Aug. 14, 1956 S. J. PICKARD ET AL 2,758,816

LAZY TONG JACK

Filed May 31, 1950 3 Sheets-Sheet 1

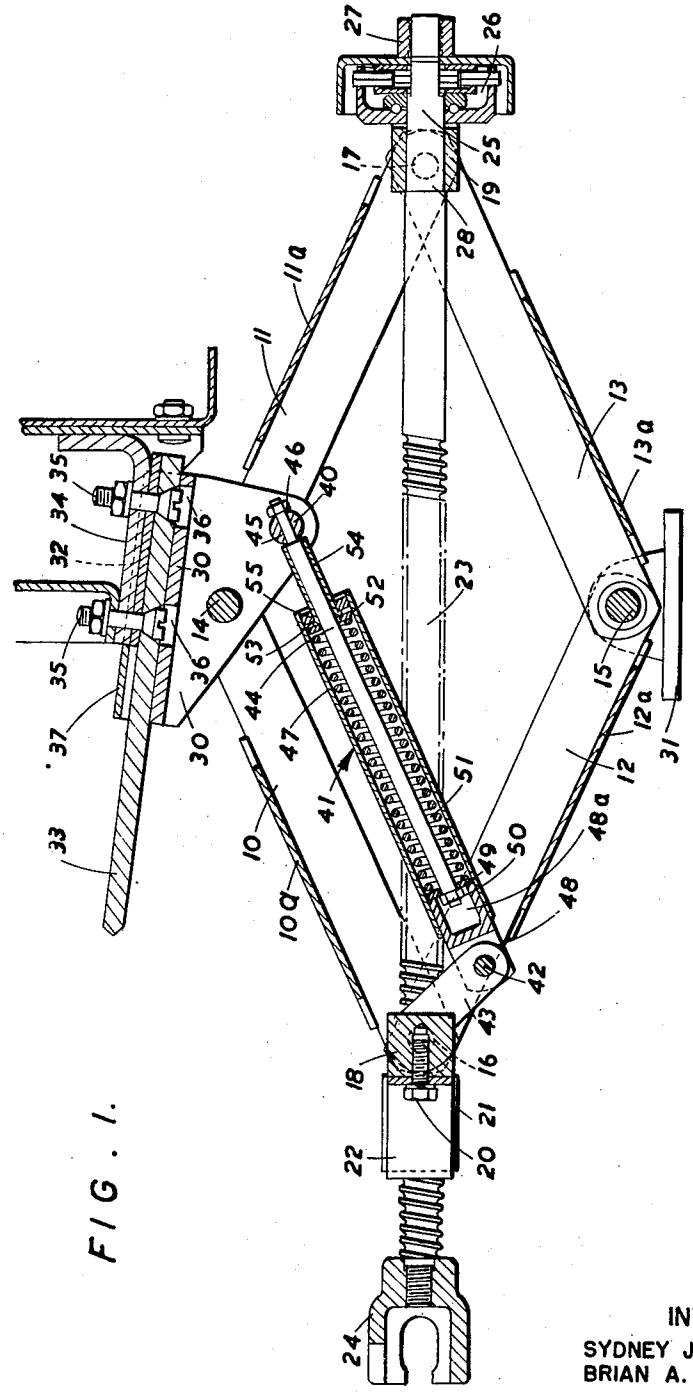


FIG. 1.

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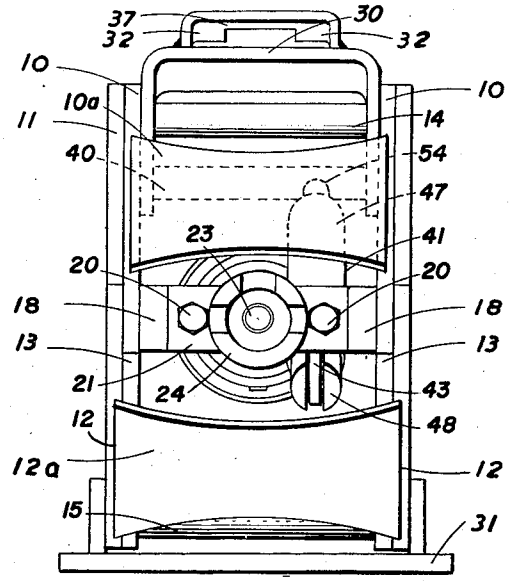
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FIG 2



