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LIFTING DEVICE FOR CONTAINER

This invention relates to a lifting device for so-called containers or the like which usually are parallelepiped and in certain cases are designed according to international standards.

5 The use of so-called containers for transporting goods of many kinds has during the last few years increased to an especially high degree. The handling of containers at goods depots, ports etc. has increased to a corresponding degree.

10 The handling of containers or other unit load takes place in several ways, depending on several factors, for example the conditions at the port and the type of ship. In addition the distance through which the container is to be transported influences the method
15 of handling.

When a fork lift truck is used, as is usual, the container is provided at its bottom with a frame providing channels for the forks. Top lift or side lift frames may also be used, and the locking to the container
20 proper is often effected by means of hydraulics, which is an expensive solution, requires an external power source and can be less attractive from a safety point of view.

Cranes of different types provide an alternative
25 method of container transportation, for example when movement from a quay to the hold of a ship is required. The coupling between crane and container is then effected by ropes, wires or the like provided with a hook. Cranes of the gripper type may, for example, be used. All the
30 different methods of crane lifting have in common that the coupling operation involves manual operating steps. The same, of course, also applies to the uncoupling

between crane and container. At many handling places, the manual work is, for obvious reasons, risky to some extent.

There is, thus, great need for an efficient
5 lifting device, which permits automatic coupling and uncoupling between crane and container or between fork lift truck with lift frame and container. The present invention provides a lifting device which enables such efficient lifting. For lifting with a fork lift truck,
10 coupling and uncoupling can take place without requiring an external power source and, at the same time, the lifting device is highly satisfactory from a safety point of view. For lifting with a crane, substantially all manual operations for achieving coupling and
15 uncoupling are eliminated, which is desirable from a safety point of view, reduces the labour demand and thereby the handling costs.

A further advantage of the lifting device according to the present invention is that it can be used with a
20 container of conventional standard design, which must be regarded as a substantially essential requirement, because the design of containers to-day is highly standardized. This applies especially to so-called ISO-containers, which are designed according to international
25 standards and used for international transport and exchanged between different countries.

A lifting device for the purpose here concerned further must meet high requirements on operational safety and at the same time the need of maintenance shall
30 be small. A lifting device according to the present invention can be expected to be very safe in operation and to require maintenance to a very limited extent.

The present invention provides a lifting device for lifting a container, which device comprises a frame
35 carrying coupling means cooperable with attachments of

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the container, the coupling means each comprising

a pair of toothed sleeves fixed relative to the frame and spaced apart from and coaxial with one another, each sleeve having at an axial end thereof a set of four teeth
5 uniformly distributed around the circumference of the sleeve, the sets of teeth of the respective sleeves facing one another and the teeth of one set being offset in a circumferential direction in relation to the other set of teeth, and

10 a coupling device adapted to be coupled to or uncoupled from the attachment and capable, during the said lifting of the container, of cooperating with the attachment so as to serve additionally as a load bearing device, which coupling device comprises

15 an axle passing through one sleeve of the said pair thereof and extending axially into the other sleeve, which axle is freely rotatable and axially movable for reciprocating movement relative to the sleeves, the axle carrying radially projecting pivot members cooperable with the teeth
20 of respective sleeves on said reciprocating movement of the axle to cause said rotation of the axle, and

a generally triangular coupling member at an axial end of the axle remote from the said other sleeve, the apex of which generally triangular coupling member defines a free
25 end of the axle, the coupling member being capable of passing, from an uncoupled position, through an elongate hole in a face of the attachment to a position at which coupling or uncoupling to the attachment is achievable by urging the apex of the generally triangular coupling member
30 against a surface associated with the container thereby causing axial movement of the axle relative to the sleeves so as to urge the pivot members into cooperation with the

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teeth of the said other sleeve to effect rotation of the axle to an extent which causes the pivot members, on subsequent retraction of the coupling member, to cooperate with the teeth of the said one sleeve, whereby the base of
5 the triangular coupling member is moved either (a) out of alignment with the elongate hole so as to prevent the coupling member from passing out of the elongate hole thereby enabling the coupling device to couple to the attachment and, during the said lifting of the container, to serve as a
10 said load bearing device, or (b) into alignment with the elongate hole so as to allow the coupling member to pass out of the elongate hole for release of the container.

