Aug. 16, 1966 W. M. J. M. GOYARTS 3,266,774

LIFTING MECHANISM

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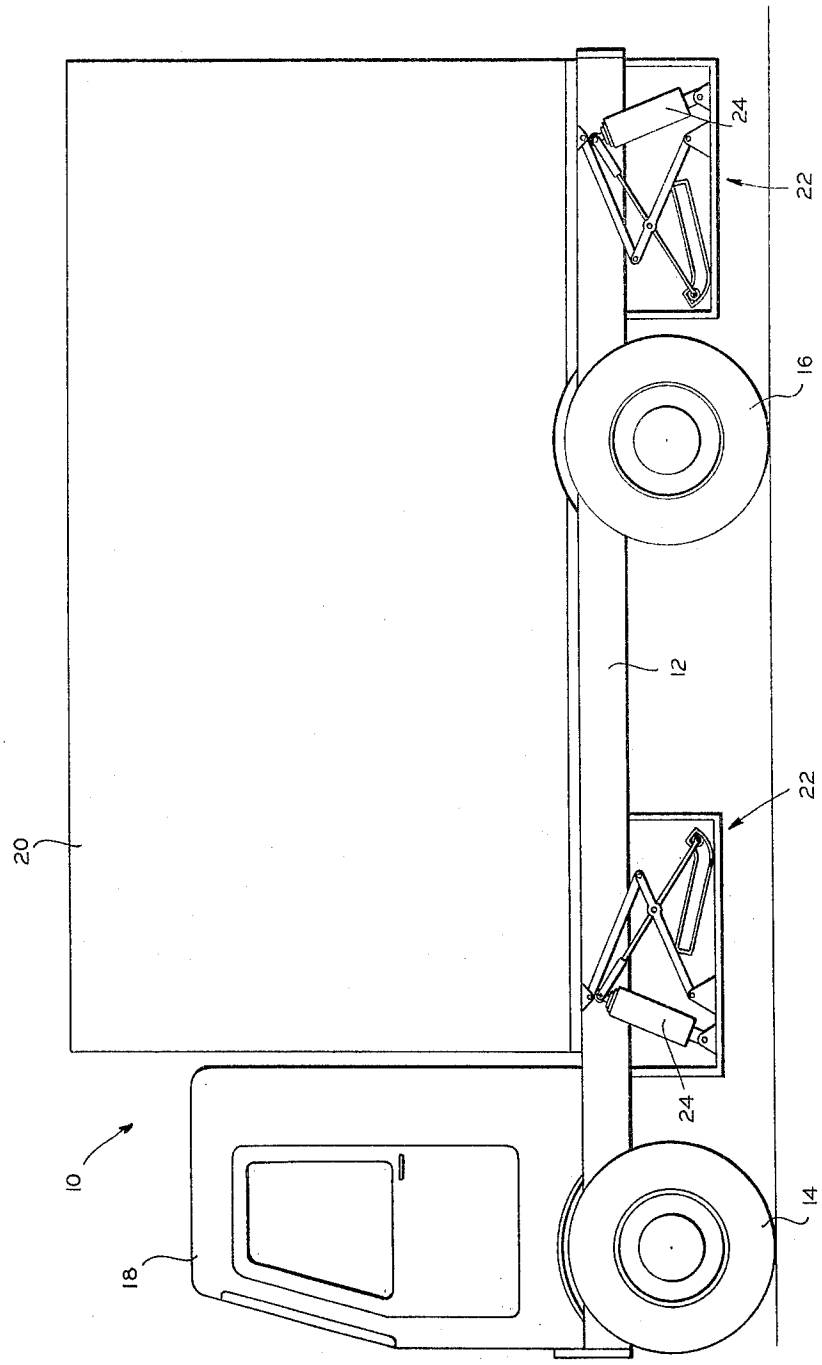