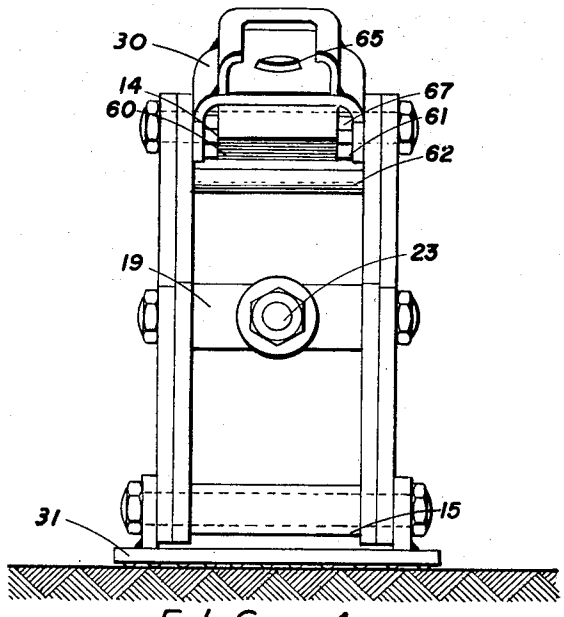


FIG. 4.

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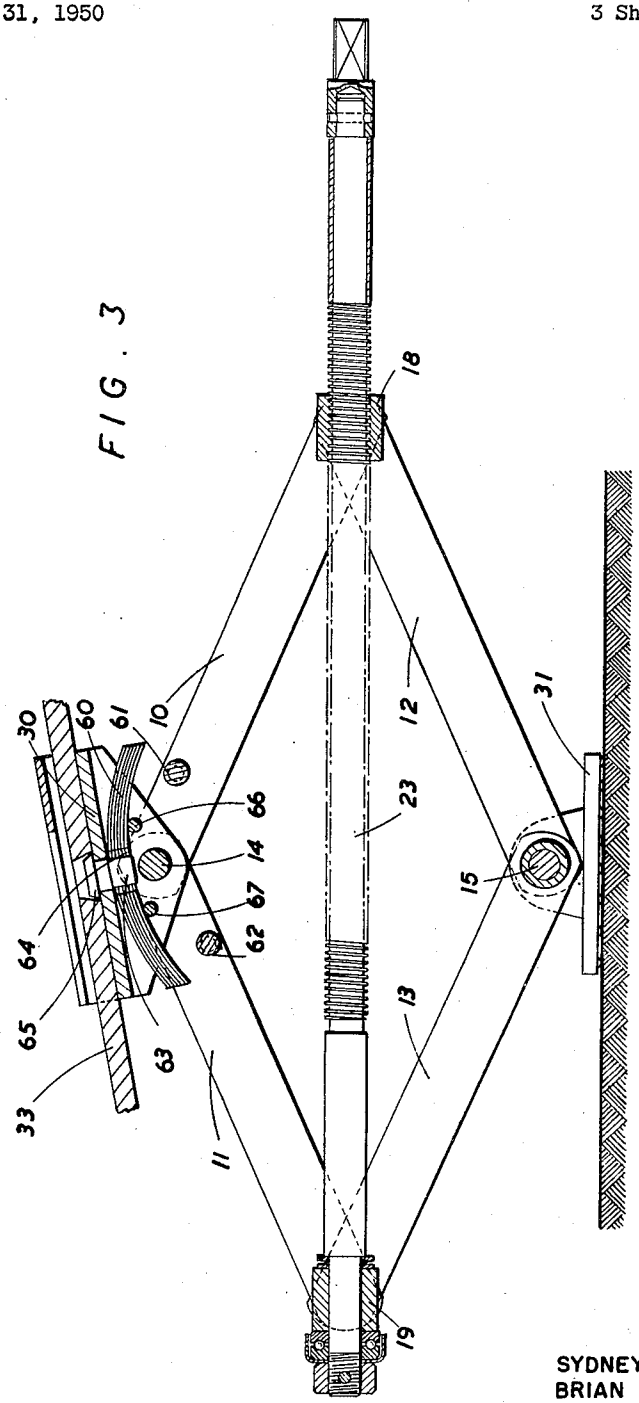
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FIG. 3



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Application May 31, 1950, Serial No. 165,218

5 Claims. (Cl. 254—126)

This invention relates to lifting devices of the lazy-tong or toggle link type, and especially to jacks for jacking up motor vehicles.

