

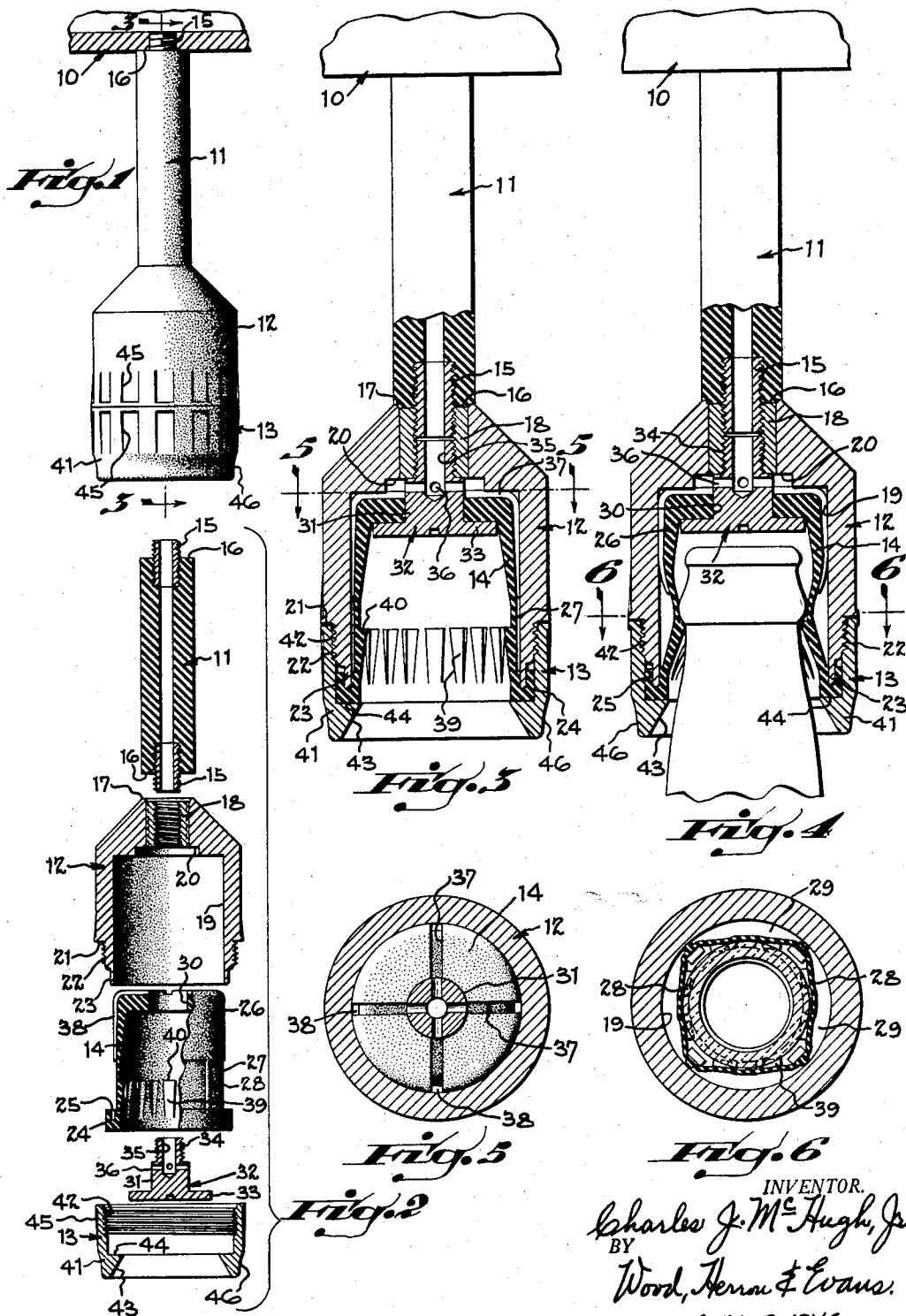
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LIFTING CUP FOR ARTICLE TRANSFERRING APPARATUS

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1

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LIFTING CUP FOR ARTICLE TRANSFERRING APPARATUS

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This invention relates to article transferring apparatus of the general type disclosed in the patent to Ernest Meierjohan No. 2,695,190 and the application of Ernest A. Hund et al. Serial No. 439,644, filed June 28, 1954. Machines of this general type are used for transferring articles from one location to another, for instance, for unloading cases of beer bottles or soft drink bottles from cardboard or wood cartons or for lifting bottles from endless belts and placing them in cases.

