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(54) **Lifting jack**

(57) A lifting jack for vehicle bodies, interchangeable platform bodies, containers or the like, comprising a rectangular baseplate 11, a guide device 57, 61 disposed above the baseplate, a lifting ram 47 adapted to be moved up and down through the guide device, and a power device 41 acting on the lifting ram, which comprises the following features: a) a cage 22 adapted to be loaded both in tension and in compression is rigidly fastened on the baseplate, the latter forming the bottom of the cage; b) the upper face rigidly carries a coaxial guide tube 57 which projects some distance downwards into the cage; c) the guide tube forms the guide device for the coaxial lifting ram; d) between the baseplate and a mounting plate 44 rigidly fastened to the bottom end of the ram is situated an air bellows 41 which has an air inlet and an air outlet; and e) horizontal socket bores 52 extend through the lifting ram, through which bores securing socket pins are adaped to be passed.

FIG. 3

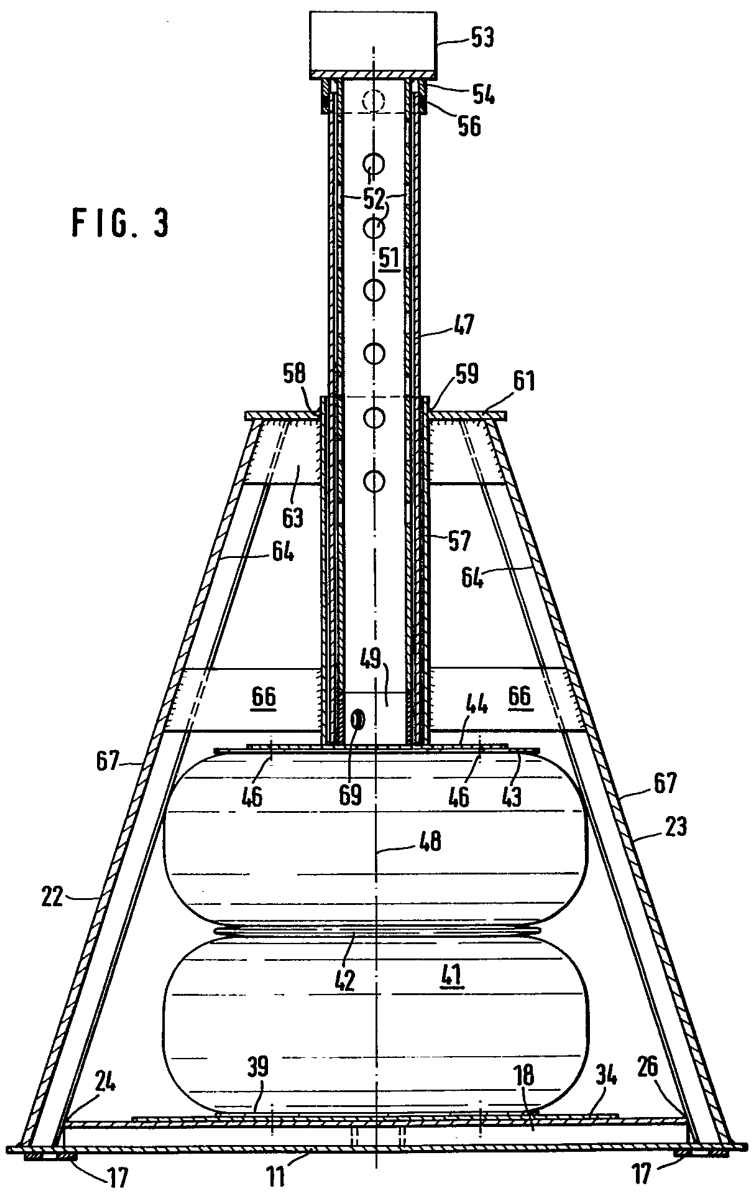

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FIG. 1

