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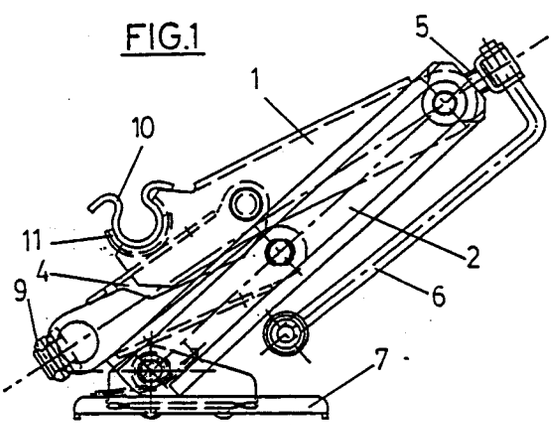
(54) Vehicle Lifting Jack.

(57) A vehicle lifting jack is provided with four mutually pivotably attached (1-4) arms disposed in a parallelogram form, with a spindle (5) extending along a diagonal of the parallelogram with one end passing through a nut pivotably attached to an apex of the parallelogram and with the other end passing through a cross member which is pivotably attached to the opposite apex of the parallelogram, one end of the spindle being terminated by a stop member which rotatably bears against said cross member, preferably through a bearing (9). Said spindle (5) is provided, at one of the two ends thereof, with a handle (6) which is preferably cranked or with temporary connection means for a handle (6) for being caused to rotate by the user. The lower rear arm (2) of the parallelogram extends from the rear apex thereof and is extended below said lower apex, forming a support leg for the jack, which is pivotably connected to a floor support foot (7). A stirrup for supporting and retaining the vehicle (10) is provided on a short front extension of the upper rear arm (1) of the parallelogram to which it is rotatably connected, to which end said stirrup (10) has a crossectional shape similiar to an inverted Greek letter omega with the ability to rotate relative to the end of the upper rear arm on which it is mounted on an axis transverse or nearly transverse to the center line of said arm (1) which is provided with linking means associating it with respective means provided at the stirrup (10) allowing the latter to rotate relative to said center line, but preventing it from moving in a transverse direction.

FIG.1



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The present invention relates to a vehicle lifting jack for raising and lowering a vehicle for changing a wheel of which the tire has become unusable.

Lifting jacks are known which are Y-shaped comprising a column with a foot for resting on the ground. To the column a lifting arm with a U-shaped stirrup or end support is hinged to support the lifted vehicle. For this purpose the vehicle is provided with corresponding flanges on the underside of the bodywork, which may partly come to rest in a channel of the stirrup. The column and the lifting arm of this type of lifting jack are associated with one another by way of a spindle screwed in a nut pivotably connected to the top of the column, while one end of the spindle is rotatably and pivotably connected to the end of the arm and the other end of the spindle has attached thereto a cranked handle, normally pivotably attached thereto, to operate the jack for lifting or lowering the vehicle. For this purpose the end of the spindle which is rotatably and pivotably connected to the end of the lifting arm is provided with a bearring. Obviously the relative position of the bearing and the nut which is disposed at the top end of the jack column could be reversed.

The base of the column of the known types of lifting jacks, which rests on the ground, moves or rocks relative thereto with the relative tilt of the column varying, since said base is fixedly attached to the column. The stability of the lifting jack is negatively effected, since the initial positioning of the jack to achieve a stable lifting motion and finally the positioning of the vehicle are critical.

There are also known leaf spring or articulated lifting jacks which are formed by arms hingedly connected together in a parallelogram form. The spindle is located on the substantially horizontal diagonal of this parallelogram with one end of the spindle being screwed to a nut which is attached to one of the apexes of the parallelogram and with the other end thereof rotatably attached to the opposite apex of the parallelogram. The spindle projects outwardly beyond one of said apexes for connection with the cranked handle. This type of lifting jack has one base member pivotably attached to the lower apex of the parallelogram to support the jack on the ground and another base member at the upper apex to support the underside of the vehicle bodywork.

In the initial lifting stage the cranked handle of this known lifting jack is located very close to the ground which makes handling difficult, both during the initial lifting and the final lowering phase of the vehicle, and may even cause injury of the hand of an user because of possible ground contact.

