

April 15, 1969

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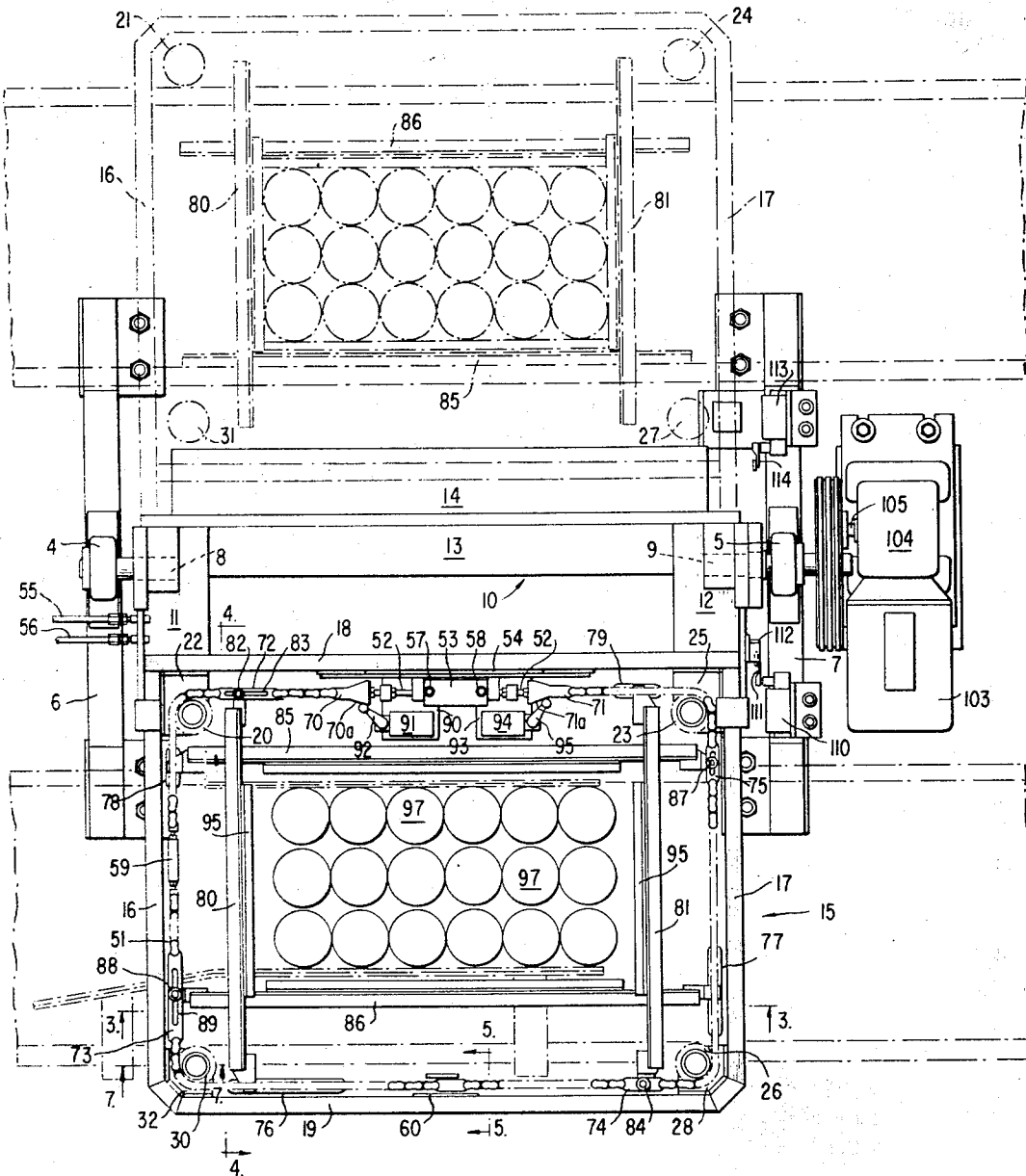
3,438,515