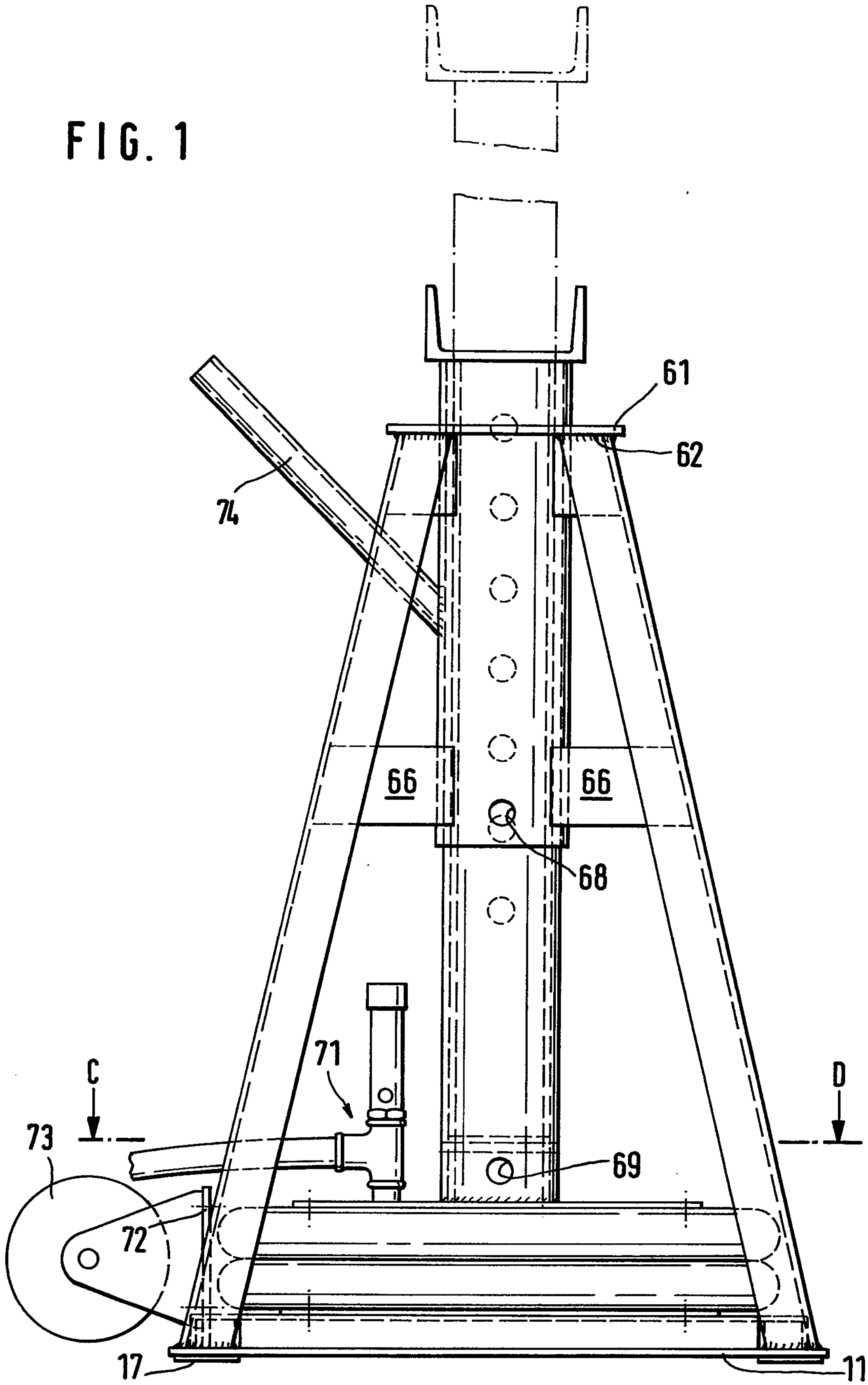

FIG. 2

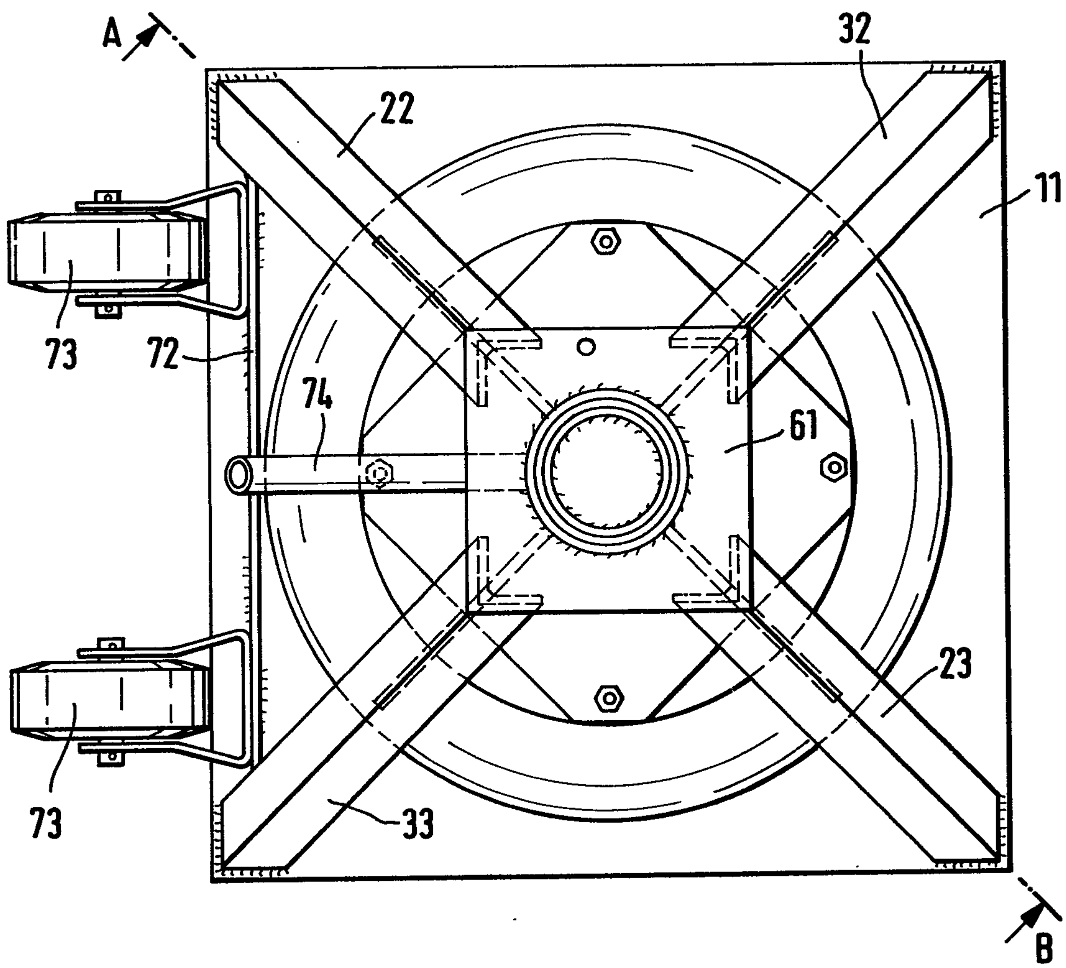

FIG. 3

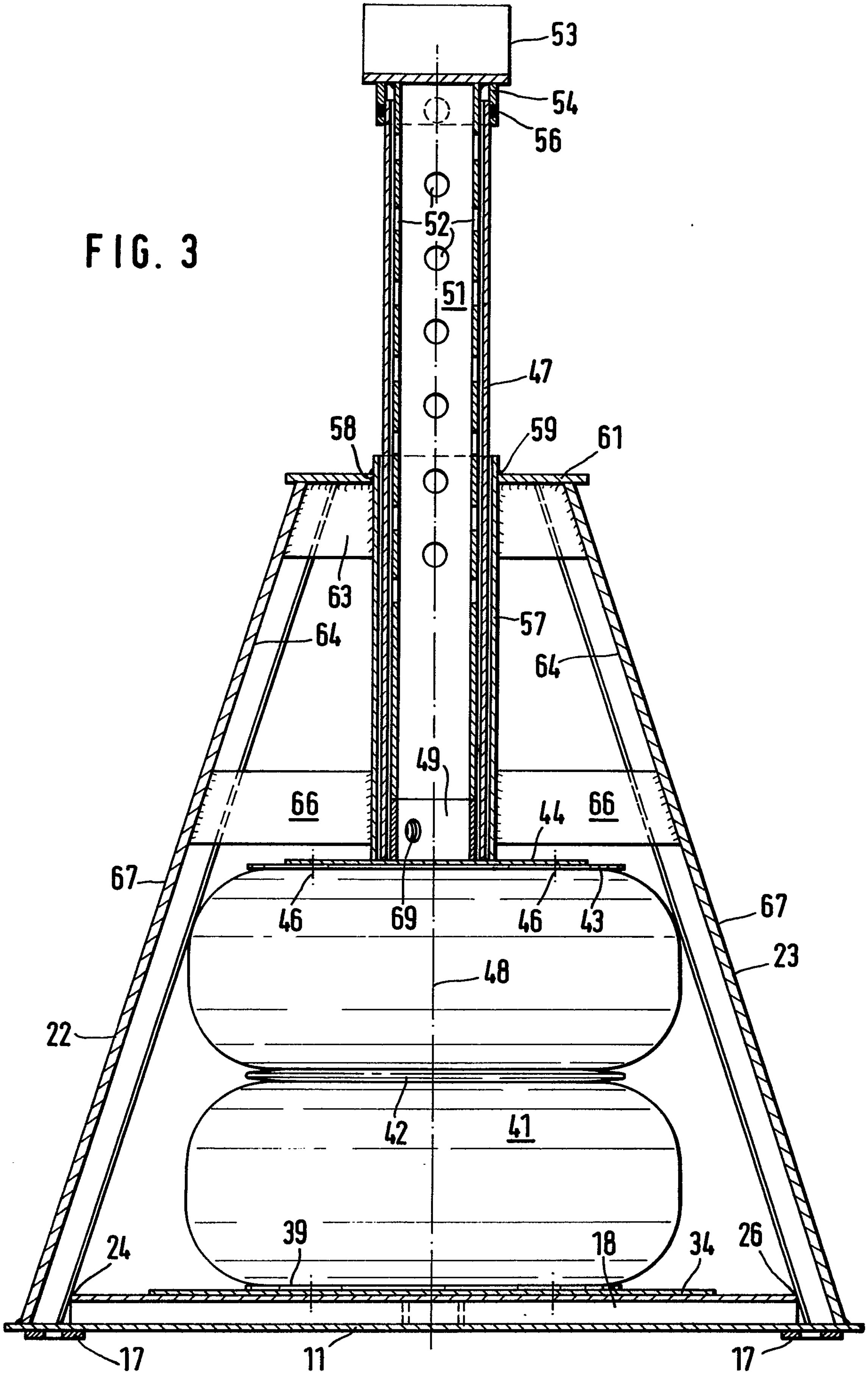
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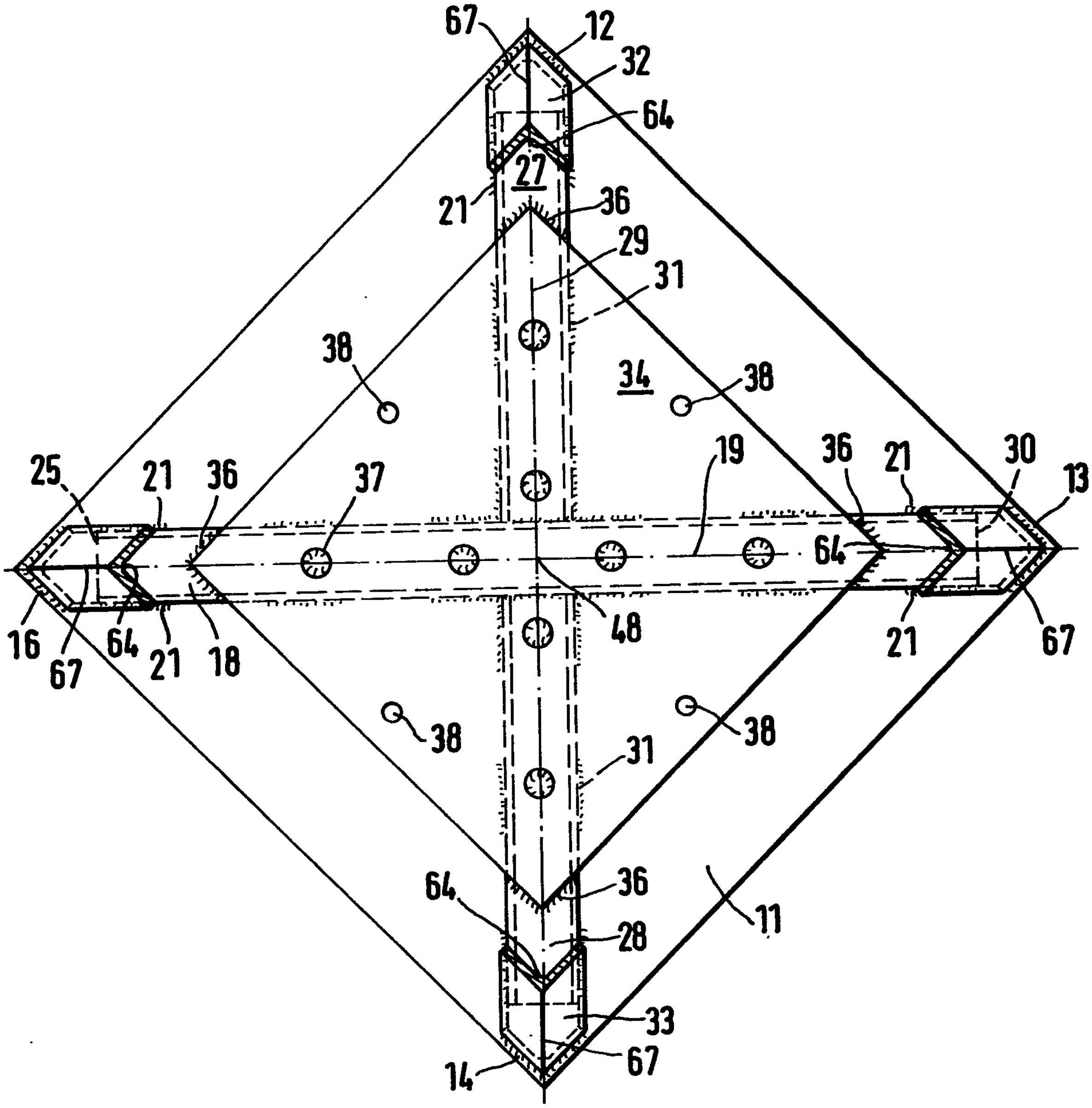
FIG. 4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SPECIFICATION

