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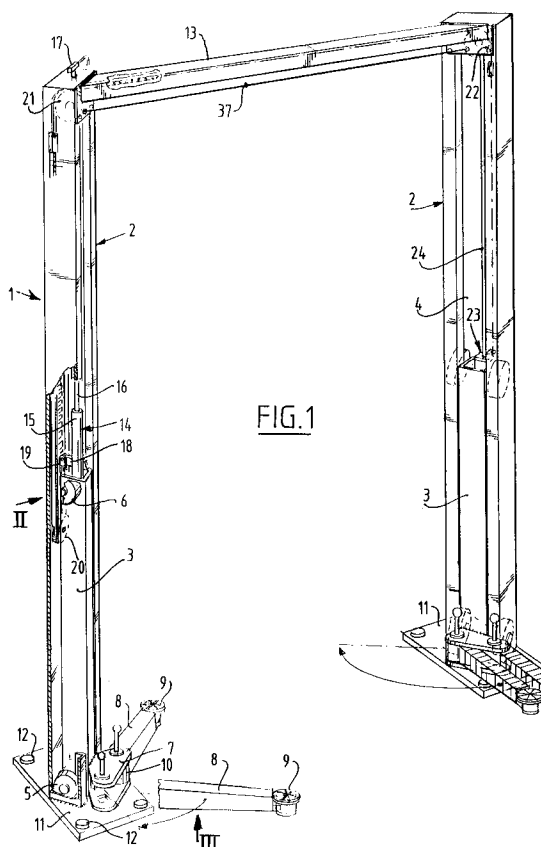
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(54) **Carrier for a vehicle lifting device.**

(57) The invention relates to a vehicle lifting device (1) comprising at least one column (2), with a vertically movable carriage (3) to which bearing arms (8) for supporting a vehicle are connected and drive means for moving the carriage (3) upward, wherein at least one of the bearing arms (8) of the carriage (3) comprises a base arm (40) pivotally connected to the carriage (3) and having a telescopically extending arm portion (41) which comprises on its free end a carrier (9) formed by a horizontal bearing platform with a downward protruding screw body (48) received in a screw-threaded hole (49) of the arm portion (41). The extending arm portion (41) comprises on its free end a mould-formed extension piece (44) in which the threaded hole (49) receiving the carrier (9) is formed and which comprises a protective cap (51,52) extending downward around the elongation of the threaded hole (49) and enclosing the bottom end of the screw body (48).

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The invention relates to a vehicle lifting device comprising at least one column, with a vertically movable carriage to which bearing arms for supporting a vehicle are connected and drive means for moving the carriage upward, wherein at least one of the bearing arms of the carriage comprises a base arm pivotally connected to the carriage and having a telescopically extending arm portion which comprises on its free end a carrier formed by a horizontal bearing platform with a downward protruding screw body received in a screw-threaded hole of the arm portion.

Such lifting devices are generally known. These can be embodied as a one- or two-column lifting device having fixed columns placed at the sides or as a jack lifter with one telescopically extending column. The movement possibilities of the bearing arms, namely pivoting, sliding out and the possibility of screwing the carrier up or downward, are required in order to accurately position the bearing platform of the carrier in a desired position under a support of the vehicle for lifting. When the carriers of all bearing arms are correctly positioned the lifting device can be set into operation and the vehicle safely lifted.

In the known two-column lifting device the extending arm portion is a steel rod. Arranged in the end of this rod is the threaded hole into which engages the screw body of the carrier. The bottom end of the screw body here protrudes beyond the hole on the underside.

This protruding screw body portion forms a safety risk. In the raised situation of the lifting device it is located at the head height of persons working beneath the raised vehicle. They can easily collide with the screw body with all the danger of head injuries that this implies.

The invention has for its object to provide a vehicle lifting device of the type described in the preamble which does not have this drawback and is therefore safer to use.

In a vehicle lifting device according to the invention this is achieved in that the extending arm portion comprises on its free end a mould-formed extension piece in which the threaded hole receiving the carrier is formed and which comprises a protective cap extending downward around the elongation of the threaded hole and enclosing the bottom end of the screw body. Direct contact with the screw body of the carrier is prevented by the protective cap. As a result of the mould-formed extension piece it is possible in economic manner to use large rounded radii at the location of the end of the bearing arm, whereby the danger of injury through collision is obviated or at least very greatly limited.

A favourable embodiment is characterized in claim 2. The mould required for manufacturing the

extension piece can hereby be embodied more simply and thus more cheaply, while the bottom end of the screw body is moreover accessible when the cover is removed, which is favourable for assembly, and particularly for arranging of a locking ring thereon. The cover is preferably made of a soft plastic.

