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(71) Applicant: **Proma S.r.l.**
**81020 San Nicola la Strada (Caserta) (IT)**

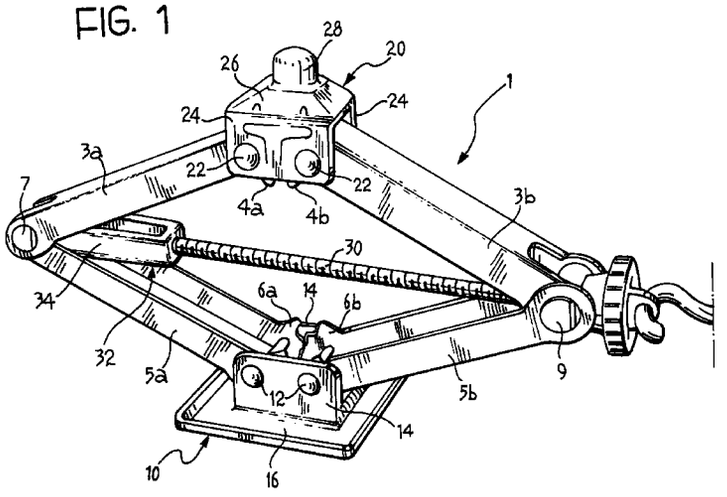
(72) Inventor: **Pino, Nicola Giorgio**
**81020 San Nicola la Strada, Caserta (IT)**

(74) Representative: **Marchitelli, Mauro et al**
**c/o JACOBACCI & PERANI S.p.A.**
**Corso Regio Parco, 27**
**10152 Torino (IT)**

## (54) A screw and pantograph lifting jack, particularly for a motor vehicle

(57) A screw and pantograph lifting jack, particularly for a motor vehicle, comprises a base support (10) and a movable support (20) which are connected by the arms (3a, 3b, 5a, 5b) of the jack (1). The supports (10, 20) have pairs of flanges (14, 24) for the articulated connection of the arms (3a, 3b, 5a, 5b). The movable support (20) has a projection (28) for engaging a seat provided in the body of the motor vehicle. A restraining member (32) articulated at the articulation between two arms (3a, 5a) carries a nut screw (31) which can be engaged by the screw (30) of the jack (1). The restraining member (32) preferably includes an elongate box-like element (34) which is fixed for rotation with the nut screw (31) and is engaged by a pin (7) which is separate from the box-like element (34) and from the nut screw (31) and defines the articulation between two arms (3a, 5a), the base support (10) being produced integrally with the respective flanges (14) and the movable support (20) being produced integrally with the projection (28) and the respective flanges (24).

FIG. 1

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## Description

The present invention relates to a screw and pantograph lifting jack, particularly for a motor vehicle, comprising four arms arranged so as to form a quadrilateral, and mutual connection means between adjacent arms at each vertex of the quadrilateral, the mutual connection means comprising, for each vertex, at least one articulation pin perpendicular to the plane of the quadrilateral and an element for transmitting force to the arms of the jack, the force-transmission element including at least one longitudinal element substantially parallel to the plane of the quadrilateral and connected to the at least one pin.

In lifting jacks of the known type specified above, the force-transmission elements connected to the articulations between respective pairs of arms of the jack, such as the base support of the jack, the support which is movable relative to the base support and which has, for example, a projection for engaging a corresponding seat provided under the body of the vehicle, and the restraining member which carries a nut screw for engagement by the screw of the jack, are normally formed by the rigid interconnection of several parts. More specifically, the base support comprises a transverse plate for bearing on the ground, welded to a U-shaped element which defines a pair of longitudinal flanges, and the movable support is constituted by another U-shaped element also defining a respective pair of longitudinal flanges and having a hole in the transverse portion connecting the flanges for the insertion of a cylindrical projection which is then locked in its seat by an upsetting operation. The restraining member comprises a longitudinal tubular element which has an internal thread and is butt-welded to a diametral hole in a pin of the articulation between two arms of the jack, the screw of the jack being intended to extend through both the tubular element and the hole in the pin.