The present invention is concerned only with the lifting cups or article engaging members which are used in machines of the type indicated, and it is illustrated by a lifting cup which is sized and proportioned for the handling of standard export beer bottles. It will be appreciated, however, that with slight modification the same member also may be employed in the handling of other types of bottles including soft drink bottles and wide mouth bottles such as those which are used for milk.

The lifting cup of this invention and the lifting cups of the Meierjohan patent and the Hund et al. application operate in the same general manner. In each case the cups comprise a cylindrical shell or an equivalent device having a bladder-like gripper inside of it which is adapted to be engaged over the top of a bottle. The cup is suspended from an air pressure manifold by means of a flexible hose or tube so that the cup can automatically align and guide itself down over the top of a bottle when the assembly is brought down into bottle engaging position. When the bladder is in the uninflated condition, it is substantially larger in diameter than the neck of the bottle to be engaged. However, upon the application of fluid pressure to the bladder inside of the cup, the bladder becomes inflated to grasp the neck of the bottle so that the bottle moves with the cup when it is elevated or translated into a new position.

The present invention is directed specifically to certain improvements in the construction of lifting cups of this general type, the primary objective being to improve the efficiency of the operation of such lifting cups and to provide an assembly which is less expensive than past constructions, and which is arranged in such a way that individual parts may be replaced readily should this become necessary after prolonged usage.

A further objective of the invention is to provide a lifting cup of the type set forth which is faster and more positive in its action than previous cups in the grasping and releasing of bottles. In addition, it is an objective to provide a lifting cup incorporating an improved bladder which is less likely to become cut when it is engaged over a broken bottle top, and which is so constructed that there is no chance of a bottle having a sticky substance upon it remaining attached to the bladder upon the release of the fluid pressure.

Other objectives and features of the invention will be readily apparent to those skilled in the art from the following description of the drawings in which:

Figure 1 is a side elevational view of a lifting cup showing it attached to a fluid pressure manifold, a portion only of which is shown in cross section.

2

Figure 2 is an exploded view showing the component parts of the lifting cup in cross section.

Figure 3 is a cross sectional view taken on the line 3—3 of Figure 1 showing the bladder of the lifting cup in deflated condition.

Figure 4 is a view similar to Figure 3 showing the lifting cup engaged over the neck of a bottle and with the bladder inflated.

Figure 5 is a cross sectional view taken on the line 5—5 of Figure 3.

Figure 6 is a cross sectional view taken on the line 6—6 of Figure 4.

The lifting cup of this invention is adapted to be suspended from a fluid pressure manifold, a portion only of which is indicated at 10. A manifold of this same general type is more fully described in the patent and the patent application to which reference has been made. Generally, the lifting cup includes a flexible hose 11, a generally cylindrical shell 12, a mouthpiece 13 and an internal bladder 14. The hose may comprise a short length of readily flexible, resilient material such as rubber and preferably it has two brass nipples 15—15 inserted into its opposite ends which may be secured in place by adhesive or by vulcanizing. If desired, the hose, with the two nipples in place, may be formed in a molding process so that the rubber is molded directly to the nipples. A substantially broad shoulder 16 is provided at each end of the hose surrounding the respective nipples. These shoulders are flat and serve as seals when the respective ends of the hose are threaded into place against the underside of manifold 10, and into place against the upper end of the shell 12. To further facilitate the sealing of the hose the shell may have a sharp annular edge 17 upon it surrounding a bushing 18 in the shell into which the lower nipple of the hose is threaded. The nipples preferably are identical so that the hose may be interchanged end for end in an installation.