According to a very favourable further development of the invention the extension piece is manufactured from a high-grade plastic. It has been found that in a design with a relatively large volume, which to obtain the above mentioned large rounded radii is already per se desirable, it is possible to fulfil all strength requirements with modern high-grade plastics. The advantage of using plastic is of course a comparatively low cost price of the mould-formed extension piece. The use of plastic moreover allows a great freedom of design, whereby an attractive finish and a robust appearance of the bearing arms can be obtained.

The application of claim 4 is favourable here.

It has been found that a very suitable plastic is a polyamide or polyarylamide with glass fibre filling. These materials have properties suitable for the intended application.

According to a further development of the lifting device according to the invention the extending arm portion is a hollow profile and the extension piece comprises a connecting protrusion fitting into the hollow profile. The extending arm portion can simply be sawn from a greater length and is therefore relatively inexpensive. The means necessary to obtain a good fixing of the extension piece to the hollow profile can be realized in simple manner on account of the great freedom in the design of the extension piece.

A favourable further development is characterized in claim 8. The mounting of the extension piece on the extending arm portion is hereby very simple. If during use an extension piece with carrier becomes damaged, for instance because a vehicle is driven against it, the damaged extension piece can be very simply replaced by a new one.

When use is made of a high-grade plastic the step of claim 9 is preferably applied. The large diameter of the screw thread contributes to the robustness of the construction and, when a pitch of the trapezium screw thread is selected that is normal at the said diameter, the advantage is furthermore achieved that a considerable height adjustment of the carrier is already obtained with a limited rotation, so that setting of the carrier to the desired height can take place very rapidly.

The invention is further elucidated in the following description with reference to the embodiment shown in the figures.

Fig. 1 shows a partially broken away perspective view of an embodiment of a vehicle lifting de-

vice according to the invention.

Fig. 2 shows on a larger scale a partially broken away view according to arrow II in fig. 1.

Fig. 3 shows on a larger scale a partially broken away view according to arrow III in fig. 1.

Fig. 4 shows a section according to IV-IV in fig. 3.

The vehicle lifting device 1 according to the invention shown in fig. 1 comprises two hollow columns 2 of sturdy steel plate, which have a substantially C-profile as shown particularly in fig. 3. Each column 2 thus has a channel 4 on one side.

Each column 2 is fixedly welded onto a base plate 11 which is anchored in the ground using bolts 12.

Received into each hollow column 2 is a vertically movable carriage 3 which is provided at its bottom end and top end with guide wheels 5 and 6 respectively. The basic body of the carriage 3 consists of a U-profile. The construction is such that the body of the U-profile of the carriage 3 lies in the channel 4 of the column 2 such that it lies in one plane with the profile parts of the column 2 adjoining the channel 4.

On the bottom end each carriage 3 bears a support construction 7 which protrudes outside the column 2 and to which two bearing arms 8 are pivotally mounted. Integrated into the swivel bearings 10 is an arresting mechanism which can lock the relevant arm 8 in a chosen swivel position. Situated on the end of an extending portion of each arm 8 further shown in fig. 3 is a carrier 9, the top surface of which can grip a support on the bottom of a vehicle for raising. To lift a vehicle the arms 8 are swivelled into such a position and extended so far until all four carriers 9 of the lifting device 1 are situated under a relevant support of the vehicle so that the vehicle can be lifted by the simultaneous movement of the two carriages 3 in both columns 2.

For synchronous upward movement of the carriages 3 the lifting device 1 is provided with drive means. In the embodiment shown these drive means comprise a hydraulic jack 14 mounted in the left-hand column 2 in fig. 1. The cylinder 15 of this jack 14 is fixedly connected to the carriage 3 and the piston rod 16 is fixedly connected at its top end to the column 2. The piston rod 16 has a central bore 36 to the outer end of which is connected a hydraulic oil feed 17. For lifting, hydraulic oil under pressure is pressed via the feed 17 and the bore 36 above the piston into the cylinder 14 whereby the cylinder 14 and therefore the carriage 3 are moved upward.

For synchronous driving of the carriage 3 in the right-hand column 2 in fig. 1 a chain transmission is arranged. This chain transmission comprises a

chain 19 which is fixedly mounted on a support 18 forming an entity with the carriage 3. The chain 19 extends downward from this support 18 and runs around a chain wheel 20 that is rotatable about a shaft fixedly connected to the column 2.