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The dimensions of the generally triangular coupling member are such that on passing it through the elongate hole, the base has passed through the hole when the apex comes into contact with the surface associated with the container.

A lifting device embodying the invention will now be described in greater detail with reference to the accompanying drawings, in which:-

Fig. 1 is a side elevation of a lifting device embodying the invention and a container, showing one longitudinal face of the container,

Fig. 2 shows a plan view of the lifting device and the container of Fig. 1,

Fig. 3 is a schematic view of an attachment associated with a container,

Fig. 4 shows a coupling means of the lifting device of Figures 1-3, where one sidewall has been removed, and a lateral view of the attachment of Fig. 3, the coupling means being in position for coupling to the attachment, and

Fig. 5 shows the coupling means and attachment of Fig. 4, coupled to one another.

In Fig. 1 the numeral 1 designates a schematically shown container of ISO-type 20' x 8' x 8' 6" seen in the direction to one of its longitudinal faces, which container is to be lifted by a lifting device embodying the invention, lifting from above being shown by way of example. The container 1 is provided at its corners with attachments 2 connected to its upper end 3 and with attachments 4 connected to its lower end 5. For lifting from above, as described below, the attachments 2 connected to the upper end 3 of the container are utilized.

The lifting device embodying the invention comprises a frame 6 consisting of four arms 7 arranged in one plane, a lift rod 8 attached in a suitable way to the arms and intended to be connected in a suitable way to a crane or

the like, and supporting struts 9 between the arms 7 and lift rod 8. At the free end of each of the arms 7, a coupling means 10 is provided.

The arms 7 are arranged so that the relative
5 distances between the coupling means 10 are equal to the relative distances between the attachments 2, in order to render it possible to couple together the coupling means 10 and the attachments 2 when the lifting device is positioned in relation to the container 1 in
10 the way intended, as shown in Figs. 1 and 2, i.e. so that each coupling means 10 may connect with a respective attachment 2.

For lifting with a fork lift truck, the frame 6 may be a lift frame of the so-called top lift or side
15 lift type. Lift frames of this kind, for example, may consist of a rectangular frame with four corners or of a beam with two ends. The frame and, respectively, beam may be either fixed or designed so as to have an extension the position of which can be varied, for
20 example hydraulically. The coupling means 10 in this case are preferably arranged at the frame corners or beam ends.

Fig. 3, shows, in greater detail, the attachment 2 of Fig. 1, designated in Figure 3 by the numeral 11. The
25 attachment 11 is of standard type and has an upper face 12 provided with a continuous elongate hole 13, the longitudinal direction of which is in parallel with the longitudinal direction of the container. The attachment 11 is, in principle, a parallelepipedic shell. The
30 attachment also has two free side faces 14 provided with elongate holes 15 corresponding to the hole 13 and continuous in a vertical direction.

Fig. 4 is a lateral view of the coupling means 10 which in Fig. 2 is designated by 16, where a sidewall 17
35 of the coupling means has been removed, and the attachment

11 is seen in a direction to the long side 18 of the container 1.

5 The coupling means each comprises a substantially cylindrical axle 19, which is rotatably and axially movably mounted in an upper tubular sleeve 20 and extends through a lower tubular sleeve 21, as shown in Fig. 4.

10 Each sleeve 20,21 is toothed at one end 22 and has four teeth 23 equally spaced along the circumference of the sleeve.