The production of elements constituted by several parts fixed together is generally quite onerous since it necessitates operations to interconnect the parts and accurate checks after the connections have been made to check their mechanical strength. Naturally, these operations contribute to the length of the manufacturing times and consequently cause an increase in overall production costs.

The object of the invention is to simplify the production of a lifting jack of the type mentioned above, enabling it to be produced more quickly and cheaply.

According to the invention, this object is achieved by a jack of the type indicated above, characterized in that at least one of the force-transmission elements is constituted by a single part which includes a pair of flanges formed integrally with a transverse member connecting the flanges.

By virtue of this characteristic, the jack according to the invention can be manufactured in shorter times than jacks known up to now, advantageously reducing production costs, and is also simpler, more reliable and lighter in weight.

Further characteristics and advantages of the present invention will become clearer from the following detailed description given with reference to the appended drawings, provided purely by way of non-limiting example, in which:

Figure 1 is a perspective view of a screw and pantograph jack according to the invention,

Figures 2 and 3 are sectioned elevational views of details indicated by the arrows II and III in Figure 1, respectively, and

Figure 4 is an exploded and partially-sectioned perspective view of a detail indicated by the arrow IV in Figure 1.

With reference to the drawings, a screw and pantograph lifting jack according to the invention, particularly for a motor vehicle, is generally indicated 1.

The jack 1 comprises, in known manner, four arms 3a, 3b, 5a, 5b of almost equal length, of which two, the arms 3a and 5a, are articulated to one another by a transverse pin 7 and the other two, the arms 3b and 5b, are articulated to one another by another transverse pin 9 parallel to the pin 7.

Moreover, the arms 5a and 5b are mounted for pivoting on a base support 10 of the jack 1 and, similarly, the arms 3a and 3b are mounted for pivoting relative to a support 20 which is generally movable relative to the base support 10.

In particular, the ends of the arms 5a and 5b opposite to the respective pins 7 and 9 are pivotable about pins 12 each of which extends through a pair of aligned holes 12a formed in parallel flanges 14 of the base support 10. Similarly, the ends of the arms 3a and 3b opposite to the pins 7 and 9 are pivotable about pins 22 each of which extends through a pair of holes 22a formed in parallel flanges 24 of the movable support 20.

Close to the movable support 20 and to the base support 10, respectively, each arm of the two pairs of arms 3a, 3b and 5a, 5b has, in known manner, corresponding external teeth 4a, 4b, 6a, 6b, which are meshed with one another so that the arms 3a, 3b and 5a, 5b can perform solely equal angular oscillations relative to the respective supports 10 and 20.

The base support 10 comprises a substantially flat plate 16 for bearing on the ground with an upturned peripheral edge and a substantially central hole 16a. The parallel flanges 14 extend integrally with the plate 16 from opposed portions of the edge of the hole 16a, so as to be perpendicular to the plate 16.

In order to produce the base support 10 in one piece, a substantially rectangular sheet-metal element is preferably provided and is subjected to a punching operation to define the hole 16a and the flanges 14 and to a bending operation which can be carried out simultaneously with the punching operation and in the course

of which the flanges 14 adopt their final positions relative to the plate 16 and the upturned edge of the plate 16 is formed.

The movable support 20 is shaped substantially like an inverted "U" and includes the flanges 24 which extend from opposed edges of a transverse support plate 26. A counter element, for example, a generally cylindrical projection 28, projects perpendicularly from the plate 26 in the opposite direction to the flanges 24 for engaging a seat of corresponding shape provided under the body of the motor vehicle. Both the projection 28 and the flanges 24 are integral with the plate 26.

In order to produce the movable support 20 in one piece, a substantially rectangular sheet-metal element is preferably provided and is subjected to a bending operation to bring the flanges 24 to the final position relative to the plate 26 and to a drawing operation which can be carried out simultaneously with the flange-bending operation to form the projection 28 by plastic deformation of the sheet metal in the central region of the plate 26.

A screw 30 for controlling the raising of the jack 1 extends between the transverse pins 7 and 9 and is mounted for rotating freely in a radial through-hole in the pin 9. The screw 30 engages a nut screw 31 carried by a restraining member 32 articulated on the pin 7 and projecting inwardly relative to the jack, towards the pin 9.

