March 17, 1964 R. W. McGILL 3,125,370

SELF-CENTERING ARTICLE GRIPPERS

Filed Jan. 3, 1962

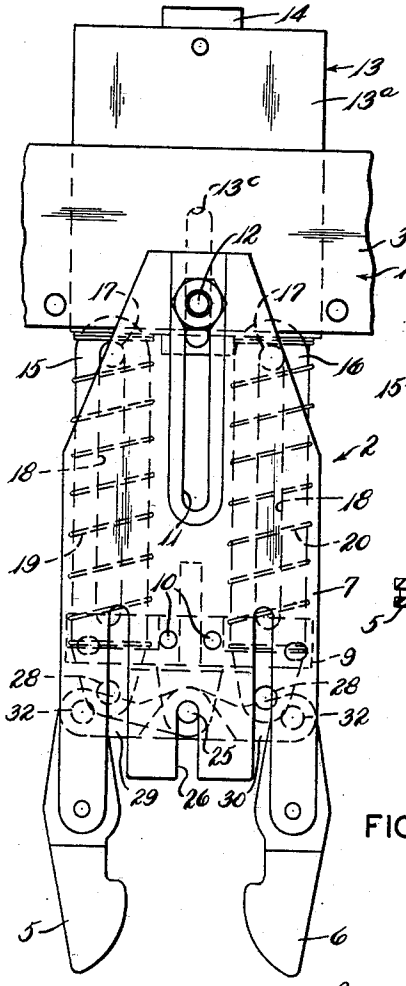


FIG. 1

FIG. 4

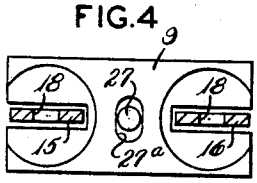


FIG. 5

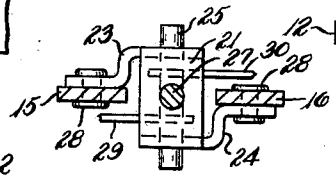


FIG. 6

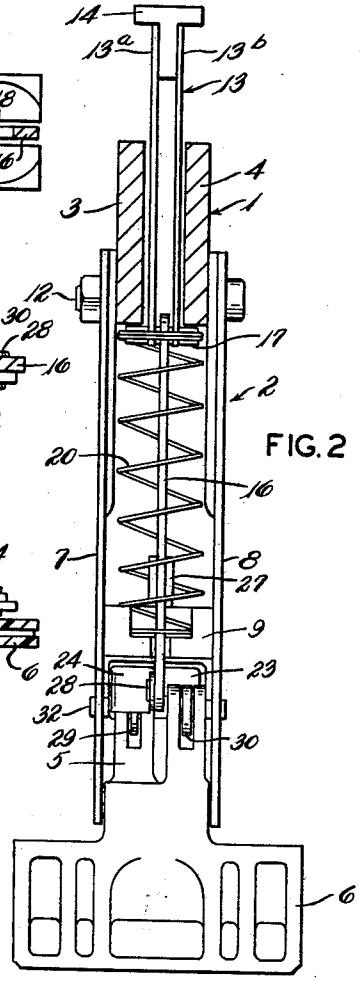


FIG. 2

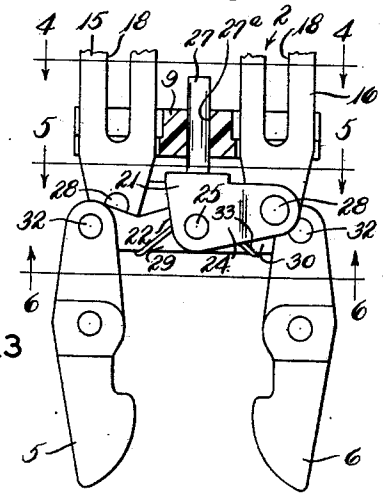


FIG. 3

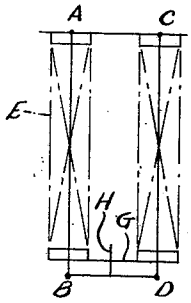


FIG. 7

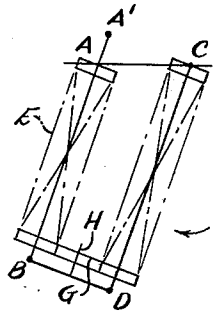


FIG. 8

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SELF-CENTERING ARTICLE GRIPPERS

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The present invention relates to article grippers, and particularly to apparatus for picking up articles such as bottles, containers or the like, transporting them a distance, and then depositing the articles in a second position.