The bushing 18 is threaded internally to receive one of the nipples on the hose. The external surface of the bushing may be serrated following known techniques to securely fasten it to the shell. The shell itself preferably is of molded plastic construction so that the bushing may be molded into it during its manufacture. The shell is generally cylindrical although it is preferred that the upper part be cone-shaped, tapering up to the sharp annular edge designated 17 surrounding the bushing 18. The shell is hollow at the inside, the cavity within it being in the form of a large cylindrical bore 19, the upper end of which terminates below the lower end of the bushing 18. A counterbore 20 provided in the upper end of the bore 19 opens the latter bore to the interior of the bushing 18. The lower portion of the outside of shell 12 is recessed to provide a shoulder 21 which extends around the circumference of the shell. Immediately below this shoulder, the outer surface of the shell is configured to provide threads 22. The threads are recessed with respect to the outer periphery of the shell and immediately below the threads, and recessed with respect to them, the shell terminates in a substantially thin edge or rim 23 which surrounds the opening of the cylindrical bore 19.

Bladder 14 preferably is formed as a molding from a resilient material such as rubber. The bladder is generally in the shape of an inverted cup and it is dimensioned to fit into the bore 19 at the inside of shell 12. The lower edge of the bladder has an annular flange 24 formed on it which is generally channel-shaped as seen in cross section to provide a groove 25 which is adapted to engage over the rim 23 on the lower edge of the shell when the bladder is in place inside of bore 19.

The upper part, designated 26, of the bladder is of a size to fit snugly into bore 19. However, the outside of

3

the lower part, designated 27, of the bladder is recessed to provide a thinner wall in this area. The extra thickness of the upper portion 26 is, however, carried down through the thinner wall part at four ribs 28, the outer edges of which snugly engage against the wall of bore 19 so as to define four discreet chambers 29 above the annular flange 25 and below the upper part 26 of the bladder. It will also be noted from Figure 2 that the wall of the upper portion 26 of the bladder gradually becomes thicker toward the top and that the top has a central opening 30 in it which is designed to fit snugly the enlarged, cylindrical shank portion 31 of a bolt-like device designated generally 32. The latter device serves to hold the top of the bladder snugly in place against the upper end of the hollow interior of the shell.

More specifically, the bolt-like device includes a large flat head 33 which is of a diameter to substantially cover the undersurface of the top of the bladder. In addition, the end of the bolt-like device above the shank portion 31 is smaller in diameter than the shank and is threaded externally as at 34 to thread up into the lower end of the bushing 18. The threaded part of the device 32 has an internal bore 35 extending down through it, terminating in the upper part of the shank 31. A pair of cross bores 36—36 are drilled into the upper part of the shank portion at right angles to one another and into communication with the bore 35 which is within the threaded upper end of the device. Hence, air pressure applied to the flexible hose is transmitted through the bore 35 and the cross bores 36.

As may be seen from Figure 3, the counterbore 20 in the upper end of the hollow interior of the shell is substantially larger in diameter than shank portion 31 of the bolt-like device so as to provide an annular air chamber into which the cross bores 36—36 open. The top of the bladder has four grooves 37 formed in it which extend radially outwardly from the four sides of the recess provided by counterbore 20. These grooves continue down the sides of the upper portion 26 of the bladder as at 38. With the bladder in place inside of the shell, these grooves define air passageways which connect the respective air chambers or cells 29 to air pressure inside of the flexible hose. In each instance the air passageway enters the cell midway between the ribs 28, which, with the inner wall of the shell, define the cell.

Also in the lower portion of the bladder the inner wall is provided with a plurality of wedges or teeth 39, each one of which starts at a substantially flat shoulder 40 extending inwardly from the wall of the bladder and it then tapers down to blend into the wall at a point opposite the bottom of the groove 25 which engages over the lower rim of the shell. The sides of each one of the wedges or teeth may taper slightly toward one another down from the flat shoulder toward the place wherein the wedge blends with the wall. In the instance shown, sixteen such wedges or teeth are provided so that there are approximately four in each quadrant or cell area.