The restraining member 32 includes an elongate box-like element 34 which is substantially U-shaped so as to have a pair of parallel longitudinal arms or flanges 36 and an intermediate transverse portion 38 connecting the arms 36. The free ends of the longitudinal arms 36 opposite the transverse portion 38, have respective holes 40 for housing the ends of the transverse pin 7. Preferably, each hole 40 is delimited by a circular edge having a flat portion 40a and the pin 7 has a cross-section of corresponding shape, particularly with a longitudinal flat 7b so that, when its ends are housed in the holes 40 it is prevented from rotating relative to the box-like element 34. The pin 7 is thus coupled to the box-like element 34 whilst being separate therefrom so that, in contrast with the prior art, it is not necessary to form a fixed connection between the nut screw or the element which supports it and the pin 7.

The transverse portion 38 has a central through-hole 38a aligned with a radial hole 7a formed in the pin 7, like that in the pin 9, the screw 30 being intended to extend through the hole 38a and the hole 7a. Close to the portion 38, the box-like element 34 supports the nut screw 31 which is separate from the box-like element 34 but is prevented from rotating relative thereto. For this purpose, the nut screw 31 is produced by the formation of a threaded hole in a substantially parallelepipedal block 33 complementary with a seat defined by the opposed faces of the arms 36 and by peripheral edges thereof. Axial sliding of the block 33a relative to the element 34 is prevented by tabs 42 which extend integrally from the longitudinal arms 36 of the box-like element 34 and are preferably constituted by portions of the peripheral edges of the arms 36 which are bent towards the interior of the element 34 so as to form axial shoulders for the block 33 on the opposite side to the transverse portion 38.

The box-like element 34 is preferably also produced in one piece by the shaping of a substantially rectangular sheet-metal element as a result of punching and/or bending operations carried out to form the arms 36 and the portion 38, each having turned-over peripheral edges for stiffening purposes and for restraining the nut screws 31, and to form the respective holes 40, as well as to bend the tabs 42 locking the female threaded member 31 in position axially.

## Claims

1. A screw and pantograph lifting jack, particularly for a motor vehicle, comprising four arms (3a, 3b, 5a, 5b) arranged so as to form a quadrilateral and mutual connection means between adjacent arms (3a, 3b, 5a, 5b) at each vertex of the quadrilateral, the mutual connection means comprising, for each vertex, at least one articulation pin (7, 9, 12, 22) perpendicular to the plane of the quadrilateral and an element (10, 20, 32) for transmitting force to the arms (3a, 3b, 5a, 5b) of the jack (1), the force-transmission element including at least one longitudinal element (14, 24, 36) substantially parallel to the plane of the quadrilateral and connected to the at least one pin (7, 9, 12, 22),
characterized in that at least one of the force-transmission elements (10, 20, 32) is constituted by a single part which includes a pair of flanges (14, 24, 36) formed integrally with a transverse member (16, 26, 38) connecting the flanges (14, 24, 36).

2. A jack according to Claim 1, characterized in that the jack (1) comprises a base support (10) having two flanges (14) connected by means of a pair of pins (12) to a pair of arms (3a, 3b) of the jack (1), the base support (10) including a plate (16) formed integrally with the respective flanges (14).

3. A jack according to Claim 1 or Claim 2, characterized in that the jack (1) comprises a support (20) which is movable relative to the base support (10), the movable support (20) having two flanges (24) connected to a pair of arms (5a, 5b) of the jack (1) by means of a pair of pins (22), and a counter element (28) for engaging a corresponding seat provided under the body of the motor vehicle, in which the counter element (28) is formed integrally with the flanges (24) of the movable support (20).

4. A jack according to any one of Claims 1 to 3, characterized in that the jack (1) comprises a restraining member (32) articulated at the articulation between two arms (3a, 5a) of the jack (1) and supporting a

nut screw (31) for engagement by the screw (30) of the jack (1), in which the restraining member (32) includes an elongate box-like member (34) which is fixed for rotation with the nut screw (31) and is engaged by a transverse pin (7) which defines the articulation between the two arms (3a, 5a) and is separate both from the box-like element (34) and from the nut screw (31), the elongate box-like element (34) comprising a pair of arms (36) and a transverse element (38) formed integrally with one another.