Likewise, with both known types of lifting jacks, the corresponding underside of the vehicle bodywork to be lifted is provided with one or more flanges which will be inserted in a groove or a channel of the liftable stirrup, support or base member of the jack, which is V-shaped in cross section. Nevertheless, this shape of the channel-shaped stirrup of the lifting jack does not - depending on the height to which the vehicle is lifted by the user and depending on the initial positioning of the jack relative to the vehicle body as selected by the user - prevent the lower flange of the vehicle body from coming to rest against the narrowest or closest part of the stirrup groove or channel. Therefore the flange of the vehicle may be deformed because of the relative rotation between this part of the vehicle and the stirrup by which it is supported, with a consequent damage to the flange itself and subsequent difficulties in lifting the vehicle on a future occasion with the same jack. Or worse, the flange may become useless or may even break.

A vehicle lifting jack according to the invention is a new type of a lifting jack with four mutually pivotably attached arms disposed in a parallelogram form, with a spindle located on a diagonal of said parallelogram, which is preferably horizontal or approximately horizontal when the jack is in the lifted position, with one end passing through a nut pivotably attached to an apex of the parallelogram and with the other end passing through a cross member which is pivotably attached to the opposite apex of the parallelogram, one end of the spindle being terminated by a stop member which rotatably bears against the cross member, preferably through a bearing; said spindle is provided, at one of the two ends thereof, with a handle, preferably a cranked handle, or with temporary connection means for such a handle for being caused to rotate by the user; the lower rear arm of the parallelogram, which extends from the rear apex thereof, is extended below said lower apex, forming a support leg for the jack, which is pivotably connected to a floor support foot; and a stirrup for supporting and retaining the vehicle is provided on a short front extension of the upper rear arm of the parallelogram to which it is relatively rotatably connected, said stirrup having a cross section similiar to a Greek letter omega which is inverted with respect to said front extension, is able to rotate relative to the end of the arm on which it is mounted on a preferably ideal axis transverse or nearly transverse to the center line of said arm which is provided with linking means associating it with respective means provided on the stirrup, allowing the latter to rotate relative to said center line, but preventing it from moving in a transverse direction.

According to the invention the linking means between the stirrup and the end of the upper rear arm of the parallelogram peferably consists of respective parallel peripheral channels which are open to opposite directions. These channels are

situated on the outer circular surface of the stirrup and form respective circular arcs. With these channels there are engaged respective inwardly folded flanges of the end of the upper rear arm of the parallelogram, which are disposed facing each other and forming respective circular arcs mating with the arcs of said peripheral channels.

By the vehicle lifting jack of the invention the problems mentioned in connection with the known types of lifting jacks are obviated and, among others, the following advantages are provided: greater stability; lower manufacturing cost for the same height; smaller volume occupied, making storage in any part of the vehicle easier; greater lifting height, for the same dimensions in the folded position of the jack; unfolding the jack to its maximum lifting height with less turns of the cranked handle, increasing user convenience; faster lifting and lowering of the vehicle to be lifted or lowered, saving time to the user; achieving a desirable separation or spacing apart of the lower flange of the vehicle bodywork from the groove or channel wall(s) of the stirrup of the jack throughout the whole vehicle lifting or lowering operation; automatic adaptation of the stirrup to the relative movement or rotation of the vehicles underfloor with respect to the ground, without the possibility of transferring harmful torques; and the possibility of making the stirrup as long as desired with respect to the axis of rotation, without limitations in view of the specific constitution of the relative linking means between the stirrup and the end of the upper rear arm of the parallelogram.

The vehicle lifting jack of the invention affords the advantages described above, apart from others which will be readily appreciated from an example of a preferred embodiment described in further detail hereinafter to facilitate the understanding of the features described, disclosing at the same time sundry details. Attached hereto are certain drawings of a preferred embodiment of such a lifting jack which is by no means a restricting example to the scope of the present invention.

Below a vehicle lifting jack according to the invention will be described by reference to the figures. Further advantages and features of the present invention will be disclosed. In the figures:

Figure 1 is a side elevational view of a lifting jack in its folded position with a cranked handle folded away; a jack spindle is shown schematically in phantom line;

Figure 2 is a side elevational view of the jack partly unfolded and engaging with the underside of a vehicle body of which the lower portion of a flange of the vehicle is illustrated in phantom line;

Figure 3 is a side elevational view of the jack in a raised position, corresponding in this case to the position of maximum height, with the vehicle lifted to a raised position, showing a portion of the spindle and a maximum lift stop member; and

Figure 4 is the sectional view A-A' of Figure 2 showing a detail of a pivoted connection of a stirrup to an end of a lifting arm of the jack.