15 The sleeves 20,21 are arranged in a parallelepipedic holder with sidewalls 24, an upper end wall 25 and a bottom wall 26, where the sleeves 20,21 are provided with a respective flange 28,27 and where the flange 27 of the lower sleeve 21 abuts and in a suitable way is attached to the bottom wall 26, and the flange of the sleeve 20 abuts and in a suitable way is attached to the upper end wall 25 via a hole 29 in the upper end wall 25, as can be seen from Fig. 4.

20 The sleeves 20,21 are aligned with their longitudinal axes relative to each other and in such a manner that the toothed ends are located at a suitable distance from and face toward each other, and so that the teeth of one sleeve 20,21 are offset by about 45° in a peripheral direction in relation to the teeth of the other sleeve 20,21.

30 The axle 19, on the portion 30 intended to be located in the holder 24,25,26, is provided with substantially cylindrical pivots 31 of which there are preferably two, which pivots 31 protrude radially of the shell surface of the axle 19. The pivots 31 are capable of assuming a position as shown in Fig. 4 in which the coupling means is uncoupled and a lift position as shown in Fig. 5, in which positions the pivots rest on the bottom of respective teeth 32 of the lower sleeve 21

between two adjacent teeth 23 of the upper sleeve 20. The pivots 31 are, in addition, capable, during a reciprocatory movement or displacement of the axle 19 in its axial direction, of cooperating with the teeth, the teeth have one edge 33 in parallel with the axial direction of the axle 19 and one edge 34 forming an angle of about 30° with the axial direction, so that the axle 19 is caused to rotate through substantially 90° . The axle 19 thus rotates through 90° in a definite and always constant direction for each reciprocatory cycle of the axle 19, as is apparent from Fig. 4.

The axle 19 has, at its free end, intended to be located outside the holder 24, 25, 26 and to cooperate with an attachment 2, a generally flat triangular coupling member 35, the base of which provides flanges 36. The generally triangular coupling member 35 may be of arrow shape as shown in Figs. 4 and 5. The coupling member 35 is so dimensioned as to be capable of being introduced into the elongate hole 13 in the attachment 2, 11 and so that when the apex of the generally triangular coupling member 35, after its insertion into the hole 13, has come into contact with a bottom surface 37 of the attachment adjacent to the container, the flanges 36 have passed through the hole 13. Thus on rotation of the generally triangular coupling member as later described, the greater length of the coupling member provided by the flanges as compared with the width of the hole 13 prevents the coupling member 35 from being removed out of the attachment 2, 11.

The above lifting device embodying the invention operates as follows.

When the lifting device is to be coupled together with a container, it is brought towards the container 1 and positioned in relation thereto as shown in Figs. 1

and 2. The coupling members 35 then have the position, in relation to the longitudinal direction of the holes 13, as shown in Figs. 1 and 4. The lifting device is lowered so that the coupling members 35 are introduced into the holes 13 until the apexes of the generally triangular coupling members 35 are pressed against the bottom surfaces 37 of the attachments 2. The axles 19 are thereby urged upwardly in the sleeves 20, 21 and the pivots 31 cooperate with the teeth 23 of the upper sleeves 20 so that the axles 19 are caused to rotate through about 90° . The flanges 36 are simultaneously rotated in relation to the longitudinal direction of the holes 13, so that the axle ends can no longer be moved out of the holes 13. Since the apexes of the generally triangular coupling members 35 provide essentially a point contact with the bottom surfaces 37 of the attachments 2, there is a minimum frictional resistance to rotation during the axial movement of the axles 19.

When the lifting device is lifted by a crane, the flanges 36 thus abut the inner surfaces 38 of the upper faces 12 of the attachments 2, as shown in Fig. 5.

When the container 1 has been positioned in the desired place, the lifting device is lowered so that the apexes of the generally triangular coupling members 35 are again pressed against the bottom surfaces 37 of the attachment 2. The axles 19 are thereby urged upwardly again and caused to rotate through about 90° , whereafter the coupling members 35 can be moved out of the holes 13.