Lifting jack

The invention relates to a lifting jack in accordance with the preamble of the main claim.

Jacks of this kind are expensive. With manual drive they cost about 2,000 to 3,000 DM. If they have an electric drive, they cost about twice as much. Typically, an electrically operated jack weighs for example 150 kg and therefore, despite its rollers, is difficult to handle. A manually operated jack with a lifting power of 3,000 kg weighs for example 78 kg. Its height is about 1 metre. In known jacks the load is not applied centrally. This means that in known jacks the baseplates must be large in order to achieve safety against overturning. This in turn means that in certain cases vehicle wheels run over the positioned baseplates. The lifting jacks are shaken thereby and the baseplate must be constructed as a drive-up ramp. In known jacks the guide device and the lifting ram are subjected to buckling stresses. This detrimental type of stressing has to be counteracted in the design by increased weight.

The object of the invention is that of providing a mechanically liftable lifting jack which is light but nevertheless has a high carrying capacity, permits one-man operation even when a plurality of lifting jacks are being used, can be operated with the power sources already available in heavy motor vehicles, and has a simple and at the same time light and maintenance free construction.

According to the invention this object is achieved by the features shown in the characterising part of the main claim.

It is immediately possible accordingly to produce a jack with a dead weight of about 60 kg and with a lifting power of 4 tonnes. The air bellows used may be of the type used as standard equipment in vehicle suspensions. Buckling of the air bellows is not a danger, since they are held by the lifting ram, and are guided on the guide tube, while the load acts centrally. An air bellows of this kind with a diameter of about 42 mm and with an internal pressure of 7.2 bar has a carrying capacity of 4,000 kg, which is amply sufficient for interchangeable platform bodies, vehicle bodies, container or the like.

The features of claim 2 provide a cage which is heavily loadable in tension or in compression and nevertheless can be constructed with a saving of material. Both the guide in the form of the guide tube and the air bellows in their inflated state can easily be accommodated in it, despite the low overall height of the lifting jack. The section bars thus surround the air bellows like a protective cage, but without entailing an increase in the size of the baseplate.

Through the features of claim 3 a minimum enclosed space is achieved, in which however there is room for the operation of the air bellows.

Through the features of claim 4 the protective action is further increased and better inside and outside definition is achieved in the edge region. Moreover, the section bars, which preferably consist of right angle V-sections, best suit the truncated pyramid shape. In addition, the forces occurring are most effectively taken by them.

Through the features of claim 5 the cage is further stiffened and the guide tube held so that it cannot yield at all when the air bellows are completely inflated and apply a thrust.

The features of claim 6 ensure that tensile and compressive forces are taken in optimum manner while the construction nevertheless remains light and there is also free access to socket pins.

The features of claim 7 enable the side struts to be cut to size in the simplest manner and without wastage of material.

Through the features of claim 8 the forces can be effectively transmitted from the section bars and the guide tube to the relatively small abutment plate.

Because of the features of claim 9 it is immaterial which way round the lifting jack is set up, and there is no preferential direction for its use.

Through the features of claim 10 the effective lifting height can be further increased by intermediate steps.

Through the features of claim 11 it is ensured that no constraining torsional forces are applied to the air bellows, as would for example be the case with a rectangular lifting tube and a rectangular guide tube.

The invention will now be explained with reference to one exemplary embodiment shown to scale in the drawings, in which:

Figure 1 is a side view of the lifting jack and at the same time shows the partly extended extenssion tube, shown broken away,

Figure 2 is a plan view corresponding to Figure 1

Figure 3 is a section on the line A - B in Figure 2, and

Figure 4 is a section on the line C - D in Figure 1.

A baseplate 11 of sheet steel has the dimensions 500 × 500 × 5 mm. Under its corner regions 12, 13, 14, 16 are situated four shims 17. Any unevenness in the baseplate 11, which may be caused by welding work, is thereby compensated. A channel section 18 is welded by weld seams 21, with its flanges downwards, symmetrically to the diagonal plane 19 which is at right angles to the plane of the drawing in Figure 4. Its end faces 22, 23, cut off at right angles, do not however extend into the corners corresponding to the corner regions 13, 16. On the contrary, they end before reaching those corners, so that, as shown in Figure 3, they abut against V-sections 22, 23, which will be described later on, and are then fastened there by welds 24, 26. Two channel sections 27, 28 are likewise fastened, symmetrically to the other diagonal plane 29 and with their flanges pointing downwards, by welds 31 to the upper face of the baseplate 11, and are also butt-welded to the channel section 18 and at their outer end faces are welded, similarly to the channel section 18, to V-sections 32, 33.