The bladder is further locked in place and sealed by means of a mouthpiece 41 which is adapted to engage around the lower end of the shell and which is threaded internally as at 42 so that it may be engaged with the threads 22 on the shell. The lower end of the mouthpiece is configured to provide an inwardly tapering throat 43 which terminates internally at a flat, annular offset shoulder 44 which is designed to engage the underside of the flange 24 on the bladder, and thus press the bladder upwardly to tightly seat the rim 23 within the slot or groove 25 which seals the lower end of the bladder with respect to the shell. As more fully explained in the copending application of Hund et al., the tapering throat of the mouthpiece serves to center the cup with respect to the bottle over which it is being engaged. The tapering teeth or wedges also serve this same function, being in effect a continuation of the slanting or tapering throat. In the copending application, the internal diame-

4

ter of the throat at the shoulder 44 is substantially less than the internal diameter of the bladder immediately above the shoulder. This relationship protects the bladder against cuts from the jagged edges of broken bottles over which it may be engaged. The same expedient may be used in the present instance. However, it is believed to be unnecessary because the added thickness in the wall material of the bladder provided by the teeth or wedges is found to be more than adequate to prevent cuts.

It will be noted that the shoulders 40 at the upper ends of the wedges are in a plane which is approximately half way between the upper and lower ends of the air cells. In addition to this, since the wall of the bladder above the shoulders is substantially thinner, and thus more inclined to bulge inwardly upon the application of air pressure to the cells, the shoulders are at the places of greatest inward distortion of the inflated bladder. Furthermore, the distance between the shoulders 40 and the top of the bladder is greater than the overall distance or height of the mouthpiece on a standard export beer bottle so that the shoulders in the inflated bladder are presented to the underside of the bulge which defines the mouthpiece. In this way the inner edges of the wedges only come into contact with the bottles. Quite often, beer bottles are returned to the brewery with a substantial amount of sticky substances on them and it has been found in the past that this may cause a bottle to adhere to the bladder after it is deflated so that the bottle is not released cleanly. By contrast, the line contacts at the inner edges of the shoulder of the wedges are found to break positively away from bottles having sticky substances upon them.

Reference is now made to Figure 6. The four ribs 28 which define the four individual cells 29 cause the bladder to inflate inwardly at four places only spaced evenly around the circumference of a bottle. The bottle is thus held evenly and securely. The controlled inward inflation presents less than all of the shoulders on the wedges to the bottle which further minimizes contact which could otherwise cause a sticky bottle to adhere to the bladder.

The construction thus provided is exceedingly simple to assemble. Either end of the hose 11 may be attached to the shell. The edge 17 on the upper end of the shell cooperates with the flat end of the hose surrounding the nipple 14 to seal this juncture and thus prevents leakage of air. The large head of the bolt-like device 32 serves to pull the top of the bladder snugly up against the top of the hollow interior of the shell so as to prevent leakage from the four grooves or passageways 28. The mouthpiece effectively seals the lower part of the bladder with respect to the shell. The outside of the mouthpiece and the shell may be provided with a series of ridges such as those shown at 45 to assist in the grasping of these two members in the application and removal of the mouthpiece. The simplified construction makes it possible to replace any one of the component parts of the lifting cup in a matter of minutes so that in the event of a break or a rupture the transfer machine does not have to be stopped for a long period of time for repair.

The taper which is provided at the upper end of the shell of the lifting device has utility in those installations having a holddown device to engage the removable bottle separators which are usually employed in cardboard cases. The bottle separators usually comprise strips of paper-board which are interlocked into a grid-like device designed to fit down into the case and provide a place for each one of the bottles packaged in the case. The hold-down device may comprise a series of bars or fingers which extend lengthwise or crosswise of the case, and which serve to hold the separator device in the case when the bottles are lifted from it. The tapering upper end of the lifting cup shell prevents it from becoming caught on the bars of the holddown device. It is also preferred that the mouthpiece be made of plastic material such as nylon which has a slippery surface. The use of a ma-

5

terial such as nylon also has the advantage over metal in that it cannot chip the upper edge of a bottle over which it is engaged. Furthermore, the combination of slippery surface and the use of a tapering throat in the mouthpiece assists materially in the self-centering action of the cup when it is engaged down over a bottle which is out of line with respect to the normal vertical axis of the cup. It will also be noted that the outer marginal edge of the mouthpiece is tapered slightly as at 46 which taper is provided so as to prevent the cups from being caught upon the upper edges of the cartons or cases from which bottles are being removed.

