescopic section includes a pair of parallel I-beams **24** which are generally parallel to the channel of side elements **2** and a pair of interlinking transverse members **26** and **27** whereby the second telescopic member forms a rectangular element. Mounted for relative movement with the first telescopic member is a carriage **28** having a pair of inwardly facing channel members **30** braced by transverse members **32** which extend betweed the channel members **30** and hold them in a rigid position. Mounted to the forward portion of the carriage **28** is a vertical flange member, shown in greater detail hereinafter, which provides support for the forwardly extending forks **34** which define the load carrying platform.

Intermediate the length of the main frame side elements **2** is a third transverse element **36** which has mounted thereupon a winch **38** for purposes hereinafter described which may be hand powered or alternatively powered by a mechanical element.

Mounted to the top transverse member **4** is a first pulley **40.** Mounted to the lowermost transverse element **26** of the telescoping section is a second pulley **42.** Mounted to the uppermost transverse element **27** of the telescoping section is a third pulley **44** and secured to the bottom portion of carriage **28** is a fourth pulley **46.** The cable which is wound upon and secured to the winch **36** extends upwardly and downwardly passing successively through pulleys **40, 42, 44, 46** and then, as shown in greater detail with respect to FIG. **2,** is dead ended in the crosspiece **27** of the first telescoping section.

As seen in FIG. **2,** the fork member **34** is supported by a pair of transversely disposed tubular members **50** and **52** which pass through a pair of flange members **54,** noted above, secured to the vertical channel members **30** of the carriage **28.** The forks **34-35** slide over the tubular members **50, 52** and are held in place by means of a bolt **56** which is threaded into the tube **50.** The securement of the forks is necessary for safety but the particular means of securement is not deemed critical. It is to be noted at this point that the vertical members **30** of the carriage **28** have an upwardly extending flanged portion **58** which serves as a stop by abutting transverse member **27** when the carriage is moved to its uppermost position. In operation, the winch is operated and the carriage **28** is moved to its uppermost position whereat the stops **58** contact the lower portion of cross member **27** and then any further inhaul of the cable causes the first telescoping section to move upwardly until, at maximum extension, the lift is approximately twice its normal height.

As seen in FIG. **3,** the fork members **34** include the outwardly extending generally horizontally disposed leg portion which is L-shaped in cross section to complement outrigger **16** and then a normally disposed element **35** attached thereto. The element **35** has a pair of bores passing therethrough whereby the fork element may be rigidly held in place by means of the transverse tubular members **50, 52** as noted above. As seen in FIG. **3,** the fork members may be placed in their inverse or opposite from normal position whereby the horizontally disposed element **34** is located at the top of the carriage **28** enabling the operator to place the load extremely close to the elevation required for clearance by the entire carriage itself. Referring back now to FIG. **2,** a pair of wheels **60** is provided at the interior of the channel members **2** at the upper portion thereof for rolling contact with one side of the I-beam **24.** A second set of wheels **62,** only one to be seen in FIG. **2,** is located at the lower portion of the first telescoping member for interaction with the channel member **2** whereby the first telescoping member has rolling contact between itself and channel member greatly reducing any frictional contact easing the burden of relative movement.

As seen in FIG. **3,** the carriage **28** includes a pair of wheels **64** at the upper portion of the carriage and an identical pair of wheels **66** at the lower portion of the carriage to interact with the inner surface of the I-beam **24** forming the side of the first telescoping member. The combination of the rolling interaction of wheels **64, 66** with the I-beam provides for relatively frictionless upward movement of the carriage with respect to the first telescoping member.

As seen in FIG. **4,** the interaction of the various vertical elements and their placement with respect to the wheels or the like may readily be seen. The main structural support is provided by the pair of inwardly facing channel members **2** which as noted above are secured to a plate or flange **8** which provides support for the axle **12** supporting the wheels **14.** Mounted interiorly of channel member **2** is an I-beam **24** which may be formed as a single unit or alternatively may be a fabrication of two or more elements. As best seen in this figure, an outwardly extending flange **70** is provided upon each of the I-beams **24,** providing additional rigidity and contact between the channel member **2** and the I-beam **24.** The wheel **62** which provides rolling contact between the channel member and the I-beam may readily be seen in this view. The carriage **28,** as noted above, is fabricated of a pair of generally vertical members **30** having mounted to their outermost section wheels **66** for rolling contact with the other half of the I-beam **24.**

It should also be realized that additional telescoping sections could be incorporated in the lift by adding one or more pairs of I-beam frames, such as **24,** inwardly of **24** with carriage **28** contained within the inner flanges of the innermost pair of I-beams. The addition of such telescoping sections would thus increase the extended lift height accordingly.