From the chain wheel 20 the chain extends upward via a chain wheel 21 at the top of the left-hand column 2 through a cross beam 13 mutually joining both columns 2 at their top ends, over a chain wheel 22 at the top of the right-hand column 2 to the right-hand carriage 3. The end of the chain 19 is fixedly connected to the carriage 3 by means of a safety construction 23 not further shown in fig. 2. This safety construction 23 is embodied such that if the chain 19 should break the rod 24 mounted fixedly in the column 2 is gripped immediately, thus preventing the right-hand carriage 3 from falling downward.

Integrated into the left-hand column is a safety device which, during normal use, also prevents undesired downward movement of the carriages 3, for example as a result of a leakage in the hydraulic jack 14. This safety device comprises a hole strip 27 mounted fixedly in the left-hand column with which a ratchet 28 co-acts that is connected pivotally to the left-hand carriage 3 by means of a shaft 29. The ratchet 28 is embodied such that it allows an upward movement but in the case of downward movement grips into a hole in the hole strip 27. To be disengaged from the hole strip 27 the ratchet 28 can be rotated round the shaft 29 in counter-clockwise direction as seen in fig. 2 by an electromagnet 30. This electromagnet 30 is activated when the control device, which is not described further here, receives a command to lower the lifting device.

The described chain transmission ensures that both carriages 3 run synchronously unless, as described, the chain breaks. The right-hand carriage 3 is then instantaneously locked on the rod 24. Chain breakage is moreover detected by a switch means, not further described here, and this switch means generates a signal to the control device whereby the lifting or lowering movement is immediately ended. Thus is prevented that an automobile resting on the bearing arms comes to hang at an unacceptable slant and possibly falls from the arms.

The mentioned switch means likewise detects when the chain 19 becomes slack. This can occur when during lowering the right-hand carriage is obstructed by a support or the like accidentally left behind under the device. The lowering movement will in this case also be switched off immediately. These safety devices are otherwise generally per se known. Another per se known safety device is a sensor wire 37 arranged directly beneath the cross beam 13 which activates a switch as soon as the

wire 37 is pressed upward, for example by the roof of a vehicle. To prevent damage through contact with the cross beam 13 the lifting movement is then immediately switched off.

As can be seen in more detail in fig. 3, the bearing arm 8 comprises a hollow base arm 40 pivotally connected to the support 7 of the carriage and a telescopically extending arm portion 41. The extending arm portion 41 bears on its end towards the carriage a stop 42 which can co-act with a stop 43 against the top face of the hollow base arm 40 in order to prevent the sliding part 41 being pushed too far outward. During assembly of the bearing arm 8 the sliding portion 41 is pushed into the base arm 40 from the left as seen in fig. 3 before the carrying construction 10 is mounted.

Arranged on the free end of the sliding arm portion 41 is a mould-formed extension piece 44. This extension piece 44 has a connecting protrusion 45 which can be pushed into the sliding portion 41.

As shown in more detail in fig. 4, a threaded hole 49 is formed in the extension piece 44 into which engages the screw body 48 of a carrier 9. This carrier 9 comprises in addition to the screw body 48 a bearing platform 46 provided with a covering 47 of rubbery material such as soft polyurethane. As noted above, the bearing platform 46 is positioned under a support on the bottom of the vehicle in order to lift up the vehicle. The bearing platform 46 can be herein adjusted to a suitable height by rotating the carrier 9.

At its bottom end the screw body 48 of carrier 9 has a locking spring 50 which prevents it being possible to entirely unscrew the carrier 9 from the threaded hole 49.

The extension piece 44 comprises a protective cap extending downward around the elongation of the threaded hole 49. This protective cap is formed by a sleeve 51 forming an entity with the extension piece 44 and a cover pushed thereon at the bottom end. The protective cap formed by the sleeve 51 and the cover 52 encloses the bottom end of the screw body 48 so that a user cannot collide with it.

Because the extension piece 44 is mould-formed there is a large degree of freedom of design. It is hereby possible in particular to employ large rounded radii in economic manner whereby the danger of injury through collision is greatly limited or even eliminated. The cover 52 can, if desired, be manufactured from a soft plastic, likewise to eliminate the danger of injury through collision.

The extension piece 44 as well as the carrier 9 are formed in this embodiment in a mould from a polyamide or polyarylamide with glass fibre filling. Through the use of this high-grade plastic the extension piece 44 and the carrier 9 obtain me-

chanical properties as desired for the intended application.