According to the Figures, a vehicle lifting jack is provided with four arms 1, 2, 3 and 4, pivotably connected and forming a parallelogram. The lifting jack is provided with a spindle 5, schematically shown by a center line in Fig. 1 and 2, which is extended along a diagonal of said parallelogram. The angular position of this diagonal changes when the jack is operated as can easily be seen by comparing Figures 1, 2 and 3.

In this embodiment there is a cranked handle 6 connected inseparably and pivotably at a rear end of the spindle 5 and serving as a means by which the spindle 5 is rotated during a lifting or lowering action causing the jack to unfold or fold down, i.e. to lift or lower a stirrup 10 of the jack and the vehicle bodywork engaged therewith. Obviously the spindle 5 may be rotated by other means which may have a separable attachment located between the handle 6 which is suitably shaped and the rear end of the spindle 5 to facilitate easy storage in the vehicle when the jack is not used.

The lower rear arm 2 of said parallelogram has a lower extension 2a serving as support leg for the jack, spacing the parallelogram apart from the floor. Said extension 2a is pivotably connected to a foot 7. To restrict pivoting between the lower extension 2a and the foot 7, stop means may be provided consisting of additional members or members defined by the very shape of the lower edge of the lower extension 2a, as shown in Fig. 1, 2 and 3. Spring means may also be provided to retain the foot 7 in the position shown in Figure 1 when it is folded down. In this embodiment the spring means is a wire spring attached at one end to the lower extension 2a and supported at the other end on the foot 7, having one or more turns wounded around the pivot shaft between the lower extension 2a and the foot 7.

The four arms 1 to 4 of the lifting jack may be formed by U-shaped sections connected by respective pivot pins or, in another embodiment, they may be formed by pairs of parallel flat bars spaced apart by respective cores acting as pivot shafts of the arms to form a parallelogram. Suited Combinations of such sections may be used in one jack and furthermore the specific configuration of said arms could be any other, depending on manufacturing needs and under consideration of the stress to which they might be exposed.

The foot 7 is provided with two parallel wings, such as the wing 8, to the outside of which there

are, in this embodiment, pivotably connected two side members which constitute the lower rear arm 2 with its lower extension 2a. It should be appreciated that each of these two side members is formed by a C-shaped section, although it may obviously be formed, as already mentioned, by any other type or form of sections and even by a single appropriate section.

The front end of the spindle 5 is supported by support or stop means which may consist of a bearing 9 or any other suitable means which, likewise, holds said spindle end in position and facilitates the rotation thereof relative to the front apex of the parallelogram. Said spindle 5 is screwed in threaded or nut means pivotably attached to the rear apex of the parallelogram, i.e., at the upper portion of the lower rear arm 2. This means allows the spindle 5 to move relative to said rear apex of the parallelogram depending on the direction of rotation of the handle 6. The relative position of the bearing 9 or the like and the nut could be reversed, i.e. the latter could be disposed at the front apex of the parallelogram and the bearing 9 at the rear apex thereof.

An upper rear arm 1 of the parallelogram has a short upper extension on which there is disposed the stirrup 10, which is rotatably attached to this arm 1. The stirrup 10 exhibits a cross section similiar to the Greek capital letter omega laying upside down or nearly upside down with respect to the underside of a vehicle bodywork which has to be lifted or lowered. Therefore the stirrup 10 is assembled such that it is able to rotate relative to the end of the upper extension of the upper rear arm 1. The axis of rotation extends in parallel to an ideal or nearly ideal transverse axis perpendicular or almost perpendicular to the longitudinal axis of the upper rear arm 1.

The end of the upper rear arm 1 is provided with linking means by which it is associated or attached to respective means of the stirrup 10, to allow the latter to rotate around said transverse axis, but to prevent it from moving in a transverse direction. Said linking means between the stirrup 10 and the end of the upper rear arm 1 consist of respective mutually parallel and opppositely facing peripheral channels, such as the channel 11, which are located on the outer circular surface of the stirrup 10, forming respective circular arcs. As shown in Fig. 4 said channels 11 may be defined by a formed flat bar 12 firmly attached, for example by welding, to the circumference of the stirrup 10, most preferably at its central portion. The bar 12 is provided with respective deviations at the parallel end edges thereof which form the channels 11. The bar 12 could be replaced by two narrower, also formed bars 12 and, likewise, said channels 11 could be formed in the stirrup 10 itself by cutting and/or swaging.