**5.** A jack according to any one of Claims 2 to 4, characterized in that the box-like element (34) and/or the base support (10) and/or the movable support (20) are produced by the shaping of respective sheet-metal elements by bending and punching and/or drawing operations.

**6.** A jack according to Claim 4 or Claim 5, characterized in that the elongate box-like element (34) is substantially U-shaped and defines a pair of arms (36) which, opposite the respective transverse element (38), have free ends close to which respective holes (40) are formed for engagement by the transverse pin (7), means (40a, 7b) being provided for preventing rotation of the transverse pin (7) in the holes (40), the transverse element (38) and the transverse pin (7) also having corresponding through holes (7a, 38a) for housing the screw (30) of the jack (1).

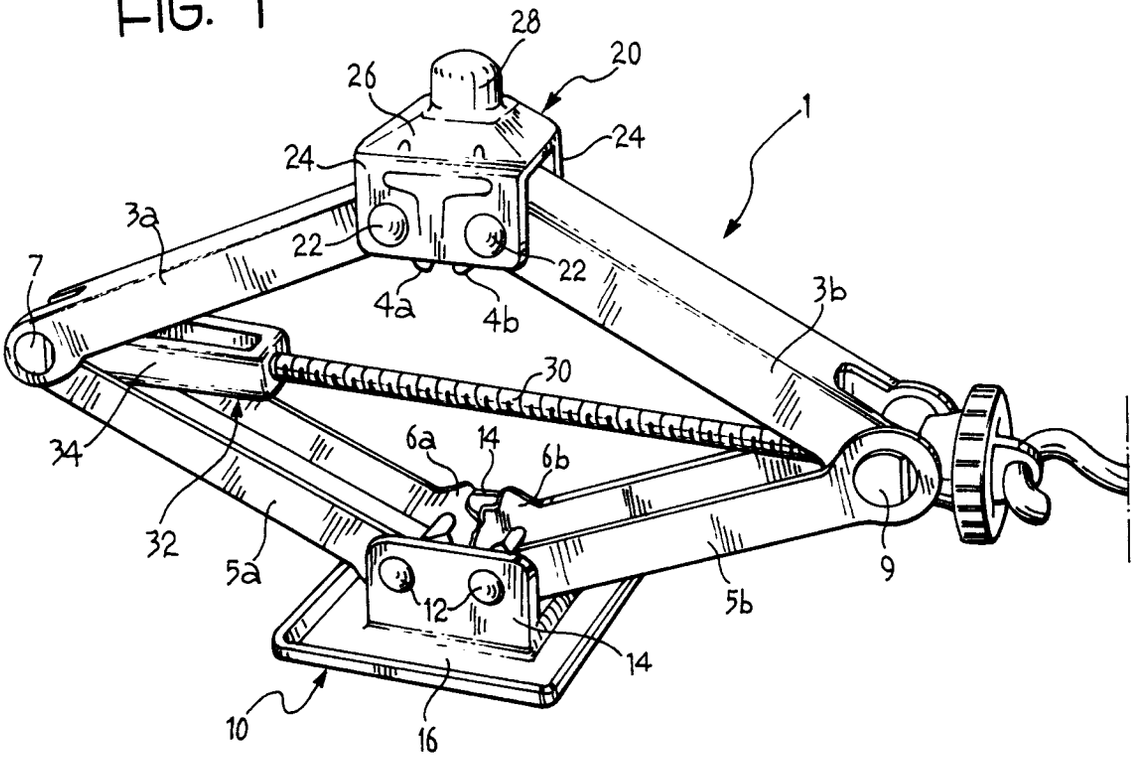
**7.** A jack according to Claim 6, characterized in that the nut screw (31) is separate from the box-like element (34) which comprises means (36, 42) for locking the nut screw (31) relative thereto.

**8.** A jack according to Claim 7, characterized in that the means for locking the nut screw (31) include means for locking it axially relative to the box-like element (34), constituted by at least one bent tab (42) which extends integrally from one arm (36) of the box-like element (34).