CLAMPING AND INVERTING MECHANISM FOR AUTOMATIC CASE LOADER

Filed Oct. 28, 1966

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FIG. 1



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FIG. 2

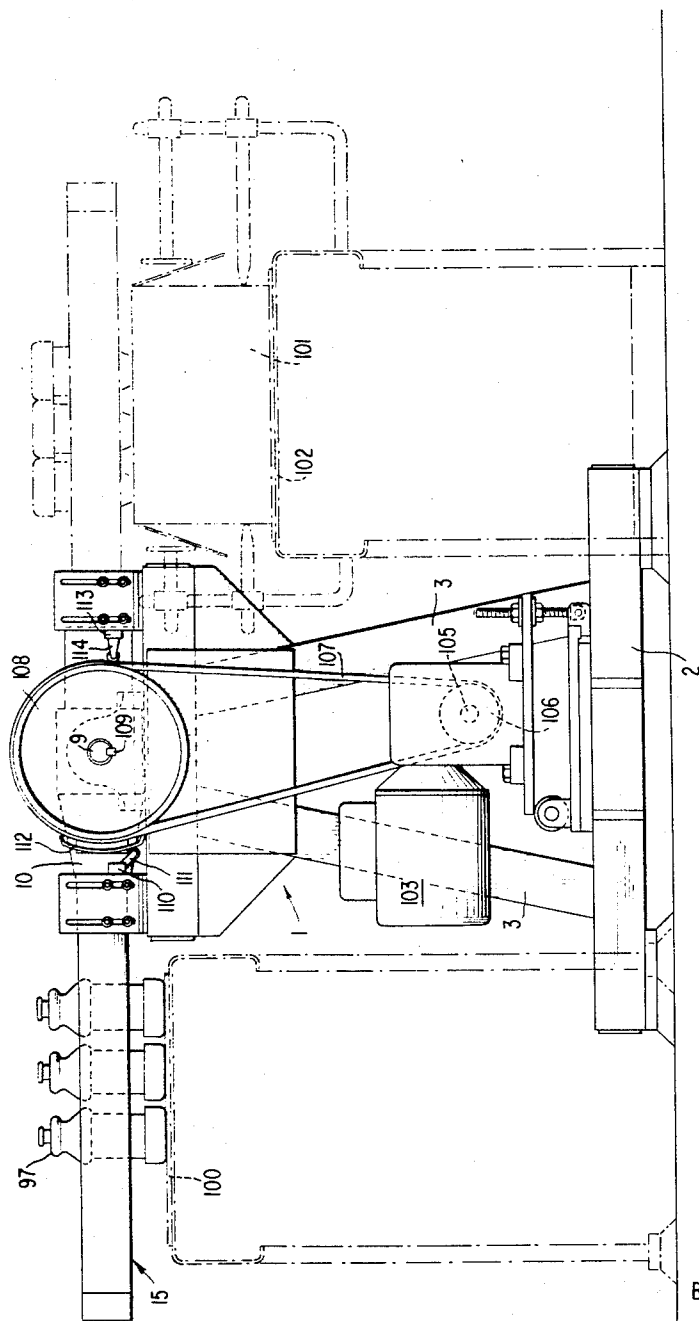
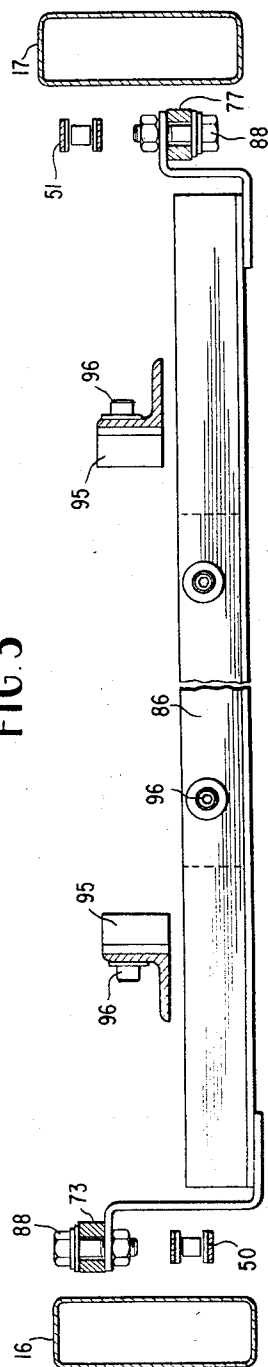