As shown in fig. 4 the screw body 48 of carrier 9 has a large diameter. In preference a diameter in the order of magnitude of 50 mm is used. Use of a trapezium screw thread with a corresponding pitch, for instance in the order of magnitude of 8 mm, achieves a robust and stable construction. The large diameter with correspondingly large pitch of the screw thread moreover has the consequence that a considerable height change of the bearing platform 46 already occurs with only a small rotation of the carrier 9. The carrier 9 can hereby be set very rapidly to the desired height.

The extension piece 44 is mounted in the sliding arm portion 41 by means of a snap-in connection. The fastening protrusion 45 comprises in its lower wall a lip 55 which carries a chamfered cam 53. A hole 54 is formed in the sliding arm portion 41. When the fastening protrusion 45 is pushed into the arm portion 41 the cam 53 can slide over the inner surface of the arm portion until the cam 53 converges with the hole 54. The cam 53 then falls into the hole, whereby the extension piece 44 is locked. Replacing an extension piece 44 can also be carried out very rapidly in this manner. By pressing the cam 53 upward using a pin-like member it can be released from the hole 54, whereafter the extension piece 44 can be moved out of the sliding arm portion 41. A replacement extension piece 44 can once again be arranged very quickly in the manner described.

As noted earlier, the freedom of design is very considerable because the extension piece is mould-formed. As can be seen in the figures, a robust and attractive appearance is already obtained owing to the large rounded radii used, particularly the large diameter of the sleeve 51, and owing to the large diameter of the screw body 48. In the embodiment shown ribs 56 are arranged on the side faces of the extension piece which serve on the one hand as embellishment while the end faces of which moreover serve as stop surfaces lying against the end of the sliding arm 41. The sliding arm portion 41 hereby need have no further provisions for fixing of the extension piece 44 and is very simply manufactured by sawing a suitable piece from a profile length. As can be seen in fig. 3, the front and rear ends slant at the same angle so that one saw-cut can suffice per sliding arm portion 41.

Many embodiment variants are possible. The extension piece can be embodied for instance as capping piece as well as extension piece as shown. The screw body can take a multiple, for instance double, form, so that it is telescopically unscrewable and enables a greater height adjustment.

In the material of the extension piece a re-

inforcement of for instance perforated sheet steel can be taken up. In case of possible molding faults this reinforcement keeps the extension piece together when breakage might occur, so that in that case nevertheless a sufficiency safety is guaranteed.

The lifting device according to the invention therefore has a number of advantages. These advantages include a greater safety during use, simpler assembly and lower manufacturing costs.

Claims

1. Vehicle lifting device comprising at least one column, with a vertically movable carriage to which bearing arms for supporting a vehicle are connected and drive means for moving the carriage upward, wherein at least one of the bearing arms of the carriage comprises a base arm pivotally connected to the carriage and having a telescopically extending arm portion which comprises on its free end a carrier formed by a horizontal bearing platform with a downward protruding screw body received in a screw-threaded hole of the arm portion, **characterized in that** the extending arm portion comprises on its free end a mould-formed extension piece in which the threaded hole receiving the carrier is formed and which comprises a protective cap extending downward around the elongation of the threaded hole and enclosing the bottom end of the screw body. 15
2. Lifting device as claimed in claim 1, **characterized in that** the protective cap is formed by a sleeve forming part of the extension piece and a cover arranged on the bottom end of the sleeve. 20
3. Lifting device as claimed in claim 2, **characterized in that** the cover is manufactured from a soft plastic. 25
4. Lifting device as claimed in any of the foregoing claims, **characterized in that** the extension piece is manufactured from a high-grade plastic. 30
5. Lifting device as claimed in any of the foregoing claims, **characterized in that** the carrier is manufactured from a high-grade plastic and the bearing platform comprises a covering of rubbery material. 35
6. Lifting device as claimed in claim 4 or 5, **characterized in that** the high-grade plastic is a polyamide or polyarylamide with glass fibre filling. 40
7. Lifting device as claimed in any of the foregoing claims, **characterized in that** the extending arm portion is a hollow profile and the extension piece comprises a connecting protrusion fitting into the hollow profile. 45
8. Lifting device as claimed in claim 7, **characterized in that** the connecting protrusion is locked into the hollow profile with a snap-in connection, wherein the snap-in connection comprises a resilient lip with a protruding cam on the connecting protrusion and a hole in the hollow profile accessible from outside for receiving the cam. 50
9. Lifting device as claimed in any of the claims 4-8, **characterized in that** the screw body and the threaded hole are provided with a trapezium screw thread with an effective diameter in the order of magnitude of 50 mm. 55