**9.** A jack according to any one of Claims 2 to 5, characterized in that the base support (10) comprises a plate for bearing on the ground (16), provided with a substantially central hole (16a), the flanges (14) of the base support (10) extending from opposed portions of the edge of the hole (16a) so as to be parallel to one another and perpendicular to the plate for bearing on the ground (16).

**10.** A jack according to any one of Claims 2 to 5, characterized in that the movable support (20) comprises a support plate (26) from which the projection (28) projects perpendicularly, the flanges (24) of the movable support (20) extending from two opposed edges of the support plate (26) in the opposite direction to the projection (28) so as to be parallel to one another and perpendicular to the support plate (26).

FIG. 1


28
20
26
1
24
24
3a
22
22
7
4a
4b
3b
30
6a
14
6b
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32
5a
9
12
5b
14
10
16

FIG. 2

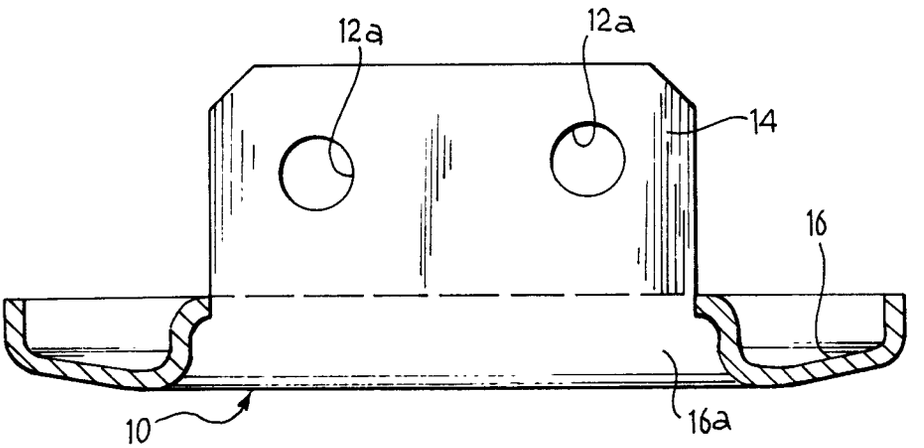
12a
12a
14
16
10
16a

FIG. 3

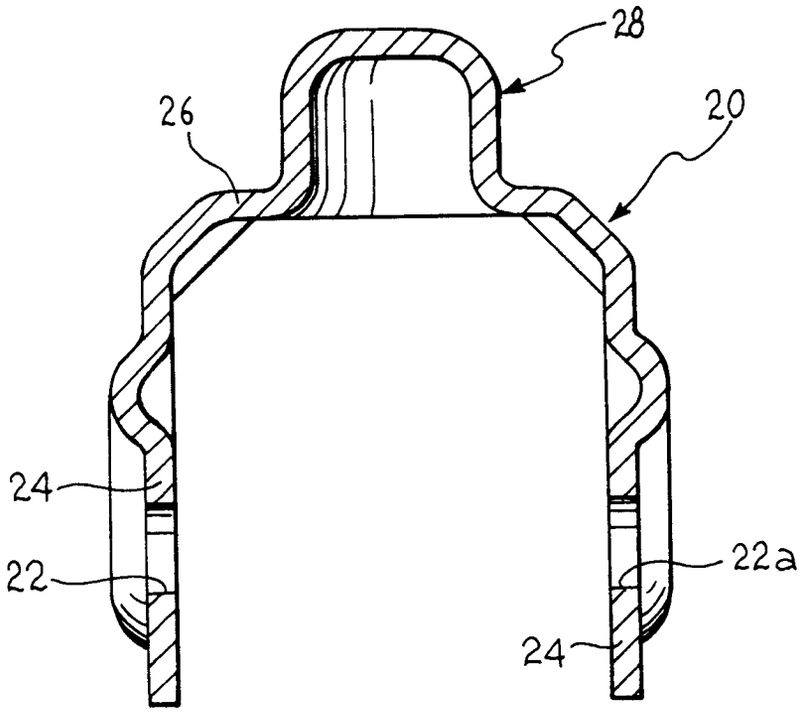


FIG. 4