Respective inwardly bent flanges 13 provided at the end of the upper rear arm 1 of the parallelogram are engaged with the channels 11 by insertion. Said flanges 13 are disposed facing each other and also forming circular arcs mating with the arcs of the channels 11 of the formed flat bar 12.

In the stirrup 10 there will be freely housed a lower flange 14 provided at the corresponding underside of the vehicle bodywork (shown in part in phantom lines in Figures 2 and 3) which is reinforced in this region to withstand the mechanical stress derived from the force of the stirrup 10 to lift the vehicle. Between the initial lifting position of the vehicle and its final or maximum height position above the ground, the stirrup 10 rotates relative to the end of the upper rear arm 1 in a counterclockwise direction as can be seen at Fig. 2 and 3. The flange 14 of the vehicle is loosely housed in the stirrup 10. Damage to the flange 14 of the vehicle is prevented and save support of the flange 14 in the stirrup 10 is maintained. Because of the design and the attachment of the stirrup 10 balance of the lifting jack is maintained throughout the complete lifting or lowering operation and, of course, in the final vehicle lifting position during exchange of a faulty wheel.

The spindle 5 may be provided with a stop means such as a bushing 15 to limit the maximum height position of the lifting jack and, at the same time, facilitating easy handling by eliminating possible dead points or points close thereto in the parallelogram mechanism.

Finally, the foot 7 may also be provided with resilient blocks to improve its adherence to the floor or with lower projections in order to enhance its gripping characteristics.

It is easy to gather how the jack may be used, even for an unskilled person. In view of the drawings and the description other or additional features and advantages of the invention will become apparent.

It should be pointed out that in the embodiment of the vehicle lifting jack of the invention, all variations of detail that experience and practice may recommend with regard to forms and dimensions, both absolute and relative, number of component pieces and parts, materials used therein and other accessory details may be applied and also that as many modifications of constructive detail as being compatible with the essence of the claimed matter may be introduced, all is still comprised within the object of the claims.

Claims

1. A vehicle lifting jack is provided with four mutually pivotably attached arms (1 to 4) dis-

posed in a parallelogram form, with a spindle (5) extending along a diagonal of the parallelogram with one end passing through a nut pivotably attached to an apex of the parallelogram and with the other end passing through a cross member which is pivotably attached to the opposite apex of the parallelogram, one end of the spindle (5) being terminated by a stop member which rotatably bears against said cross member, preferably through a bearing (9);

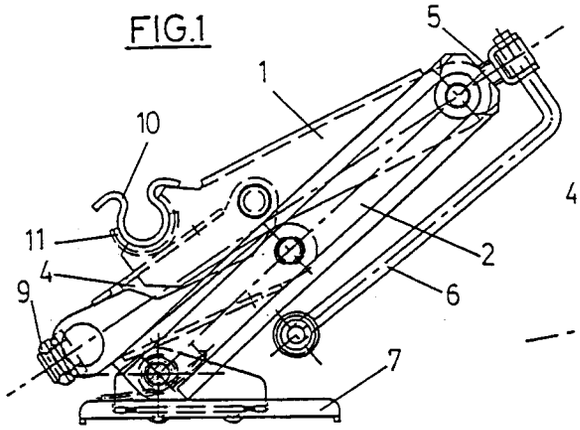
said spindle (5) is provided, at one of the two ends thereof, with a handle (6), preferably a cranked handle (6), or temporary connection means for a handle (6) for being caused to rotate by the user;

the lower rear arm (2) of the parallelogram extends from the rear apex thereof and is extended below said lower apex, forming a support leg (2a) for the jack, which is pivotably connected to a floor support foot (7); and

a stirrup (10) for supporting and retaining the vehicle is provided on a short front extension of the upper rear arm (1) of the parallelogram to which it is rotatably connected, to which end said stirrup (10) has a crossectional shape similiar to an inverted Greek letter omega with the ability to rotate relative to the end of the upper rear arm (1) on which it is mounted on an axis transverse or nearly transverse to the center line of said arm (1) which is provided with linking means (13) associating it with respective means (12) provided at the stirrup (10) allowing the latter to rotate relative to said center line, but preventing it from moving in a transverse direction.

