

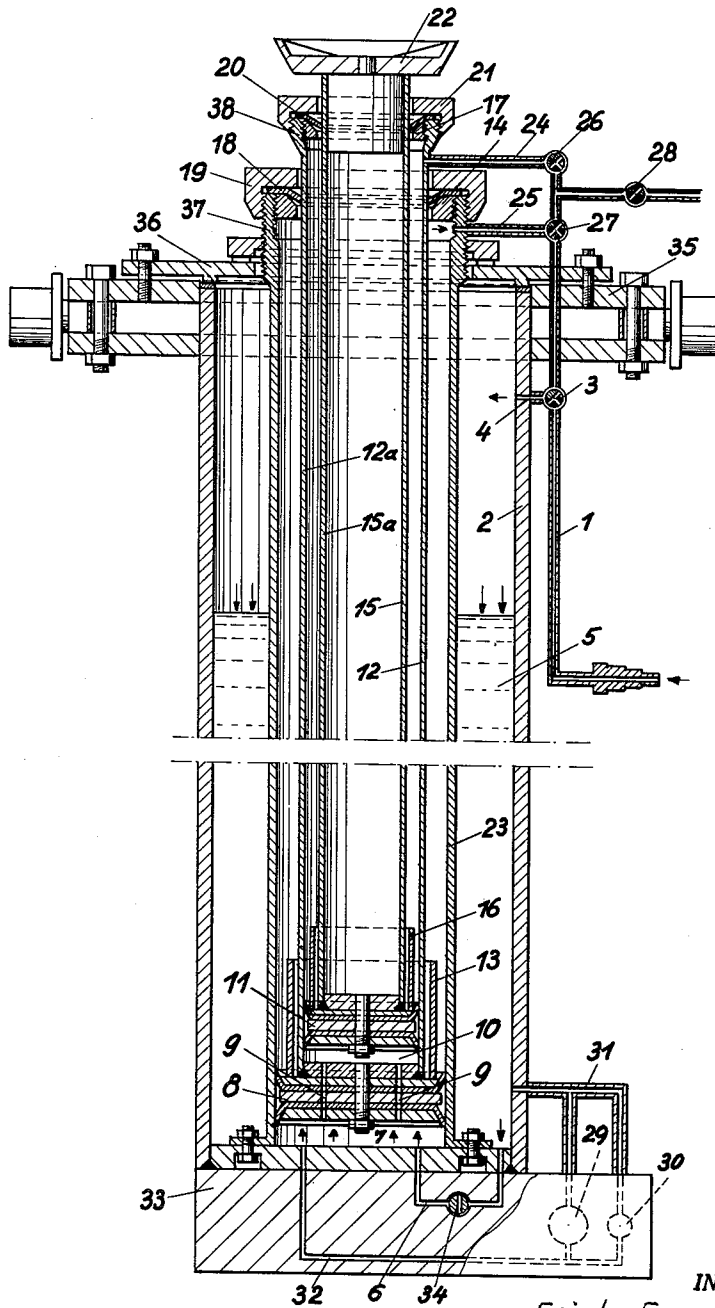
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DEVICE FOR THE LIFTING OF LOADS

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DEVICE FOR THE LIFTING OF LOADS

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1 Claim. (Cl. 60—51)

This invention relates to a device for the lifting of vehicles or of portions of vehicles, and is particularly directed to a lifting device as used in the assembling pits of work-shops or the like.

Lifting devices of this kind consist essentially of two or more pressure cylinders or pressure pistons which are shiftably arranged with one another, and which are preferably mounted on the assembling pit for actuation in two directions extending vertically to each other. The means usually employed in known constructions of this kind for the actuation of the working cylinders or working pistons is either compressed air or a pressure liquid, such as pressure oil or the like. Compared with pressure oil compressed air has, because of the storing possibility, the advantage that the lifting means can quickly be lifted to the position in which they rest against the object to be lifted, and that the actual working stroke can be carried out at a comparatively high speed, whereby it is further important that work-shops in which this type of lifting device is employed are usually provided with compressed air plants. On the other hand, the use of pressure oil has the advantage that thereby greater lifting effects are produced with a lifting contrivance of smaller size, and at a comparatively smaller actuating power. Furthermore, there is no need for protection against corrosion when pressure oil is employed, and also the lifting height can be accurately regulated then.