It is an object of the invention to enable a firm bearing to be achieved both on the ground and on the vehicle or other load irrespective of the camber or other inclination of the ground and of the angle of tilt of the vehicle during lifting and at the same time to enable the jack to be conveniently reached for operating it.

According to one feature of the invention a lifting device of the type referred to has the upper ends of its upper links connected pivotally on a common axis on which also a load-engaging member is pivotally mounted, and the lower ends of the lower links connected pivotally on a common axis on which also a ground-engaging member is pivotally mounted, operating means being provided for moving the other ends of the links towards and away from each other. The load and ground-engaging members can thus tilt pivotally in relation to the remainder of the jack to accommodate themselves to different angular dispositions of the load and ground.

The load-engaging member may be constructed for attachment to the vehicle chassis or to any other part of the vehicle so that the jack is suspended from the vehicle and in operation is extended downwardly to engage the ground. The operating means may comprise a rotatable screw having one end journalled on a pivot block to which one pair of upper and lower links are pivoted, said screw engaging a nut which is non-rotatably attached to a second pivot block to which the second pair of upper and lower links are pivoted. Conveniently both the upper links and both the lower links are of equal length and once the device has been extended with said ground-engaging member in contact with the ground the load axis, i. e. the plane through the pivoted upper ends of the upper links and the pivoted lower ends of the lower links, and the screw axis both become substantially fixed. If, therefore, the screw is maintained substantially horizontal during the operation of extending the jack to engage the ground the load-axis will be substantially vertical. This, however, generally necessitates stooping on the part of the operator and there may often be a tendency to lift the outer end of the screw during the preliminary fitting operation with the result that the load axis becomes inclined, while in addition the screw may contact and damage the lower part of the body. If, under such conditions, the device should be used at the side of a vehicle on a sharply cambered ground surface, the tendency may exist for the vehicle, once the load has been taken off the wheels at one side, to slew sideways and possibly slide off or tip over the jack.

According to a further feature of the invention, this possibility may be avoided by the provision of resilient means interconnecting the load-engaging member and the toggle system and tending to maintain said member in a predetermined mean angular position with respect to the toggle system. With the addition of such interconnecting means the angular position of attachment of the load-engaging member to the vehicle chassis will determine the angular position of the load axis in relation to the chassis. The latter, for example, may be provided with a projection in the form of a rail along which the load-engaging member, which may be of channel or claw shape, is slidable to a pre-determined position and the rail may be inclined to the chassis to an extent corresponding to the inclination of the load-engaging member relatively to the screw axis, thereby ensuring that the load axis is located in the required plane. In the operative position of the jack the load-engaging member preferably locates against an abutment on the rail which prevents further relative movement.

The aforesaid additional connection between the load-engaging member and the toggle system may be effected by a link which extends parallel to one of the toggle links and is constructed in such manner that its length is resiliently variable upon the application of a force thereto in either longitudinal direction. The resilience may be provided by means of a spring which is normally in a stressed condition so that it presents immediate resistance to deformation. The parallel link may have one end pivotally connected to the load-engaging member at a point offset from the point of pivotal connection of said member to the upper ends of the upper toggle links and its other end pivotally connected to a bracket which is fixed in relation to one of the pivot blocks connecting a pair of upper and lower links. Preferably the resilient link is located within the compass of the toggle link system so as not to increase the overall size of the device in the collapsed condition of the latter.

The resilient or parallel link may be constructed in the form of two members which are assembled for relative longitudinal movement, a compression spring being fitted between said members so as to maintain the link at a pre-determined length (in relation to the parallel toggle link) while at the same time allowing for variation in said length in either direction with further compression of the spring so as to enable the load-engaging member to follow the inclination of the vehicle chassis by turning about its pivotal axis.