A plate 34 having the dimensions 330 × 330 × 4mm, and consisting of steel sheet, is disposed in such a manner that the diagonal planes 19, 29 extend through its corners. Parallel to the baseplate 11, the plate 34 is welded on the channel sections 18, 27, 28 in its outer corner regions, by welds 36 on the outer side of these sections. In the plate 34 four holes

37 are provided, equidistantly spaced apart, in each of the diagonal planes 19, 29, the edges of these holes being welded to the channel sections 18, 27, 28 lying beneath them. The plate 34 thus remains flat and can also take heavy loads and effectively transmit forces received by it.

In addition, in conjunction with the baseplate 11 it forms a sandwich construction.

Through holes 38 are provided, near the edge of the plate 34, in the bisectors of the diagonal planes 19, 29. Through them can be pushed screwbolts (not shown) which project outwards from a standard bottom mounting plate 39 of a spring bellows 41. Since the channel sections 18, 27, 28 have a height of 25 mm, nuts are presented by hand from below and can, together with any lock washers required, be screwed from below onto the screwbolts. As shown in Figure 3, the spring bellows 41 comprises two chambers with an intermediate ring 42. In the inflated state its operating height is 350 mm. In the compressed state its height is 75 mm. At the top the standard spring bellows 41 has a standard mounting plate 43, whose four upwardly projecting screwbolts (not shown) pass through holes in a counter-plate 44 having the dimensions 250 × 250 × 6 mm. These holes, screwbolts and nuts are indicated by the dashed line 46. A sleeve 49 is welded centrally on the counter-plate 44, this sleeve fitting into the lifting ram 47, to which it is pinned. The air bellows 41 is thereby secured against tilting.

The lifting ram 47 consists of a steel tube of the dimensions 88.9 × 4.5 − 620 mm. Its geometrical longitudinal axis 48 lies in the line of intersection of the diagonal planes 19, 29. The spring bellows 41 is also coaxial to that line. In the lifting ram 47 is disposed coaxially an extension tube 51, which has the dimensions 76.1 × 4.5 − 575 mm, is made of steel, and in its retracted position rests as a stop on the upper end face of the sleeve 49, which serves as a stop. The extension tube 51 has four through bores 52 which are in alignment and offset by 90° to one another. From one through bore 52 to the other the height distance is equal. However, the through bores 52, which horizontally are in alignment are offset by half a spacing from the other row. At the top a load holder 53, in the form of a channel section of the type U 120 − 120, which is open at the top, is welded by its cross web horizontally and coaxially on the extension tube 51.

A supporting ring 54 is welded coaxially, by welds 56, from outside on the top end region of the lifting ram 47, the inside diameter of this supporting ring corresponding to the outside diameter of the lifting ram 47, while its top end face is able, without substantial deformation, to withstand a socket pin pushed through the through bores 52. In addition, in the unextended state of the extension tube 51 the horizontal cross web of the load holder 53 rests on the supporting ring 54.

A guide tube 57 fastened to the frame is made of steel and has the dimensions 101.6 × 4.5 − 330. It is disposed coaxially and guides the lifting ram 47 with slight clearance. Just below its top end face it is welded into a coaxial bore 58 by a weld 59 made from above. The bore 58 is formed in an abutment plate 61 made of steel, which has the dimensions 175 × 175 × 5. The abutment plate 61 extends parallel to the baseplate 11, that is to say at right angles to the longitudinal axis 48. The diagonal planes 19, 29 extend through its corners. At a distance of 7 mm from the periphery, the V-sections 22, 23, 32, 33 extend from below into the corner regions and are fastened from below by welds 62. In the space just below the abutment plate 61, gusset plates 63 (shown in Figures 1, 2 and 3) are also welded in position, the welds being made on the outside of the guide tube 57, on the lower side of the abutment plate 61, and on the inner edges 64 of the V-sections 22, 23, 32, 33. The inner edges 64 and also the gusset plates 63 lie in the diagonal planes 19, 29.

A short distance from the lower end face of the guide tube 57 four side struts 66 are disposed in the diagonal planes 19, 29, and are welded on the one hand to the guide tube 57 and on the other hand to the inner edges 64.