The improvements which are provided herein increase substantially the efficiency of the operation of an article transferring machine such as a bottle uncaser. The bottle engaging lugs or wedges 39 are surprisingly efficient in gripping and holding bottles. The edges provided at the flat shoulders at the upper ends of the lugs not only prevent bottles having sticky substances upon them from adhering to the bladder, but they also provide a surer grip on bottles. With the substantially smooth surfaces of the bladders employed heretofore, it was found that wet bottles or bottles having slippery substances upon them were inclined to slip out of the cups. It is desirable for a number of reasons to operate the bladders at a low pressure, for example at approximately six pounds per square inch, which pressure is not a very substantial force. The lugs, or wedges, increase the gripping action of the bladder by concentrating the relatively small force at the shoulders which securely grip the articles over which the cup is engaged.

Having described my invention I claim:

1. A lifting cup for article transfer apparatus comprising a shell having a cylindrical hollow interior which opens downwardly, a mouthpiece engaged on the lower end of said shell, said mouthpiece being configured to provide an outwardly and downwardly flaring lower rim portion for said shell, an inverted cup-shaped bladder fitting snugly into the hollow interior of said shell, said bladder being made of a rubber-like material, the exterior of the bladder in the lower portion thereof being configured to provide a plurality of discreet inflatable air cells between the bladder and the inside wall of the shell, means to seal the lower part of said bladder with respect to said shell, a flexible hose adapted to connect said shell to a source of air pressure, the interior of said hose being in communication with a chamber inside of said shell above said bladder, means to hold the top of the bladder snugly against the upper end of the hollow interior of the shell, a plurality of grooves in the outer side of the bladder in the upper portion thereof connecting said chamber to the respective cells surrounding the lower portion of the bladder whereby upon the application of fluid pressure to said hose the respective cells are inflated inwardly into article gripping relationship with an article over which the bladder is engaged, and a plurality of wedge-shaped article gripping members formed as an integral part of the inner wall of the bladder in the lower portion thereof, said article gripping members presenting edges in a horizontal plane which are substantially half-way between the top and bottom of the cells, whereby said edges are brought into contact with an article inside of said bladder upon the inflation thereof.

2. A lifting cup for article transfer apparatus comprising a shell having a cylindrical hollow interior which opens downwardly, a mouthpiece threadingly engaged on the lower end of said shell, said mouthpiece being configured to provide an outwardly and downwardly flaring lower rim portion for said shell, an inverted cup-shaped rubber bladder fitting snugly into the hollow interior of said shell, the exterior wall in the lower portion of said bladder being configured to provide four discreet individual air cells which are spaced evenly around the bladder between the bladder and the inside wall of the shell, means at the lower end of said shell cooperable with

6

said mouthpiece to seal the lower part of said bladder with respect to said shell, a flexible hose to connect said shell to a source of air pressure, the interior of said hose being in communication with the respective cells surrounding the lower portion of the bladder, and means to prevent the downward collapse of said bladder upon the application of air pressure to said shell, whereby upon the application of fluid pressure to said hose the four cells are inflated inwardly into article gripping relationship with an article over which the bladder is engaged.

3. A lifting cup for article transfer apparatus comprising a shell having a hollow interior which opens downwardly, an inverted cup-shaped rubber bladder fitting snugly into the hollow interior of said shell, the exterior wall in the lower portion of said bladder being configured to provide a plurality of individual inflatable air cells between the bladder and the inside wall of the shell, means to seal the lower part of said bladder with respect to the lower rim of said shell, a flexible hose to connect said shell to a source of air pressure, the interior of said hose being in communication with a chamber inside of said shell above said bladder, means to hold the top of the bladder snugly against the upper end of the hollow interior of the shell, a plurality of grooves in the outer side of the bladder in the upper portion thereof connecting said chamber to the respective cells surrounding the lower portion of the bladder, whereby upon the application of air pressure to said hose the individual cells are inflated inwardly into article gripping relationship with an article over which the bladder is engaged.