Heretofore there have been various types of article grasping apparatus, or bottle grippers provided and various types of such machines and members have been produced commercially in some appreciable quantities.

The present invention particularly relates to an improvement in the bottle gripper structure shown in Bruce G. Copping's pending patent application Serial No. 91,405, filed February 24, 1961. Apparatus made in accordance with such invention has been sold commercially in some quantity and has provided satisfactory article and bottle gripping, transport and release action. However, in some instances, such prior apparatus, which includes carrier members or support bars that would be carried by a conveyor and have a plurality of the bottle grippers extending downwardly therefrom for article engaging action, has had problems in maintaining such bottle grippers in a centered, vertical position with relation to its support or carrier bar.

The general object of the present invention is to provide novel and improved bottle gripper apparatus characterized by the self-centering action thereof when any of the bottle grippers are moved laterally from their normal centered position.

A further object of the invention is to provide a pivotally positioned substantially parallelogram shaped means in the assembly of gripping jaws and associated controls in article grippers and wherein a pair of laterally spaced lost-motion connecting means are present and have associated compressed coil springs urging the lost-motion means to the extremities of their positions normally, but with one such lost-motion means being adapted to be moved outwardly of the parallelogram when the article grippers are moved laterally to further compress one positioned coil spring means and aid in snapping the means back into a normal centered position when the external force applied thereto is removed.

Another object of the invention is to provide a special link having only controlled vertical movement in a parallelogram-type of a control in article gripper apparatus and the like and where a normal parallelogram relationship between such special link and other parts of the article grippers is altered when the article gripper is moved laterally from a normal vertical position whereby stresses are set up in the apparatus to aid in returning it to its normal centered position.

A further object of the invention is to provide improved article gripper apparatus using special controls for toggles used in article gripping and release action to aid in centering the article gripper if laterally displaced.

The foregoing and other objects and advantages of the invention will be made more apparent as the specification proceeds.

Attention is now particularly directed to the accompanying drawings, wherein:

FIG. 1 is an elevation of an improved bottle or article gripper embodying the principles of the invention;

FIG. 2 is a side elevation, partially in vertical section, of the apparatus of FIG. 1;

FIG. 3 is an enlarged elevation, partly in vertical section, of the article grippers and associated control means of FIG. 1;

FIGS. 4, 5 and 6 are fragmentary horizontal sections taken on lines 4—4, 5—5 and 6—6, respectively, of FIG. 3; and

FIGS. 7 and 8 are diagrammatic views illustrating the positioning of the gripper jaw means and controls of the invention for effective centering action therein with FIG. 8 specifically showing the action in such members when an external force is applied to a gripper jaw assembly to move it laterally from its normal centered position.

Generally speaking, the invention relates to article transfer apparatus including a carrier frame provided to engage an article transfer member, and an article gripper secured to the carrier frame and normally extending downwardly therefrom, which article gripper includes a positioning or frame means engaging the carrier frame but extending downwardly therefrom and being movable towards and from the carrier frame, which frame means can be moved laterally of the carrier frame by external forces to aid in article locating and engaging action, a pair of gripper jaws pivotally positioned on the frame means, a pair of lost-motion, laterally spaced connecting means operatively engaging the gripper jaws and the frame means for controlling the position of the gripper jaws, and a pair of compressed coil spring members individually engaging the pair of connecting means to urge the frame means to a normally centered position with relation to the carrier frame, and where the connecting means include a centering unit operatively engaging the frame means and the coil spring means to urge the frame means normally to a centered position on the carrier frame.