Instead of employing a parallel link as above described, a laminated semi-elliptic leaf spring may be attached at its centre to the lower side of the load-engaging member, the opposite downwardly curved ends of said spring engaging pins or like abutments on the two upper toggle links. The load-engaging member may carry two stops engaged by the under side of the spring on either side of the position of attachment of the latter to said load-engaging member. These stops enable the spring loading to be relieved from one of said abutments when the spring loading is increased on the other side due to tilting of the load-engaging member in relation to the remainder of the jack. The abutments may be in a horizontal plane or one higher than the other, according to whether the normal position of the load-engaging member is required to be horizontal or tilted.

In order that the invention may be clearly understood and readily carried into effect, the same will now be more fully described with reference to the accompanying drawings, in which:

Figure 1 is a longitudinal sectional view of one form of motor vehicle lifting jack shown attached to a vehicle chassis;

Figure 2 is an end elevation of the jack shown in Figure 1 as seen from the left of said figure;

Figure 3 is a view similar to Figure 1 of another form of motor vehicle lifting jack according to the invention; and

Figure 4 is an end elevation of Figure 3 as seen from the left of said figure.

Referring firstly to Figures 1 and 2, the device here

illustrated comprises two similar laterally spaced toggle link systems, each system having a pair of upper links **10**, **11** and a pair of lower links **12**, **13**, the corresponding upper and lower links of the two pairs being respectively interconnected by transverse plates **10***a* **11***a* and **12***a*, **13***a* welded thereto. At their upper ends the two pairs of upper links are pivoted on a transverse rod **14**, the lower ends of the two pairs of lower links being similarly pivoted on a transverse rod **15**. The other ends of the links of each system are connected together in pairs to provide a parallelogrammic assembly, each such pair, comprising one upper link **10** or **12** and one lower link **11** or **13**, being pivotally carried on a pin **16** or **17** projecting laterally from a pivot block **18** or **19**. The block **18** is secured by bolts **20** to a bracket **21** which surrounds a non-rotatable internally threaded sleeve or nut **22**, said nut co-operating with a rotatable screw rod **23**. One end of said rod has secured thereto a socket **24** for the reception of an operating handle or crank, and the other end has a reduced diameter portion **25** which is freely rotatable within the pivot block **17**. A thrust ball race **26** is provided at this end of the screw and is held on the screw by a nut **27**, the pivot block being located against movement axially of the screw between the ball race and a shoulder **28** formed by the reduced diameter portion **25**. As will be evident, rotation of the screw will produce movement of the pivot blocks **18**, **19** towards or away from one another and consequent variation in the spacing of the upper and lower pivot rods **14**, **15**.

The upper pivot rod **14** also has fulcrumed thereon a load-engaging member **30** which extends between the two toggle link systems, while the lower pivot rod **15** carries a ground-engaging member **31** which is freely rockable so as to rest evenly on the ground irrespective of the camber or slope. The load-engaging member is constructed for co-operation with a part of the vehicle chassis in such manner that the device is suspensible from the chassis. To this end, the member **30** is of inverted U-shaped cross-section and has welded to its upper face a pair of laterally spaced inturned L-shaped ribs **32** which are adapted to be slid over a rail **33** of flat metal bar carried by a bracket **34** fixed to the vehicle chassis. The height of the channel provided by the ribs **32** is greater than the thickness of the rail so that in the freely suspended position of the device there will be a clearance between the bottom of the rail and the top of the load-engaging member. This enables a pair of dowels formed by the heads of bolts **35** by which the rail is secured to the bracket **34** to be aligned with openings **36** provided in the top wall of the member **30** and to enter said openings when the device is extended to contact the ground and raise the vehicle, thus preventing relative movement of the load-engaging member and rail in the lifting position of the device. The space between the ribs **32** is bridged at one end to provide an abutment **37** which limits inward movement of the member **30** along the rail by engaging the outer end of the bracket **34** and aligns the openings **36** with the bolt **35**. The rail **33** may be horizontal or, as shown, may be upwardly inclined towards its free end at about 5° to the horizontal, being preferably mounted so as to extend laterally from the chassis with said end about flush with the edge of the running board or the side of the vehicle body.