Hence, the object of the present invention is to combine the advantages of both of the aforesaid pressure means, and to simultaneously eliminate the disadvantages to the largest possible degree, in order to produce a lifting device having lifting means which can be quickly brought to rest against the object to be lifted and which in addition have the advantages of large lifting power, small dimensions, and accurate regulating possibilities for the desired lifting height.

For this purpose the lifting device of the invention is so constructed that the working pistons or working cylinders which are shiftably arranged within one another, are actuated by means of a pressure liquid, such as pressure oil or the like, and that the pressure of the pressure oil is selectively produced by compressed air supplied from the outside and acting upon the liquid charge, or by a pumping contrivance suitably arranged in the path of the inner liquid cycle.

Such an arrangement makes it possible for the working pistons to be quickly brought to rest against the object to be lifted by a supply of compressed air, and that through a change over to pump actuation the working pistons are enabled to reliably lift heavy loads. If there are only light loads to be lifted, it is of course quite possible to continue the supply of compressed air and to lift the load solely in this way, without the necessity of a change over to pump actuation.

However, in order to make it possible to also lift loads of considerable weight without an increase of the actuating power, and in order to enable a precise adjustment of the lifting height, the invention provides the pumping contrivance with a plurality, preferably two piston pumps of differently dimensioned piston diameters. Through selective connection of one or the other or of simultaneously connecting both pumps, the lifting device can take care of all requirements and accurately regulate every desired lifting height.

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In the sole FIGURE of the drawing is a central vertical section of an embodiment of the lifting device of the invention.

Referring now to the drawing in detail, the reference numerals 12 and 15 designate the working pistons consisting of the piston arms 12a and 15a and of the bottom-pieces 8 and 11. The pistons 12 and 15 are shiftably displaceable within each other and slidingly arranged in the pressure cylinder 23 fastened in the lifter casing 2 which serves simultaneously as storage tank for the pressure oil 5. The lifted casing 2 is in known manner suspended from a supporting frame 35 equipped with rollers and provided with a tightly closing cover 36 and having the cylinder 23 and the piston arms 12a and 15a extending through it. The upper ends of the pressure cylinder 23 and of the outer working piston 12 sliding in the cylinder 23 are provided with threaded extensions 37 and 38, respectively, and with cap nuts 19 and 21, respectively, screwed onto the outer threads of the threaded extensions 37 and 38, while stop collars 14 and 15 engage the inner threads of these threaded extensions. Interposed between the cap nuts 19 and 21 and the stop collars 14 and 17 are packing collars 18 and 20, respectively, which securely close the piston arms 12a and 15a from the outside. Provided at the upper end of the inner working piston 15 is a claw 22 adapted to bear against the object to be lifted.

The bottom pieces 8 and 11 of the working pistons 12 and 15 are in known manner provided with double-acting packing collars and screwed onto the lower ends of the piston arms 12a and 15a. In addition the bottom piece 8 is provided with a plurality of vertical passages 9 through which the pressure oil can flow to the inner pressure piston. Both the working pistons 12 and 15 have their strokes limited by a distance regulating sleeve 13 and 16, respectively, positioned above the bottom pieces 8 and 11, respectively, and which at the end of the stroke strike against the stop collars 14 and 17, respectively.

The pumping contrivance of the lifting device is preferably accommodated in a special compartment 33 located at the lower end of the lifter casing 2 and consists of two piston pumps 29 and 30 provided with pistons of different diameters. The pumps 29 and 30 are connected with the lifter casing 2 and the pressure cylinder 23 by suitable passages or channels 31 and 32.

The device operates as follows:

Lifting.—Compressed air is supplied through the conduit 4 into the portion of the lifter casing 2 located above the oil level of the pressure oil 5. For this purpose the conduit 4 is connected by a three-way-cock 3 with a compressed air pipe 1. The compressed air presses upon the oil 5 and forces the pressure oil through the conduit 6, provided for its shut-off with the valve 34, into the compartment 7 formed between the bottom piece 8 of the outer working piston 12 and the lower end of the pressure cylinder 23. The result is that first the working piston 12 is lifted, and thereupon also the working piston 15, as the oil is forced through the passages 9 also beneath the bottom piece 11 of the inner working piston 15. The air contained in the piston arm 12a and in the cylinder 23 escapes through the conduits 24, 25 and the three-way-cocks 26, 27 and the common shut-off cock 28.

After the working pistons have been lifted to such an extent that the claw 22 has thereby been brought to rest against the load to be lifted, the supply of further compressed air is cut off by means of the cock 3 and the valve 34 closed, whereupon the pump 29 with the large piston is connected, or, if required by the heaviness of the load, both pumps 29 and 30 are connected simultaneously.