Reference is now made to FIGS. **5, 6** and **7** to more graphically depict the interaction of the various elements during the elevation or lowering of the load upon the inventive hand truck, shown schematically in these figures. As seen in FIG. **5,** the hand truck is in its collapsed configuration with the carriage and telescoping section at their lowermost position. The carriage at the bottom of the first telescoping section rests with its base adjacent the base of the vertical upright and overlying outriggers **16.** At this point the cable will be extended to its greater length. In FIG. **6** the carriage and load supporting platform have been moved by operation of the winch to the uppermost position of the carriage relative to the telescoping section whereat it is adjacent the top of the telescoping section. At this position the stops **58,** as seen in FIG. **2,** will contact the upper horizontal member **27** of the telescoping section and thus eliminate any further upward movement of the load supporting platform and its carriage.

Continual cranking of the winch will thus cause the cable between the first telescopic section and the winch to be retracted thus providing an upward force upon

the pulley located at the lowermost portion of the telescoping section, pulling it upwardly until it has reached its fully extended position as shown in FIG. 7. Thus, as can be seen, the truck is utilizable in its telescoped configuration to move a load from the position adjacent the floor to a position adjacent its upright without activating the telescoping section. If it is desired to move a load to a higher elevation the telescoping section is then utilized and without any delay or adjustment carries the load to an elevation approximately twice the height of the original channel members. If it is necessary that the load be placed immediately adjacent the ceiling or where low clearance is a problem and the load must pass beneath beams or the like, then the forks will be inverted, as noted above, and the load placed on the normally bottom portion of the forks will be raised to a position essentially adjacent the top of the first telescopic section regardless of its position.

Thus it can be seen that there has been provided a simplified and inexpensive lift capable of being dismantled and stowed in a very small place, utilized for lifting relatively heavy loads without a necessity of exterior power source to a position approximately twice the height of the vehicle itself.

The embodiments of the invention in which an exclusive property or priviledge is claimed are defined as follows:

1. A portable lift comprising, a portable base including an upwardly projecting first mast frame of generally rectangular configuration,

a second mast frame of generally rectangular configuration slidably mounted on said first frame for vertical movement relative thereto.

a carriage slidably mounted on said second frame for vertical movement relative thereto and carrying horizontally projecting lifting element means,

winch means supported by the base and having a cable wound thereon,

sheave means on the top of said first frame, the bottom and top of said second frame, and on said carriage through which said cable is reeved in the recited order and dead-ended on the top of the second frame to provide a mechanical advantage for lifting said second frame relative to the first frame and for also providing a mechanical advantage for lifting said carriage relative to said second frame, said second-mentioned mechanical advantage being as great as the first-mentioned mechanical advantage whereby when the cable is hauled in by the winch means said carriage is raised substantially to its full extent relative to the second frame before said second frame moves upwardly relative to the first frame to further raise the carriage.

2. A portable lift according to claim **1** in which said first-mentioned mechanical advantage and second-mentioned advantage are each two to one.

3. A portable lift according to claim **1** in which said lifting element means comprises a pair of fork elements and said base has a pair of ground support wheels near the lower end of said first frame, and a pair of laterally spaced outriggers projecting from said base between said wheels in the same direction as the fork elements and arranged to have said fork elements located therebetween when the fork elements are in a lowered position, said outriggers being removable and being horizontally adjustable on said base in said direction.

4. A portable lift according to claim **1** in which each of said fork elements has a support leg extending from its inner end, and means on the carriage for selectively mounting each support leg in alternate vertical positions whereat the fork is in operating position at the bottom of the leg or the top of the leg to thereby provide alternative fork elevations when the carriage is at its uppermost position relative to the base.

5. A portable lift according to claim **1** in which said first frame is rigidly mounted on said base and has an elevated handle on the opposite side thereof from said lifting element means, and in which said winch means is manually operated and is mounted beneath said handle on said first frame.

6. A portable lift comprising,

a vertical frame assembly,

a vertically movable carriage slidably mounted on said frame assembly and having a pair of laterally spaced fork mounting means each comprising a respective horizontal pair of laterally projecting and vertically spaced fork supports,

a pair of vertically reversible L-shaped fork elements each having a horizontal lifting fork and a vertical support leg adapted to be alternatively sleeved on the fork elements of a respective said fork mounting means in a first position whereat the fork is at the bottom of the leg or in a second vertically reversed position whereat the fork is at the top of the leg and projects in the same direction as when in said first position whereby the maximum elevation of said lifting forks may be varied by vertically reversing the support legs,

and means for moving said carriage to the top of said frame assembly with said lifting forks in either of said positions.

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