The provision of a pivoted load-engaging member **30** and a pivoted ground-engaging member **31** ensure that a firm bearing shall be effected both on the ground and on the vehicle irrespective of the camber or other inclination of the ground and of the angle of tilt of the vehicle during lifting. It is important, however, that during the operation of extending the jack to make contact with the ground the load axis, i. e., the plane through the upper and lower pivot rods **14**, **15**, shall be as near vertical as possible. This requires that the actuating screw **23** shall be horizontal or substantially so, but as this generally necessitates stooping on the part of the operator, there may often be a tendency to lift the outer end of the screw. To prevent such a contingency the jack, in accordance with a further feature of the invention, is provided with means which, once it has been fitted on the rail as above described, ensures that the load axis is correctly positioned and will not deviate therefrom during the lifting operation more than is required by the tilting of the vehicle. One such means will now be described with reference to Figures 1 and 2.

Journalled in the side arms of the load-engaging member is a bar **40** to which is attached one end of a resilient link generally designated by the numeral **41**, the other end of said link being pivotally connected at **42** to a bracket **43** welded to the pivot block **18**, said link tending to urge the load-engaging member **30** about the pivot rod **14** to a mean position. The bar **40** and bracket **43** are so located that the link **41** lies parallel to the adjacent link **10** of each toggle system within the compass of the two systems so as not to increase the overall size of the jack in its collapsed condition. As illustrated, the resilient or parallel link comprises two members arranged one within the other and capable of relative longitudinal movement, one of said members being in the form of a rod **44** having an end portion **45** of reduced diameter passing through a transverse aperture in the bar **40** and fixed thereto by a nut **46**, while the other member consists of a tube **47** surrounding the greater part of the rod **44** and welded at one end to an arm **48** pivoted on the bracket **43**. At its opposite end the rod **44** carries a washer **49** which is slidable thereon and is maintained on said rod by a nut **50**. The arm **48** has a recess **48***a* which receives the nut **50**. A compression spring **51** coiled about the rod **44** has one end bearing against the washer **49**, its other end engaging a second washer **52** which is also slidable on the rod. The washer **49** is pressed by the spring **51** against the end of the arm **48** and the washer **52** is similarly pressed by the spring against the flanged end **53** of a sleeve **54**, said sleeve being secured against withdrawal from the tube by a plug **55** threaded into said tube and serving to maintain the rod and tube in axial alignment.

In Figure 1 the position of the parts corresponds to the normal or non-lifting condition, the length of the link **41** and consequently the inclination of the load-engaging member being such that when said member is located in position on the rail **33**, the load axis through the pivot rods **14**, **15** will be substantially vertical assuming the vehicle to be on a more or less flat or at the most slightly cambered surface. Similarly the screw axis will then be substantially horizontal and the device will be maintained with said axes in substantially the same planes while the jack is being extended to engage the ground, when the foot **31** will pivot to rest accurately thereon. When, thereafter, the screw is further actuated to lift the vehicle, the inclination of the vehicle chassis will be communicated through the rail to the load-engaging member and the link **41** will become extended or contracted, either action being effected against the force of the spring. If, for example, the load-engaging member **30** tilts in relation to the rest of the jack so that the link **41** is extended, the rod **44** and tube **47** moving relatively outwardly, the rod **44** and washer **49** are drawn upwardly away from the arm **48**, thus further compressing the spring and so increasing the resistance provided against change in the direction of the load axis or the screw axis. If the load-engaging member should be tilted in relation to the rest of the jack in the opposite direction so that the link **41** is contracted, the rod **44**, washer **52** and sleeve **54** will be forced downwardly by the bar **40** which, as shown, normally abuts the outer end of said sleeve. The spring is thus further compressed to produce the same effect as in the previous case.