2. Vehicle lifting jack according to claim 1, wherein the linking means (12) of the stirrup (10) preferably consist of respective parallel peripheral channels (11), open in opposite directions, situated on the outer circular surface of the stirrup (10) and forming respective circular arcs, in which channels (11) there are engaged respective inwardly folded flanges (13) of the end of the upper rear arm (1) of the parallelogram and which are disposed facing each other, also forming respective circular arcs mating with the arcs of the peripheral channels (11).

FIG.1



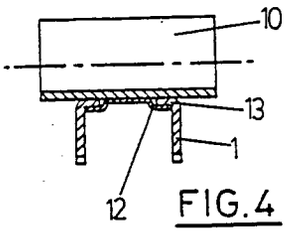


FIG.4

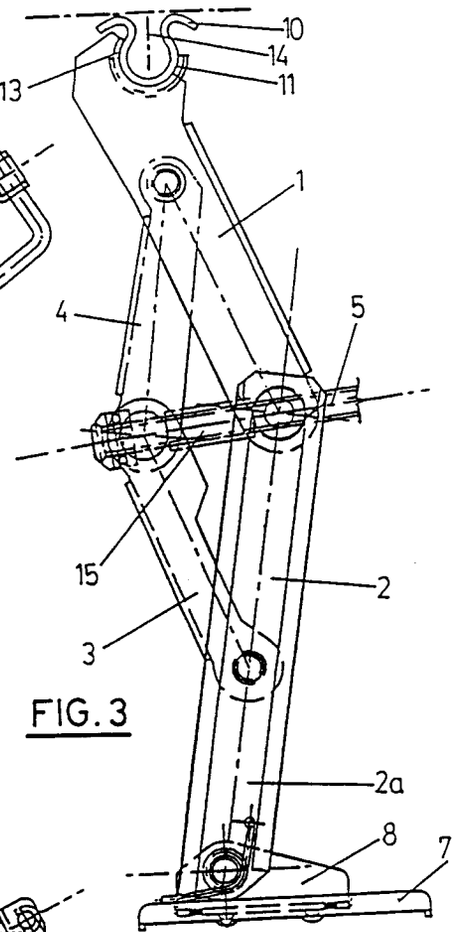


FIG.3

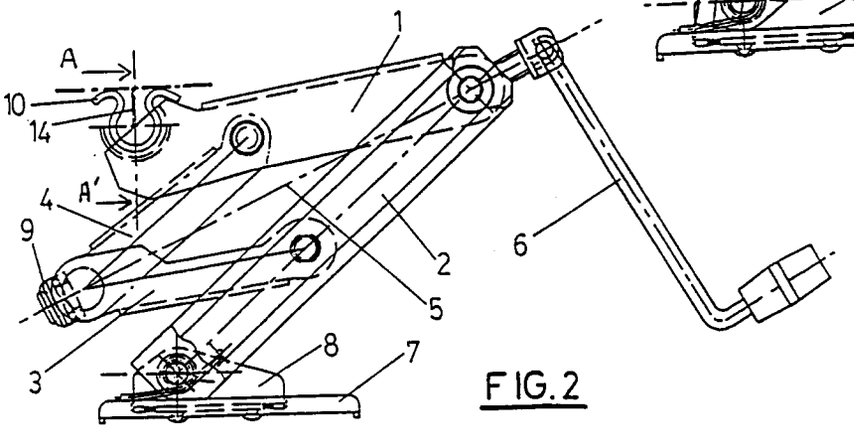


FIG.2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 10 2264

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X Y	DE-U-8 901 680 (AUGUST BILSTEIN) * the whole document * ---	1 2	B66F3/12
Y A	DE-A-2 936 002 (E.A.STORZ) * claims 1,3-12; figures 5-8 * * page 4, line 1 - line 9 * * page 5, line 16 - page 6, line 8 * * page 7, line 24 - page 8, line 30 * * page 12, line 33 - page 14, line 28 * -----	2 1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B66F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 MAY 1992	WESTLAND P.G.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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