The supply of pressure is then effected by the pumping

contrivance 29, 30, and the oil flows from the lifter casing 2 via the conduit 31 and the pumps through the conduit 32 into the cylinder 23. If the load is very considerable, or if an accurate lifting height is to be obtained, the pumping is carried out only by means of the pump 30 provided with the smaller piston, which produces comparatively small lifting effects, but which at equal actuating power achieves high pressures. The operation as hereinbefore described shows clearly that, if light loads are to be lifted, the lifting can be done exclusively by the use of compressed air.

Lowering.—For the lowering of the load the valve 34 is opened, whereupon the oil can flow from the working pistons and the cylinder 23 through the conduit 6 back into the lifter casing 2. The air thereby expelled from the lifter casing 2 passes through the conduit 4 and the correspondingly adjusted three-way-cock 3 to the open air. But in order to provide a flow of air also into the cylinder chambers above the bottom pieces 8 and 11, the cocks 26, 27 and 28 are left open during the lowering. An arrangement of this type provides a closed air cycle, as the air expelled from the lifter casing by the oil flowing back into it, passes via the three-way-cock 3 and the two other three-way-cocks 27 and 26 into the space or clearance between the pressure cylinder 23 and the working piston 12 and between the working piston 12 and the working piston 15. The formation of condensation water is thereby reduced. If, on the other hand, a speedy return of the working pistons to starting position is desired, particularly when there is no load on the claw 22, then the cock 28 is closed and the cocks 3, 27 and 26 are adjusted in such manner that the compressed air passes from the conduit 1 into the cylinder chambers above the bottom pieces 8 and 11. The pistons 12 and 15 are then pushed under increased pressure in downward direction and force the pressure oil at increased speed back into the lifter casing 2.

The cocks and valves of the lifting device are combined in suitable manner into groups and are correspondingly connected with one another, so that the operation of the device is effected by the actuation of one or two operating levers.

It should be noted that this novel type of lifting contrivance is not confined to the embodiment described and illustrated in the specification, but may be changed or modified in any suitable manner, so long as such changes or modifications do not constitute any material departure from the salient features of the invention as expressed in the appended claim. The construction may also be of a stationary type, or adapted for mounting on a vehicle specially devised for that purpose. Furthermore, it is possible to provide the device not only with one or two working pistons, but with a larger plurality of such pistons or cylinders shiftably positioned in one another.

What I claim as new and desire to secure by Letters Patent of the United States is:

A lifting device, comprising a hollow vertical piston

having a closed bottom, another hollow piston enclosing the first-mentioned piston and spaced therefrom, the second-mentioned piston having a bottom with openings formed therein, the bottom of the first-mentioned piston engaging the second-mentioned piston in the retracted position of said first-mentioned piston, the first-mentioned piston being slidable in the second-mentioned piston, a pressure cylinder having a bottom and enclosing the second-mentioned piston and spaced therefrom, the bottom of the second-mentioned piston engaging the bottom of said pressure cylinder in the retracted position of said second-mentioned piston, the second-mentioned piston being slidable in said pressure cylinder, said openings connecting a space between the two pistons with a space between the second-mentioned piston and said pressure cylinder, a casing enclosing said pressure cylinder, a space being formed between said casing and said pressure cylinder, the bottom of said pressure cylinder being connected with said casing, the space between said casing and said pressure cylinder constituting an oil container, a supporting frame carrying said casing, a cover carried by said supporting frame and tightly engaging said pressure cylinder, said pressure cylinder and the two pistons extending through an opening formed in said cover, separate cap nuts upon the upper ends of the second-mentioned piston and said pressure cylinder, separate stop collars enclosed by said cap nuts, load engaging means upon the upper end of the first-mentioned piston, separate regulating sleeves carried by the bottoms of the two pistons, each of said regulating sleeves being adapted to engage a separate stop collar to limit the upward movement of the piston connected therewith, a pumping device carried by said casing and comprising a larger piston pump, a smaller piston pump, means forming a passage connecting said oil container with said pumps, means forming a passage connecting said pumps with the second-mentioned space, and means forming a passage connecting said oil container with the second-mentioned space, a compressed air conduit communicating with an upper portion of said oil container, another conduit connected with the first-mentioned conduit and communicating with the top of the second-mentioned space, and a third conduit connected with the second-mentioned conduit and communicating with the top of the first-mentioned space.

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