With reference now to the details of the structure shown in the drawings, a portion of an article transfer apparatus is indicated, and a portion of a carrier frame 1 is shown. Such carrier frame 1 is of any suitable construction and is adapted to be attached to a member, such as a conveyor or other unit, by which members carried by the carrier frame 1 can be moved from one place to another and articles can be picked up and deposited at different portions of the movement, as desired. This carrier frame 1 is provided with one article gripper indicated as a whole by the numeral 2. While FIG. 1 of the drawings only shows one article gripper 2 in association with the carrier frame 1, in some instances it is desirable to provide a plurality of laterally spaced article grippers 2 at spaced portion of the carrier frame 1. Such carrier frame 1 would extend transversely of the conveyor means (not shown) to which it would be secured and these article grippers 2 are adapted to engage with articles in different laterally spaced streams of articles to be processed. The apparatus of the invention is designed to function automatically and, to this end, the article or bottle grippers 2 will engage articles in carrier cases therefor and will firmly grasp such articles to withdraw them from the cases and to move them to other positions at which places the articles can be released from the individual article grippers 2.

The carrier frame 1 of the invention is shown in FIG. 2 and may comprise a pair of spaced metal plates 3 and 4 that are held in spaced relation by suitable members (not shown). A pair of gripper jaws 5 and 6 of any suitable design are piovtally carried by each of the article grippers 2. These article gripper jaws 5 and 6 are journalled on positioning members, or frame means in the article grippers and comprising a pair of side plates 7 and 8. These side plates 7 and 8 are secured in spaced relationship to each other by a member, such as a cross plate 9, secured to the side plates 7 and 8, as by a plurality of rivets 10. The cross plate 9 is normally positioned

vertically intermediate the ends of the side plates **7** and **8** and the cross plate normally has a horizontal position parallel with the lower surface of the carrier frame **1**. The upper ends of the frame means for the article grippers have vertically extending slots **11** therein and a bolt **12** extends through the slots **11** to secure each of the article grippers **2** to the carrier frame **1** for relative vertical movement therebetween. The downward movement of the side plates **7** and **8** with relation to the carrier frame **1** is limited by the bolt **12** engaging the upper ends of the slots **11**. Both the article gripper jaws **5** and the cross plates **9** may be made from a suitable plastic material, such as nylon or other relatively hard, durable plastic that can be molded to a desired shape.

In the apparatus of the invention, the positions of the jaws are controlled by a control member **13** shown as comprising a pair of vertically extending plates **13***a* and **13***b* associated with the carrier frame **1**. The control member **13** has a top plate or flange **14** secured thereto by which members (not shown) may engage the control member **13** and force it downwardly with relation to the carrier frame **1** for control action, as hereinafter described. FIGS. 1 and 2 of the drawings clearly bring out the fact that the control member **13** extends vertically upwardly and downwardly from the carrier frame **1**, and it connects at its lower end to a pair of lost-motion connecting members, or links **15** and **16** that extend downwardly in the article gripper **2**. The control member **13** engages the upper portions of the connecting links **15** and **16** by members, such as pins **17**, that extend through elongate slots **18** formed in the links **15** and **16**.

In order to urge the side plates **7** and **8** downwardly, and the control member **13** upwardly to the lower end of a slot **13***c* formed therein, but to permit relative vertical movement therebetween and with relation to the carrier frame **1**, a pair of coil springs **19** and **20** are received in laterally spaced but compressed positions intermediate the cross plate **9** and the lower end of the control member **13**. Hence the side plates **7** and **8** are urged to their lowermost positions, as shown in FIG. 1, in the normal positioning of the article gripper **2**.

It is an important feature of the present invention that the article gripper **2** is provided with means therein to aid in positively centering such article gripper **2** in relation to its dependent, laterally pivotal position on the carrier frame **1**. Hence if an article gripper **2** strikes an article or other obstruction, it can move laterally a short distance to try to accommodate itself to the position of the article for picking it up, or discharging it, as desired, as long as some external force is applied in some manner to the article gripper. However, when such external force is removed, it is very desirable that the article gripper **2** then take its centered position rapidly in the apparatus. Such result is achieved by means including a rocker link, or control link **21** that has a substantially inverted U-shaped center section **22** provided therein with oppositely directed arms **23** and **24** fixedly extending from opposite sides thereof. The position of this control link **21** is regulated by means of a control pin **25** that extends through the center section **22** of the control link **21** and is received in vertically extending slots **26** provided at the lower ends of each of the metal plates **3** and **4** whereby such control pin **25** will limit the position of the control link and relative vertical movement between the control link and the side plates **7** and **8**. However, to maintain such control ilnk **21** in a substantially horizontal position, parallel with the cross plate **9** at all times, a control plunger or pin **27** is provided and is suitably secured to the control link **21**. Such control pin or plunger **27** extends vertically of the article gripper **2** along the center axis thereof and is snugly and slidably engaged with a vertically directed hole **27***a* formed in the cross plate **9**.