FIG. 1

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FIG. 2

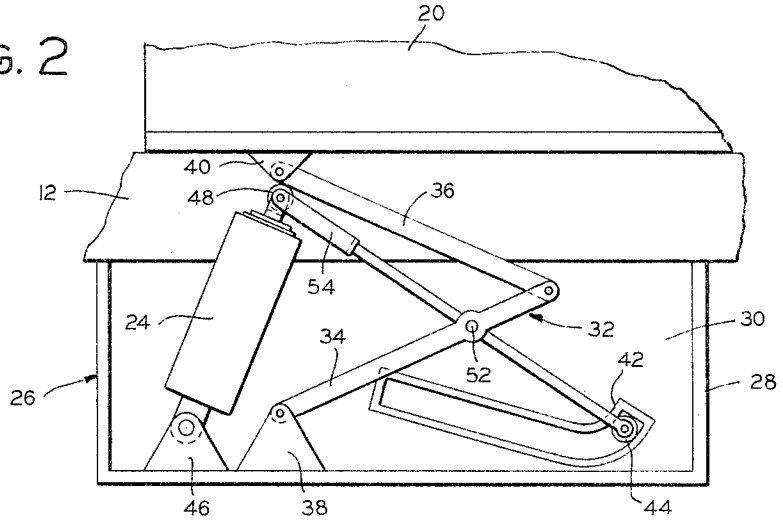
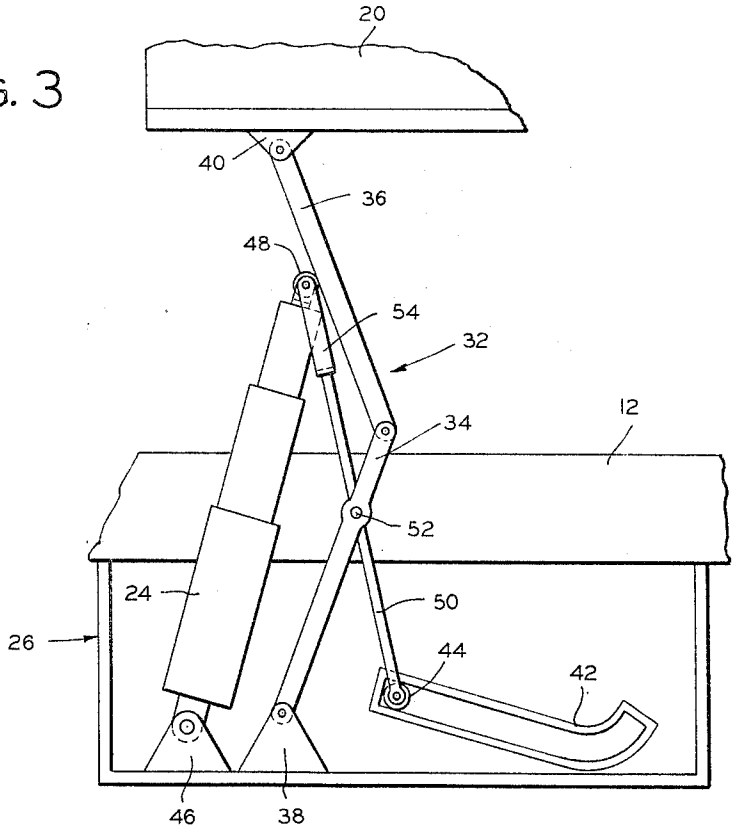


FIG. 3



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LIFTING MECHANISM

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4 Claims. (Cl. 254—122)

This invention relates to a lifting mechanism, and more particularly to a modified pantograph used in conjunction with an extensible fluid motor.

Pantograph or scissors type linkages often are used with piston and cylinder type fluid motors in order to provide a lifting mechanism that has a minimum collapsed height for a given lifting or extended height. However, such mechanism generally requires a large initial actuating force which decreases as the mechanism approaches a full lifting height. Consequently, the fluid motor which is used with the mechanism must be large enough to supply the force required for the initial lifting, although such a large force is not required throughout the entire operation of the mechanism. In this respect, such mechanisms are inefficient since during a substantial part of the lifting operation the fluid motor is larger than required.

A principal object of my invention is to provide a lifting mechanism in which the actuating force is substantially constant through the entire lifting operation of the mechanism.

Another object of my invention is to provide a lifting mechanism having improved efficiency.

In carrying out my invention in a preferred embodiment thereof, I provide a support or base to which an extensible fluid motor is pivotally connected. Also connected to the support is a generally J-shaped guide. A two-bar toggle is pivotally connected at one end to the support, the other end of the toggle being associated with the object to be lifted. A link is pivotally connected intermediate the ends thereof to the lower bar of the toggle, and also is pivotally connected to the guide for movement therealong.

The above and other objects, features and advantages of my invention will become more readily apparent to persons skilled in the art in view of the detailed description which follows taken in conjunction with the accompanying drawing wherein:

FIGURE 1 is a side view showing a preferred embodiment of my invention in use in a truck having an elevatable cargo van,

FIGURE 2 is an enlarged side elevational view of the forwardly locating lifting device of my invention as shown in FIG. 1, showing the device in a down or collapsed position, and

FIGURE 3 is similar to FIG. 2, except that the device is in fully elevated position.

Referring now to FIG. 1, there is shown a truck **10** having a frame **12** supported by front and rear pairs of wheels **14** and **16**, respectively. A driver's cab or compartment **18** is carried by frame **12** at the front end thereof and a cargo van **20** is carried by frame **12** rearwardly of cab **18**. Normally, cargo van **20** rests on frame **12** and is connected thereto by means of a lifting mechanism **22** located at each corner thereof, two of which mechanisms are shown. Each lifting mechanism **22** includes a two stage telescopic fluid motor **24**, each fluid motor preferably being connected to a central control valve (not shown) located in cab **18** so that the vehicle operator can upon the actuation of the valve energize simultaneously all of the fluid motors **24** to cause the lifting mechanisms **22** to elevate cargo van **20**.