As is apparent from the above, a lifting device embodying the invention renders it possible for coupling and uncoupling between lifting device and container to take place fully automatically, i.e. without manual operation. The construction, furthermore, is very simple, reliable in operation and can be simply adapted to standardized attachment design of containers.

In an alternative embodiment, the axle 19 is, in an obvious way, spring-loaded whereby the operational reliability is increased and which also renders operation possible when the longitudinal direction of the axle 19 and the coupling means 10 are substantially horizontal and not vertical as in the embodiment described above. By spring-loading the axle 19 and by suitably designing the coupling means 10 in general as well as the frame 6, a lifting device embodying the invention can be coupled to containers from directions other than from above, for example from the side. It is thus obvious that the invention also can be applied to lifting by fork lift trucks having a lift frame of the top lift or side lift type, in which connections the coupling means 10 are preferably arranged at the corners or ends of the frames.

In addition, the frame 6 can be designed in several different ways, for example as a rectangular frame or as a substantially straight beam with only two ends having coupling means 10, where coupling takes place to only two, preferably diagonal, ones of the attachments 2 of the container 1.

The described lift rod 8 can be designed in several ways, for example with a means for gravity centering when lifting by a crane. When lifting by a lift fork truck the lift rod is preferably replaced by a recess in the lift frame.

The number of pivots 31 on the axles 19 can be varied from one to four pivots when using the sleeves 20, 21 of the type described above.

The holder 24, 25, 26 for the sleeves 20, 21 also can be designed so that the sleeves and the portion of the axle 19 for cooperation with the sleeves are completely encased.

Furthermore, the coupling members 35 can be designed in a different way, for example more robustly, in order to obtain an optimum design from



CLAIMS:-

1. A lifting device for lifting a container, which device comprises a frame carrying coupling means cooperable with attachments of the container, the coupling means each comprising

5 a pair of toothed sleeves fixed relative to the frame and spaced apart from and coaxial with one another, each sleeve having at an axial end thereof a set of four teeth uniformly distributed around the circumference of the sleeve, the sets of teeth of the respective sleeves facing
10 one another and the teeth of one set being offset in a circumferential direction in relation to the other set of teeth, and

a coupling device adapted to be coupled to or uncoupled from the attachment and capable, during the said
15 lifting of the container, of cooperating with the attachment so as to serve additionally as a load bearing device, which coupling device comprises

an axle passing through one sleeve of the said pair thereof and extending axially into the other sleeve, which
20 axle is freely rotatable and axially movable for reciprocating movement relative to the sleeves, the axle carrying radially projecting pivot members cooperable with the teeth of respective sleeves on said reciprocating movement of the axle to cause said rotation of the axle, and

25 a generally triangular coupling member at an axial end of the axle remote from the said other sleeve, the apex of which generally triangular coupling member defines a free end of the axle, the coupling member being capable of passing, from an uncoupled position, through an elongate
30 hole in a face of the attachment to a position at which coupling or uncoupling to the attachment is achievable by



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urging the apex of the generally triangular coupling member against a surface associated with the container thereby causing axial movement of the axle relative to the sleeves so as to urge the pivot members into cooperation with the
5 teeth of the said other sleeve to effect rotation of the axle to an extent which causes the pivot members, on subsequent retraction of the coupling member, to cooperate with the teeth of the said one sleeve, whereby the base of the triangular coupling member is moved either (a) out of
10 alignment with the elongate hole so as to prevent the coupling member from passing out of the elongate hole thereby enabling the coupling device to couple to the attachment and, during the said lifting of the container, to serve as a said load bearing device, or (b) into
15 alignment with the elongate hole so as to allow the coupling member to pass out of the elongate hole for release of the container.

2. A lifting device according to claim 1, substantially as herein described and as illustrated with reference to the
20 accompanying drawings.

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