FIG. 3 of the drawings clearly brings out the fact that the lost-motion connecting links **15** and **16** extend down through slots in the cross plate **9** so that the control link **21** is positioned below such cross plate **9** and one end of each of the links **15** and **16** is pivotally connected, respectively, to one of the arms **23** and **24** on the control link, again as best shown in FIG. 3, by means such as rivets **28**.

The invention also contemplates a toggle action for controlling the position of the article gripper jaws **5** and **6** and hence a pair of toggle arms **29** and **30** are pivotally secured at one end to the control pin **25** and with the opposite ends of these toggle arms **29** and **30** being pivotally connected to the upper ends of the gripper jaws **5** and **6**, as by means of pins or rivets **32**.

The article grippers of the invention also include a suitable spring means **33** that is carried by the control pin **25** and has end portions thereof engaging the toggle arms **29** and **30** to force such toggle arms upwardly to pivot inwardly at all times to endeavor to pull the gripper jaw upper ends inwardly at all times, and hence to move the gripper jaws to their open, or article engaging position, while the closed article grasping position is shown in FIGS. 1 and 3. When no external forces are applied to the article gripper **2**, the gripper jaws and control means will take their operative closed positions, as indicated. The reaction forces from the ends of the spring means **33**, as transferred to the control pin **25**, urge it downwardly at all times. However, when the control member **13** is moved down towards the carrier frame **1**, then the jaws **5** and **6** are moved to their opened position for either article releasing, or article engaging action, as desired.

FIGS. 7 and 8 of the drawings best show, in a diagrammatical manner, the functioning of the parallelogram type of controls for the jaw and gripper means of the invention and the centering action obtained. Hence, FIG. 7 indicates the pair of lost-motion connecting means, corresponding to the members **15** and **16** of the other figures of the drawings and wherein the lost-motion connecting means comprise two equal length members A—B and C—D. These two members are pivotally connected to a top member indicated by the line A—C, and to a bottom member indicated at B—D. The member B—D is held in fixed relationship to a support plate, or platform G by a pin H that slidably engages the platform G and maintains the member B—D parallel with the fixed support G. Now when the parallelogram support unit has had some external force applied thereto, it swings over in a lateral direction, as indicated in FIG. 8. At such time, the original member A—B has been forced vertically upwardly to assume the position indicated at A^1—B, and the spring member E has hence been compressed by such action. Thus the further compression of the spring E results in a change of the original parallelogram by reduction in the length of the size A—B thereof and creates compressive forces that will return the parallelogram structure to its normal centered position, as indicated in FIG. 7.

It will be seen that the maintenance of the member B—D in parallel relationship with the shelf G at all times has altered the action of gripper assembly means such as is shown in the previously filed Copping application referred to hereinbefore.

The apparatus of the invention includes connecting means including the links **15** and **16**, the rocker link **22**, and the links **29** and **30**, so that such connecting means will operatively engage the gripper jaws to operatively connect them to the control means **13** in the apparatus. As in the previous type of a gripper jaw described, movement of the control member **13** towards the carrier frame or bar **1** and the action of the spring **33** will effectively control the positioning of the gripper jaws **5** and **6**. However, the connecting means and associated parts are modified to have different actions on lateral displacement of the article grippers.

It will be realized that the apparatus of the invention can be used for engaging bottles, jars, cans and other containers, or articles, as desired, dependent upon the original

design provided in the apparatus. The apparatus can pick up articles at any desired loading station and release them at a desired location through proper means brought into engagement with the control member **13**. The control link **21** and its associated means can be considered a centering unit in the apparatus.