Turning now also to FIGS. 2 and 3, one of the lifting mechanisms **22** will be described in detail. A base or

support **26** is secured to frame **12** and extends downwardly therefrom. Support **26** includes a generally U-shaped frame **28** to which a plate **30** is secured by any suitable means, such as welding. Cargo van **20** is connected to support **26** by means of a two-bar toggle or linkage **32**. Linkage **32** includes link **34** pivotally connected to a link **36**. Link **34** is pivotally connected adjacent one end to support **26** by means of a pin and bracket connection **38** and link **36** is pivotally connected at one end to cargo van **20** by means of a pin and bracket connection **40**. Connected to plate **30** is a guide member or means **42** having generally a J-shaped trackway within which a roller **44** is mounted for movement therealong.

Fluid motor **24** is pivotally connected at one end to support **26** by means of a pin and bracket connection **46**. A roller **48** is rotatably connected to the upper end of fluid motor **24** and is held in abutment with the lower edge of link **36** by means of a rigid link or bar **50**. Link **50** is pivotally connected intermediate the ends thereof to link **34** at **52**. Further, link **50** is pivotally connected at one end to roller **48** by means of a U-shaped yoke **54** and is pivotally connected at the other end to roller **44**.

Turning now to the operation of my invention, it will be assumed that the operator of truck **10** wishes to elevate cargo van **20** and so actuates the control valve in cab **18** to supply pressurized fluid simultaneously to all four of fluid motors **24** causing them to extend simultaneously, in a manner as is illustrated in respect of one of the fluid motors, from the position shown in FIG. 2 to the position shown in FIG. 3. In the FIGS. 2 and 3 showing of one of the lifting mechanisms **22**, roller **48** moves along the lower edge of link **36** as fluid motor **24** extends and causes linkage **32** to unfold from the position shown in FIG. 2 to the position shown in FIG. 3. At the same time, link **50** in cooperation with roller **44** and guide **42** coordinates upward movement of fluid motor **24** and toggle **32** so that roller **48** continues to engage the bottom edge of link **36**.

It will be noted that in actuating the lifting mechanism **22** from the position shown in FIG. 2 to the position shown in FIG. 3 the vertical force component of fluid motor **24** increases slightly as the fluid motor assumes a more nearly vertical position, while the mechanical advantage through which fluid motor **24** operates decreases slightly as roller **48** moves down link **36** away from connection **40**. The geometry of the mechanism is chosen so that the increase of the vertical force component of the fluid motor is substantially offset by the decrease in mechanical advantage through which the vertical force component acts with the result that fluid motor **24** operates lifting mechanism **22** with a substantially constant actuating force.

The above detailed description is intended to be illustrative only, and so should not be construed as limiting the scope of my invention. For example, while my lifting mechanism has been shown in conjunction with a truck having an elevatable cargo van carried thereon, it is obvious that my invention has other applications. Also, it is not necessary that a two-stage telescopic fluid motor be used. Therefore, the limits of my invention should be determined from the following appended claims when taken in light of the relevant prior art.

I claim:

1. A lifting mechanism comprising a support, an extensible fluid motor pivotally connected to the said support, guid means connected to the said support, an X-shaped linkage including first and second links pivotally connected together intermediate their ends, the said first link being connected to the said guide means for movement therealong and pivotally connected to the said fluid motor, the said second link being pivotally connected to the said support, and a third link pivotally connected to

the said second link and disposed to abut the said fluid motor.

2. A lifting mechanism for use with an elevatable member, said mechanism comprising a base, a first link pivotally connected to the said base, a second link pivotally connected to the said first link and the elevatable member, an extensible fluid motor pivotally connected to the said base, guide means connected to the said base, and a third link pivotally connected to the said fluid motor, connected to the said guide means for movement therealong and pivotally connected intermediate the connections to the said fluid motor and guide means to the said first link.

3. A lifting mechanism for use with an elevatable member, the said mechanism comprising a base, first and second links pivotally connected together, said first link being pivotally connected to the said base and the said second link being pivotally connected to the elevatable member, guide means connected to the said base, a third link pivotally connected intermediate the ends thereof to the said first link, one end of the said third link being connected to the said guide means for movement therealong, and an extensible fluid motor connected to the said base and the other end of the said third link, the said fluid motor being disposed so that the end thereof connected to the said third link abuts an edge of the said second link.

4. A lifting mechanism for use with an elevatable member, the said mechanism comprising a support, an extensible fluid motor pivotally connected at one end to the said support, a generally J-shaped guide connected to the said support in spaced relation from the said fluid motor, a first link pivotally connected at one end to the said support between the said fluid motor and guide, a second link pivotally connected at one end to the elevatable member and pivotally connected at the other end thereof to the other end of the said first link, a third link pivotally connected intermediate the ends thereof to the said first link and pivotally connected at one end thereof to the other end of the said fluid motor, a roller rotatably connected to the other end of the said third link and disposed to engage the said guide for movement therealong, and a roller rotatably connected to the said other end of the said fluid motor and disposed to engage the adjacent edge of the said second link.

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