Fig. 1

Apparatus for applying and lifting heavy covers on containers

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This invention relates to an apparatus fitted with balancing system for applying and lifting heavy covers on containers.

In contradistinction to existing apparatuses of the type, the one according to the invention is principally characterized in that the container and cover are connected to each other by at least one lifting device, by means of which the cover is mechanically operable with respect to the container in the last part of the movement for applying and in the first part of the movement for lifting off, and that the lifting device is swivably supported on the container and associated with means for balancing the weight to enable pivotal movement of the cover from the opening of the container towards the outside of the container wall and vice-versa.

Further features of the invention will appear from the following description and claims, taken in conjunction with the accompanying drawing, wherein there is shown by way of example one form of embodiment incorporating the invention.

Fig. 1 shows a side view of an apparatus according to the invention, the full lines indicating the position of the parts with closed cover, and the chain-dotted lines the position of the parts with opened cover;

Fig. 2 shows a vertical section on a larger scale through one lifting device and the associated means for balancing the weight;

Fig. 3 is a sectional view on the line III--III of Fig. 2;

Fig. 4 is a top view of a portion of the container with cover removed and with lifting devices and means for balancing the weight dismantled.

Referring to said annexed drawing, according to Fig. 1, a cylindrical container 10 with vertical axis of symmetry has a cover 11 which, in its closed position, is seated with its closed rim 12 on a circumferential rim 13 extending round the opening of the container 10. The cover 11 and container 10 are connected to each other by two hydraulic lifting devices located at diagrammatically opposite places thereof. In Fig. 1 there is shown only one of the two identical but laterally inverted lifting devices 15. The top of each lifting device 15 is bolted to a connecting piece 16 fixed on the side of the cover 11. The bottom of each lifting device 15 is swivably supported on a fulcrum pin 17 horizontally arranged on the outside of the container wall. The two oppositely disposed fulcrum pins 17 are at the same height.

One of the lifting devices 15 is shown in greater detail in Figs. 2 and 3. The respective pin 17 has rotatably mounted thereon a hub 18 which is welded to a hydraulic cylinder 19 whose symmetrical axis extends radially to the hub 18. The cylinder 19 has a plunger 20 within it, which is rendered tight against the inner wall thereof by a piston ring 21. The top end-face of the plunger 20 shown in Fig. 2 is convex and cooperates with a ram 22, 23 which comprises a pressure piece 22 and an adjoining tubular shaft 23. Said shaft is carried for end-wise movement within a sleeve 24 firmly seated within the top portion of the cylinder 19. The end of the shaft 23 protruding from the cylinder 19 is bolted to the connecting piece 16.

The hub 18 has an inner circumferential groove 26 communicating with the inner space of the cylinder 19 through a radial bore 27. The pin 17 has an axial bore 28 machined from its free end, as well as a radial bore 29 connecting the axial bore 28 with the circumferential groove 26. The hub 19 has a threaded portion into which is screwed an axially bored nipple 30 connected to a pipe 31 (Fig. 1) for the feed and discharge of a pressure medium, say, pressure water. The pipe 31 is connected to a multi-way-cock 32 itself connected to a discharge pipe 33 and, via a feed pipe 34, to a source of pressure (not shown).

The hub 18 of each lifting device 15 has rigidly with it an arm 40 which extends substantially radially to the axis of the pin 17 and is pivoted at 42 to a U-shaped stirrup 41. The latter is fixed to the lower part 43 of a bush 43, 44 arranged for endwise movement in a cylinder 45. The cylinder 45 at its closed upper end is provided with an eye 46 which embraces a pin 47 attached to the outside of the container wall so as to provide pivotal connection between said cylinder and container. The bush 43, 44 forms a hollow plunger which can slide in the cylinder 45. Situated partly within the cylinder 45 and partly within the bush 43, 44 are two compression springs 48, 49 with different spring characteristics. One spring 48 rests against the closed end plate of the cylinder 45 and a movable intermediate piece 51, whereas the other spring 49 bears on the one hand against said intermediate piece and on the other hand against a pressure piece 52 between which and the bottom part 43 a spacer sleeve 53 is inserted. The members 40--53 are means for balancing the weight of the cover 11 when brought into its open position as shown in chain-dotted lines in Fig. 1. Said means are provided in laterally inverted arrangement on the two opposite sides of the container. In the preferred design shown of the means for balancing the weight, the cylinder 19 of the lifting device 15 and the cylinder 45 of the weight-balance run substantially vertical beside each other when the cover 11 is in its closed position.