By the article grippers **2** of the invention, a very effective, automatic, substantially instantaneous centering action is obtained on each of the article grippers when it has been moved from its normally centered position by some externally applied force. The rapid recentering positioning action of the article grippers aids in obtaining improved action from the apparatus of the invention and the apparatus with which it can be operatively associated. Hence it is believed that the objects of the invention have been achieved.

While one complete embodiment of the invention has been disclosed herein, it will be appreciated that modification of this particular embodiment of the invention may be resorted to without departing from the scope of the invention as defined in the appended claims.

What I claim is:

1. In a bottle, or article gripping apparatus,
a carrier frame,
a dependent positioning means pivotally associated with said carrier frame and normally centered with relation thereto,
a pair of pivotal gripper jaws operatively carried by said positioning means,
a pair of coil spring means operatively engaging said positioning means and said carrier frame for movement of said positioning means towards and away from said frame but normally to urge said positioning means away from said frame,
a control member for said gripper jaws operatively carried by said carrier frame,
connecting means including a pair of lost-motion members operatively extending between and connecting said control member to said gripper jaws to move them from a locked bottle gripping position to bottle engaging and/or releasing position when said control member is moved,
a support plate carried by said positioning means and forming an end stop for one end of said coil spring means, and
a rocker link positioned parallel to said support plate and slidably connected to said support plate for only movement towards and away from said support plate while maintained parallel thereto,
said rocker link having fixedly positioned oppositely extending arms thereon parallel to said support plate and pivotally connected to said lost-motion members to provide lost motion in one of said members on lateral deflection of said positioning means.

2. In a bottle, or article gripping apparatus,
a carrier frame,
a dependent positioning means pivotally associated with said carrier frame and normally centered with relation thereto,
a pair of pivotal gripper jaws operatively carried by said positioning means,
a pair of coil springs operatively engaging said positioning means and said carrier frame for movement of said positioning means towards and away from said frame but normally to urge said positioning means away from said frame,
a control member for said gripper jaws operatively carried by said carrier frame and operatively engaging said coil spring means to be urged away from said positioning means,
connecting means including a spring and a pair of lost-motion members operatively extending between and connecting said control member to said gripper jaws to aid in moving them from a locked bottle gripping position to bottle releasing position when said control member is moved,
a fixed means carried by said positioning means and forming an end stop for one end of said pair of coil springs, and
a member positioned parallel to said fixed means for movement only towards and away from said fixed means while maintained parallel thereto,
said member being pivotally connected to both of said lost-motion members to provide lost motion in one of said members by movement of such member towards said carrier frame on lateral deflection of said positioning means to stress said coil springs unevenly and aid in centering said positioning means.

3. In a bottle, or article gripping apparatus,
a carrier frame,
a positioning means movably associated with said carrier frame,
a pair of pivotal gripper jaws operatively carried by said positioning means,
spring means operatively engaging said positioning means and said carrier frame for movement of said positioning means towards and away from said frame but normally to urge said positioning means away from said frame,
a pair of connecting means operatively extending between and connecting said positioning means to said gripper jaws to move them from a locked bottle gripping position to a bottle releasing position when said positioning means is moved towards said carrier frame, and
a support plate carried by said positioning means and forming an end stop for one end of said spring means,
said connecting means including lost-motion means and a common rocker link positioned parallel to said support plate and slidably connected to said support plate for only movement towards and away from said support plate while maintained parallel thereto.

4. In bottle or article gripping apparatus,
an elongate carrier frame adapted to be secured to a conveyor to extend transversely thereof,
a dependent positioning member operatively secured to spaced portions of said carrier frame for limited vertical movement towards and away from said carrier frame,
a cross plate on said positioning member adjacent the lower end thereof,
a pair of gripping jaws pivotally secured to said positioning member adjacent the lower ends thereof but below said cross plates,
a control member for said pair of gripping jaws operatively carried by said carrier frame and extending thereabove,
a pair of coil spring means operatively engaging said positioning member and said control member to urge each away from said carrier frame in opposite vertical directions but to permit either or both of such members to move towards said carrier frame,
one end on each said coil spring means being seated on said cross plate,
a control link having fixed arms extending therefrom parallel to said cross plate,
a control pin engaging said positioning member for limited movement with relation thereto and also secured to said control link,
a pair of lost-motion connecting link means connecting said control member to the said control link in said positioning member to move it vertically upon movement of said control member towards said carrier frame,
a pin slidably engaging said cross plate and fixedly secured to said control link to retain it parallel to said cross plate, and
toggle arms pivotally and individually connecting said control pin to said gripping jaws to control the posi-