Figures 3 and 4 show another embodiment of jack according to the invention in which the mean angular

position of the load-engaging member is determined by a spring which normally couples said member to the two upper links **10, 11** of each toggle system. As illustrated, a pre-stressed semi-elliptic leaf spring **60** is interposed between the flat top portion of the load-engaging member **30** and a pair of rods **61, 62** which are carried transversely between the corresponding links **10, 10** and **11, 11** of the two toggle systems. The spring **60** is located relatively to the load-engaging member by a rivet **63** which passes freely through an opening **64** in the spring, the head **65** of said rivet serving as a dowel which is adapted to engage an opening provided in the suspension rail **33** so as to hold the jack against movement relatively to the rail when in its lifting position. Also engaged with the under side of the spring is a pair of rods **66, 67** carried between the side arms of the load-engaging member at either side of the pivotal axis **14** of said member, the purpose of which is to prevent equalization of the spring pressure on the rods **61, 62** when the load-engaging member is tilted from its mean position by relieving one rod from the force of the spring as the load on the other is increased. As will be seen, the pin **61** is somewhat higher than the pin **62**, whereby the load-engaging member in its mean position is inclined so that, when engaged with a similarly inclined rail as in Figures 1 and 2, the load axis of the jack will be substantially vertical.

In Figures 3 and 4 the jack is shown sufficiently extended to bring the rods **61, 62** away from the spring, but the spring will press on the pins in the collapsed condition of the jack and during its extension into contact with the ground.

While particular embodiments of the invention have been described, it is to be understood that these are by way of example only and that modifications may be introduced within the scope of the appended claims.

We claim:

1. A lifting device having upper links, the upper ends of which are connected pivotally on a first common axis on which a load engaging member is pivotally mounted, and having lower links the lower ends of which are connected pivotally on a second common axis on which there is a ground engaging member also pivotally mounted, operating means for moving the other ends of said upper and lower links to and from each other, resilient means comprising a link coupled to said load engaging member at a point offset from the pivotal axis of said member, a pivot block carried by said device and positioned adjacent said operating means and one of the other ends of one of said links, said resilient means having one end coupled to said pivot block and extending substantially parallel to that one of said links interconnecting said load engaging member and said block in at least one of its positions with respect to said load engaging member, said link being resiliently deformable along its axis under both compression and tension forces.

2. Device as claimed in claim 1, wherein the resilient link comprises a rod and a tube respectively pivotally connected to the load-engaging member and the said pivot block and arranged one within the other for relative axial movement in either direction, a coiled compression spring within said tube and surrounding the rod, means limiting extension of the spring in either direction, and a sleeve interposed between an abutment on the load-engaging member and the adjacent end of the spring, whereby the spring will be further compressed upon relative movement of the rod and tube in either axial direction.

3. A lifting device comprising an upper set of links and a lower set of links, said sets of links being pivoted together at their outer ends, pivot blocks mounted between the upper and lower sets of links at the points at which said sets of links are pivoted together, a load engaging member pivotally connected to said upper set of links, a ground engaging member connected to said lower set of links, a link connected between one pivot block and the load engaging member, said link being connected to said load engaging member at a point offset from the pivotal connection between said load engaging member and said upper set of links, said link being substantially non-deformable in directions transverse to the length thereof and offering a resilient restraint against deformation along its longitudinal axis.

4. A lifting device of the lazy-tongs type comprising a pair of pivotally connected upper links and a pair of pivotally connected lower links articulated to said upper links, operating means for moving the articulated ends of the links towards and away from each other, a load engaging member tiltably mounted in relation to said links on the pivotal axis of the upper pair of links, a ground engaging member freely tiltable in relation to said links on the pivotal axis of the lower pair of links, and means for resiliently restraining the load engaging member against tilting movement over at least part of the opening movement of the jack, pivot blocks connecting the articulated ends of the link acted upon by said operating means, said means for resiliently restraining the load-engaging member comprising a link substantially non-deformable in directions transverse to the length thereof and offering resilient restraint against deformations thereof along its longitudinal axis.

5. The combination set forth in claim 4, said link forming part of said means for resiliently restraining the load-engaging member comprising a rod and a tube respectively pivotally connected eccentrically to the load-engaging member and one of said pivot blocks and arranged one within the other for relative axial movement in either direction, a coiled compression spring within said tube and surrounding the rod, means limiting extension of the spring in either direction, an abutment on the load engaging member, a sleeve interposed between said abutment on the load engaging member and the adjacent end of the spring, whereby the spring will be compressed upon relative movement of the rod and tube in either axial direction.

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