The action of the described device is as follows:
If the cover 11 has to be lifted from the container 10 by actuating the cock 32, a pressure medium is at first admitted into the pipe 31 and through the bores 28, 29 and 27 into the cylinders 19 of the two lifting devices 15. Thereby the plunger 20 of the lifting devices goes up and the cover 11 is moved clear of the circumferential rim 13 of the container by means of the rams 22, 23, and this takes place fully automatically without any physical exertion of the attendants. Thereupon the two lifting devices 15 can be swivelled about the common longitudinal axis of the fulcrum pins 17, the cover 11 making a movement from the opening of the container 10 towards the outside of the container wall. The arm 40 of each lifting device thereby moves upwards with the pivot 42, the bush 43, 44 serving as plunger being pushed more deeply into the cylinder 45 causing at first compression of the spring 49 and then also of the spring 48. The torque exerted through the springs 48 and 49 upon the hub 18 is substantially equal and opposed to that exerted by the weight of the cover 11 and lifting devices 15 upon the hub 18 so that there is balance. The swinging of the lifting devices 15 and cover 11 may thus be readily carried out by hand. In the full open position of the cover 11, its closing rim 12 runs substantially in a vertical plane and parallel to the container wall, as shown chain-dotted in Fig. 1. In this position of the cover 11, the springs 48, 49 are either fully compressed or their force is capable of entirely balancing the weight of the cover 11. It is therefore not necessary to secure...
or support the cover in its open position by any additional means.

For closing the cover 11, the lifting devices 15 are at first swung into the vertical position, whereby the cover comes to lie over the opening of the container. This movement may be readily carried out by hand, since the previously compressed springs 48, 49 will release the spring power stored therein to overcome the influence of gravity. Finally, the pressure fluid is permitted to leave the cylinder 19 through the pipe lines 31, 33 by suitably actuating the cock 32, whereby the cover 11 descends under gravity and comes to lie upon the circumferential rim of the container 10. Now the container 10 is closed by the cover 11.

If necessary, means known per se and not described here in detail may be provided to lock the cover 11 in its closed position on the container 10.

Instead of a liquid, the lifting devices may also be actuated by a compressed gas, say, compressed air. In another modified form, instead of the springs 48, 49, another compressible means, say, a gas may be present in the cylinder 45 to balance the weight.

It is understood that the foregoing detailed description is given merely by way of illustration and that other variations may be made therein without departing from the scope of the appended claims.

What I claim is:

1. Means for removing and replacing a cover on a container comprising two connecting rods extending parallel to one another at two diametrically opposite places upon said container pivotally attached to said container and oscillatable around a common pivot-axis, pressure means for actuating said connecting rods to lift the cover off the container and to set it upon the container in the longitudinal direction of said connecting rods, an arm rigidly connected to each of said connecting rods extending at least approximately radially to said pivot axis, a weight-balancing device connected to said container comprising a cylinder extending in the closure position of said cover at least approximately parallel beside its corresponding connecting rod, a piston in said cylinder and an elastically compressible agent coating with said piston to facilitate the swinging of said connecting-rod with said cover for opening and closing said container.

2. Means as set forth in claim 1 wherein said elastically compressible agent comprises two helical springs, connected in series each having a different spring characteristic.

3. Means as set forth in claim 1 wherein said two connecting rods are swingable around two pivots which are fastened on the container, said pivots having passages which on one hand are connected to pipe lines for the supplying and outflow of a pressure agent and on the other hand are in connection, in any swing-position of the connecting-rods, with the interior of said lifting devices.

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