tioning thereof, said toggle arms being biased to move said gripping jaws to their open position.

5. In bottle or article gripping apparatus,

a carrier frame adapted to be secured to a conveyor,

a dependent positioning member operatively secured to said carrier frame for limited vertical movement towards and away from said carrier frame,

a cross plate on said positioning member,

a pair of gripping jaws pivotally secured to said positioning member adjacent its lower end,

a control member for said pair of gripping jaws operatively carried by said carrier frame and extending thereabove,

a pair of laterally spaced compressed coil spring means operatively engaging said positioning members and said control member to urge each away from said carrier frame in opposite vertical directions but to permit either or both of such members to move towards said carrier frame,

one end on each said coil spring means being seated on said cross plate,

a control link positioned parallel to said cross plate,

a pair of longitudinally slotted lost-motion connecting link means extending through said cross plate and connecting said control member to said control link in said positioning member to move it upon movement of said control member towards said carrier frame,

a pin slidably engaging said cross plate and fixedly secured to said control link to retain it parallel to said cross plate,

toggle means operatively connecting said control link to said gripping jaws to control the positioning thereof, and

resilient means engaging said toggle means to urge said gripping jaws to their open position,

one of said connecting link means being moved vertically upwardly when said positioning member is moved laterally by an external force and is snapped back into normal position when the external force is removed.

6. In a bottle, or article gripping apparatus,

a carrier frame,

a dependent positioning means pivotally associated with said carrier frame and normally centered with relation thereto,

a pair of pivotal gripper jaws operatively carried by said positioning means,

a pair of coil springs operatively engaging said positioning means and said carrier frame for movement of said positioning means towards and away from said frame but normally to urge said positioning means away from said frame,

a control member for said gripper jaws operatively carried by said carrier frame and operatively engaging said coil spring means to be urged away from said positioning means,

connecting means including a resilient member and a pair of lost-motion members operatively extending between and connecting said control member individually to said gripper jaws to aid in moving them from a locked bottle gripping position to an open bottle releasing position when said control member is moved towards said positioning means, and

fixed means carried by said positioning means and forming an end stop for one end of each of said pair of coil springs, the improvement comprising

a control member positioned parallel to said fixed means for only movement towards and away from said fixed means while maintained parallel thereto, and

said control member being pivotally connected to both of said lost-motion members by sections of said control member maintained parallel to said fixed means to provide lost-motion in one of said lost-motion members on lateral deflection of said positioning means to stress said coil springs unevenly and aid in centering said positioning means.

7. In article transfer apparatus, a carrier frame for operatively engaging a member such as an article transfer conveyor or the like; and

an article gripper secured to said carrier frame and comprising

frame means including a pair of side members and a cross member secured to and extending between the side members intermediate the ends thereof, which frame means engages the carrier frame and extends downwardly therefrom being pivotally movable in one plane with relation to the carrier frame to aid in article locating and engaging action;

a control member extending upwardly from and slidably engaging said carrier frame;

a control link including opposed arms positioned parallel to said cross plate and engaged therewith by means to maintain such parallel relationship but to permit vertical movement therebetween;

a pair of gripper jaws pivotally positioned on said frame means;

a pair of resilient, lost-motion connecting means operatively engaging and extending between said control member and said control link; and

means including a resilient member operatively connecting the arms of said control link to said gripper jaws to urge them normally to an open release position and to urge said connecting means downwardly, movement of said control member towards said cross member effecting movement of said gripper jaws from a closed to an open position, but with lateral movement of said frame means in said plane merely producing lost-motion in one of said connecting means.

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