4. A lifting cup for article transfer apparatus comprising a shell having a hollow interior which opens downwardly, a mouthpiece engaged on the lower end of said shell, an inverted cup-shaped bladder fitting snugly into the hollow interior of said shell, said bladder being made of a rubber-like material, the exterior wall in the lower portion of said bladder being configured to provide a plurality of individual inflatable cells between the bladder and the inside wall of the shell, means to seal the lower part of said bladder with respect to the lower rim of said shell, a flexible hose to connect said shell to a source of fluid pressure, the interior of said hose being in communication with the respective cells surrounding the lower portion of the bladder, and means to prevent the downward collapse of said bladder upon the application of air pressure to said shell, whereby upon the application of fluid pressure to said hose the individual cells are inflated inwardly into article gripping relationship with an article over which the bladder is engaged.

5. A lifting cup as set forth in claim 4 in which a plurality of downwardly tapering lugs are provided as an integral part of the inner wall of the bladder, said lugs terminating at their upper ends at shoulders which extend inwardly from the inner wall of the bladder to present article engaging edges in a horizontal plane which is substantially midway between the upper and lower ends of the inflatable cells.

6. A lifting cup for article transfer apparatus comprising a plastic shell having a cylindrical hollow interior which opens downwardly, an inverted cup-shaped bladder fitting snugly into the hollow interior of said shell, means to seal the lower annular edge of the bladder to the lower rim of the shell, the central area of the top of the bladder having a circular opening therein, a large headed bolt-like device having a shank fitting snugly in said opening, said device threading up into the shell above said hollow interior with the large head thereon pressing the top of the bladder snugly against the upper end of the hollow interior of the shell, a chamber formed in said shell above the bladder, a flexible hose engaging the upper end of said shell, a passageway connecting the interior of said hose to said chamber, a plurality of grooves in the outside of said bladder extending from said chamber and down along the sides of the bladder to define air passageways with the inner wall of the shell, and the

7

lower portion of the bladder being configured to provide individual cells between the outside thereof and the inner wall of the shell, said cells individually connected to said chamber by said grooves and being spaced equally around the lower portion of the bladder, whereby upon the application of air to the hose the individual cells are inflated inwardly to grasp an article over which the bladder is engaged.

7. A lifting cup for article transfer apparatus comprising a plastic shell having a cylindrical hollow interior which opens downwardly, an inverted cup-shaped bladder fitting snugly into the hollow interior of said shell, means securing the upper end of said bladder in place within the shell, means to seal the lower annular edge of the bladder to the lower rim of the shell, a chamber formed in said shell above said bladder, a plurality of grooves at the outside of the upper portion of said bladder extending from said chamber and down along the sides of the bladder to define air passageways with the inner wall of the shell, and the lower portion of the bladder being configured to provide inflatable cells between the outside thereof and the inner wall of the shell, said cells individually connected to said chamber by said grooves and being spaced equally around the lower portion of the bladder, whereby upon the application of air to the chamber the individual cells are inflated inwardly to grasp an article over which the bladder is engaged.

8. A lifting cup for article transfer apparatus comprising a plastic shell having a cylindrical hollow interior which opens downwardly, a mouthpiece which is made of a slippery plastic such as nylon threadedly engaged on the lower end of said shell, said mouthpiece being configured internally to provide an outwardly and downwardly flaring throat for said shell, an inverted cup-shaped rubber bladder fitting snugly into the hollow interior of said shell, said bladder having an annular channel-shaped flange extending around the lower edge thereof which is engageable over the lower rim of said shell, an annular shoulder on said mouthpiece engageable with said channel-shaped flange on the bladder to press it tightly into engagement with the rim on the lower edge of said shell to seal the lower end of said bladder with respect to said shell, means engaging the shell and pressing the top of said bladder tightly against the top interior of said shell, the lower annular area at the outside of said bladder having a plurality of recesses therein defining inflatable air cells with the inner wall of the shell, and means to apply air pressure simultaneously to the respective air cells to inflate inwardly the lower portion of said bladder into article gripping engagement with an article over which the cup is seated.