As can be seen from the figures, the V-sections 22, 23, 32, 33 form by their ridge edges 67 the singular boundary edges or boundary planes of a truncated pyramid. They are inclined inwards at an angle of about 72°. These dimensions and this type of construction ensure that in the views shown in Figures 1 and 3 the spring bellows 41 is accommodated and protected in its two end positions.

In order the enable the lifting jack to be used simply as a supporting chock with the spring bellows 41 deflated, or without the spring bellows 41 having been driven at all, a horizontal through bore 68 is provided, on the bisector, in the guide tube 57 near the bottom end face of the latter. This corresponds to a through bore 69 at the same angle and also of the same size, which is disposed at the same distance from the bottom end of the lifting ram 47 and which also passes through the sleeve 49. In the position shown in Figure 3 a socket pin (not shown) can then be pushed right through, thus securing the load. The through bores 68, 69 obviously extend right through. Because of the construction selected, however, a socket pin thus placed in position does not prevent the extension tube 51 from being extended, and a socket pin 52 pushed through through bores 52 provides a second support for the selected extension.

A fitting 71 leads to the spring bellows 41 and enables compressed air to be introduced or let out. The safety valve disposed vertically on the fitting 71 has ample space for its vertical movement, as shown.

On the same side, as shown in Figures 1 and 2, a plate 72 is welded on the baseplate 11, standing vertically between two V-sections, and carries on the outside, at its two ends, bearings for rollers 73 which project and come into contact with the ground only when the lifting jack is tipped over by means of a handle 74 which is welded on the outside on the guide tube 57 in a bisector, at an angle of 45°.

CLAIMS

1. A lifting jack for vehicle bodies, interchangeable platform bodies, containers or the like, compris-

ing a rectangular baseplate, a guide device disposed above the baseplate, a lifting ram adapted to be moved up and down through the guide device, and a power device acting on the lifting ram, which comprises the following features:

a) a cage adapted to be loaded both in tension and in compression is rigidly fastened on the baseplate, the latter forming the bottom of the cage; b) the upper face rigidly carries a coaxial guide tube which projects some distance downwards into the cage; c) the guide tube forms the guide device for the coaxial lifting ram; d) between the baseplate and an abutment plate rigidly fastened to the bottom end of the guide tube is situated an air bellows which has an air inlet and an air outlet; e) a stop limiting the maximum expansion of the air bellows is provided; and f) horizontal socket bores extend through the lifting ram, through which bores securing socket pins, which in turn are supported firmly on the frame, are adapted to be passed.

2. A lifting jack as claimed in claim 1, wherein the cage has the shape of a truncated pyramid whose side edges are formed by section bars and into which the guide tube projects from above for by far the greatest part of its length, and its bottom region forms the stop.

3. A lifting jack as claimed in claim 2, wherein the diameter of the collapsed air bellows is accommodated in the base edge length of the cage, and that the diameter of the air bellows in the maximum inflated state in the cage is accommodated in the edge length existing at the height of the top diameter of the air bellows.

4. A lifting jack as claimed in claim 2, wherein the section bars are V-sections whose ridge edge points outwards.

5. A lifting jack as claimed in claim 1, wherein side struts extend outwards to the cage from the bottom end region of the guide tube, and that the side struts are rigidly fastened at both ends.

6. A lifting jack as claimed in claims 4 and 5, wherein the side struts are I-sections disposed on edge and their outer ends are fastened in the inner edge of the V-sections.

7. A lifting jack as claimed in claim 6, wherein the I-sections extend horizontally from the bottom end region of the guide tube and four of them extend in each diagonal half.

8. A lifting jack as claimed in claim 1, wherein the abutment plate is the upper mounting for the guide tube and is likewise rectangular.

9. A lifting jack as claimed in any of the preceding claims, wherein the cage describes the shape of a square truncated cone.

10. A lifting jack as claimed in claim 1, wherein an extension tube is disposed coaxially telescopically in the lifting tube.

11. A lifting jack as claimed in claim 1, wherein the lifting tube and the guide tube are circularly cylindrical.

12. A lifting jack substantially as described with reference to and as illustrated by the accompanying drawings.

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