9. A lifting cup for article transfer apparatus comprising a plastic shell having a cylindrical hollow interior which opens downwardly, a mouthpiece which is made of a slippery plastic material threadedly engaged on the lower end of said shell, said mouthpiece being configured to provide an outwardly and downwardly flaring lower throat for said shell, an inverted cup-shaped rubber bladder fitting snugly into the hollow interior of said shell, said bladder having an annular channel-shaped flange extending around the lower edge thereof which is engageable over the lower rim of said shell, an annular shoulder on said mouthpiece engageable with the channel-shaped flange on the bladder to press it tightly into engagement with the rim on the lower end of said shell to seal the lower end of the bladder with respect to said shell, a flexible hose connected to the upper end of said shell, a plurality of air passageways extending from said hose between the bladder and the inner wall of said shell to the lower portion of said bladder, the lower annular area at the outside of said bladder having a plurality of recesses therein defining inflatable air cells with the inner wall of the shell, said

8

passageways connecting said cells to the hose, whereby upon the application of air pressure to said hose the respective air cells inflate inwardly into article gripping engagement with an article over which the cup is seated, and means securing the upper end of said inverted cup-shaped rubber bladder relative to said shell to prevent said bladder from collapsing downwardly upon the application of air pressure to the upper end of said shell.

10. A lifting cup for article transfer apparatus comprising a shell having a cylindrical hollow interior which opens downwardly, an inverted cup-shaped bladder fitting snugly into the hollow interior of said shell, means to seal the lower annular edge of the bladder to the lower rim of the shell, a chamber formed in said shell above the bladder, a flexible hose engaging the upper end of said shell, a passageway connecting the interior of said hose to said chamber, a plurality of grooves in the outside of said bladder to define with the inner wall of the shell air passageways, the lower portion of the bladder being configured to provide inflatable air cells between the outside thereof and the inner wall of the shell, said cells individually connected to said chamber by said grooves and being spaced equally around the lower portion of the bladder, means to prevent the downward collapse of the bladder upon the application of air pressure to said chamber, whereby upon the application of air to the hose the individual cells are inflated inwardly, and a plurality of lugs formed as an integral part of said bladder at the inside thereof adapted to move into article gripping position upon the inflation of said cells.

11. A lifting cup as set forth in claim 4 in which a plurality of lugs is provided on the inner wall of the bladder, whereby the application of air pressure to the respective cells surrounding the lower portion of the bladder brings said lugs into engagement with an article over which the cup is disposed.

12. A lifting cup as set forth in claim 4 in which the hose comprises a length of readily flexible, resilient material such as rubber having a projecting threaded nipple centered in an end thereof, the end of the hose surrounding said nipple presenting a flat annular shoulder, said shell having a threaded bushing to receive the threaded nipple, said shell having a flat area surrounding said bushing against which the shoulder on the hose may be tightened to seal the hose to the shell and thereby prevent leakage of air from the upper end of said shell.

13. A lifting cup comprising a shell, inflatable means in said shell, a threaded bore in the top of said shell, means defining air passageways in said shell interconnecting said inflatable means and said threaded bore, a hose to connect said shell to a source of air pressure, said hose being of readily flexible resilient material such as rubber and having a substantially thick wall, a threaded nipple projecting from an end of said hose and threading into said threaded bore, the end of the hose surrounding the nipple being flat to provide a substantially wide annular shoulder, and the annular area of the shell immediately surrounding said threaded bore being flat, whereby the nipple may be tightened down into said threaded bore to bring the flat annular shoulder on the end of the hose into sealing contact with the annular area of the shell immediately surrounding the threaded opening to provide an air-tight seal for the juncture of the hose and the shell.

14. A lifting cup as set forth in claim 13 in which the shell is configured to provide a ridge which encircles said annular area immediately surrounding the threaded bore and which is contactable by the end of the hose when the nipple is tightened down as aforesaid.

References Cited in the file of this patent

UNITED STATES PATENTS

2,283,613	Schmidt	May 19, 1942
2,308,209	Schmutzer et al.	Jan. 12, 1943
2,695,190	Meierjohan	Nov. 23, 1954