FIG. 3



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FIG. 4

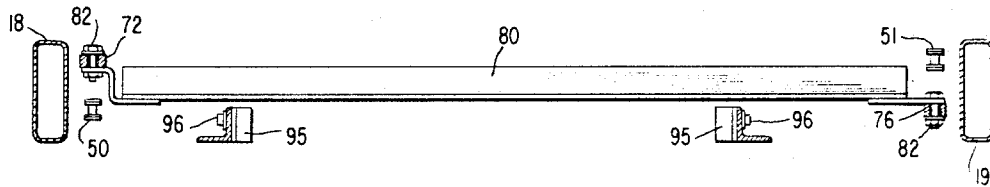


FIG. 5

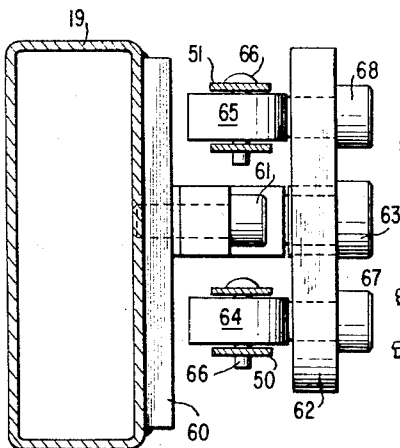


FIG. 6

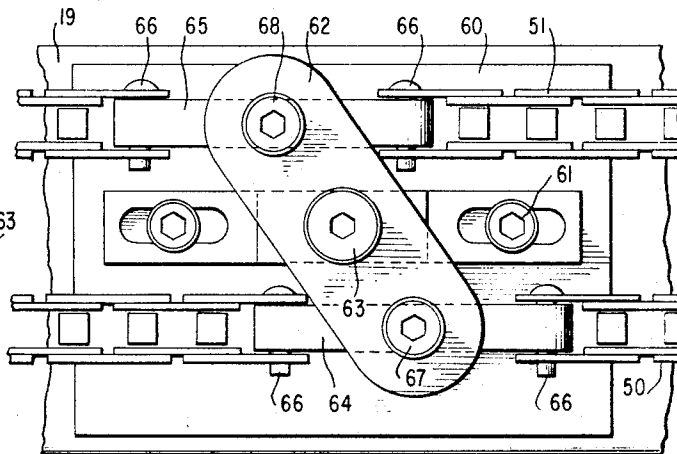
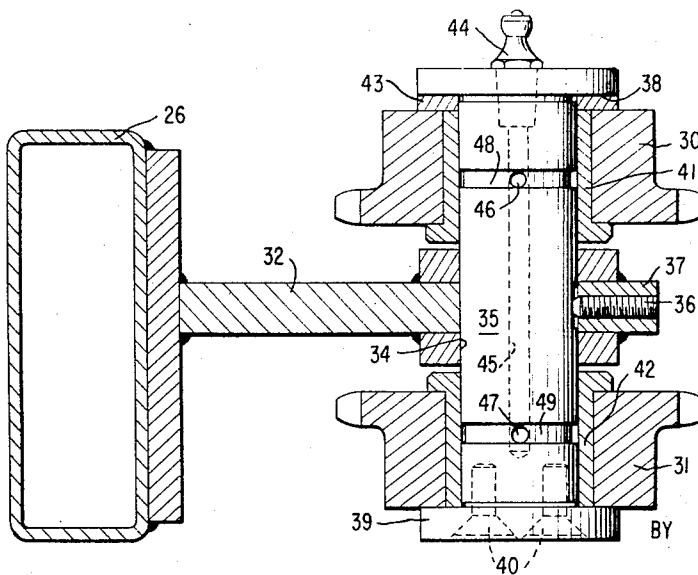


FIG. 7



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3,438,515
**CLAMPING AND INVERTING MECHANISM FOR
AUTOMATIC CASE LOADER**
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U.S. Cl. 214—1 13 Claims

This invention relates to case loading apparatus of the type in which articles to be loaded are assembled into a group, then inverted and loaded into cases in the inverted condition. More particularly, this invention relates to an improved article clamping and inverting mechanism for use in such a case loading apparatus.

In a copending application by Lawrence D. Ninneman, U.S. patent application Ser. No. 589,877, filed Oct. 27, 1969, assigned to the assignee of the present application, an article packaging apparatus is disclosed, in which packaging apparatus a plurality of articles to be loaded in a case are assembled into a group (preferably a full case load, or a full layer if the articles are packaged in the case in layers) and the formed group is then clamped from opposite sides and simultaneously inverted and transferred from the group forming station to a case loading station. The formed group is then released and permitted to fall, by gravity, in the inverted position, into an open case. While the improved clamping mechanism of the present invention may have other uses, it is particularly well adapted for use in such a case packaging apparatus. Accordingly, an object of the present invention is to provide an improved article clamping and transfer mechanism for use in automatic case packaging apparatus.

Another object of the invention is to provide such a clamping device which is fast acting and reliable.

Another object of the invention is to provide such a clamping device which automatically applies the same clamping load regardless of variations in size or configuration of the articles clamped.

Another object of the invention is to provide such a clamping device which is operable to clamp articles simultaneously from four sides.

In the attainment of the foregoing and other objects, an important feature of the invention resides in providing spaced, generally parallel clamping bars which are mounted for transverse movement toward and away from one another to clamp or release articles disposed therebetween. A pair of elongated supporting elements are mounted in generally parallel spaced relation to one another at each end of the clamping bars in substantially perpendicular relation thereto, and means are provided for simultaneously moving the support members of each pair in a generally longitudinal direction with the individual members of each pair moving in opposite directions. The arrangement is such that the movement of the individual support elements of each pair corresponds to movement of the individual support elements of the parallel pair of support elements, and the clamping bars each have their respective ends mounted on the support elements for transverse movement toward or away from one another depending upon the direction of movement of the support elements.

Other objects and advantages of the present invention will become apparent from the following detailed description, taken with the drawings, in which:

FIG. 1 is a top plan view of the article clamping mechanism according to the present invention, with certain parts shown in an alternate position in phantom line;

FIG. 2 is an elevation view of the article clamping mechanism shown in FIG. 1;

FIG. 3 is a sectional view taken on lines 3—3 of FIG. 1;

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FIG. 4 is a sectional view similar to FIG. 3, taken on lines 4—4 of FIG. 1;

FIG. 5 is an enlarged sectional view taken on lines 5—5 of FIG. 1;

FIG. 6 is a fragmentary side elevation view of the structure shown in FIG. 5; and

FIG. 7 is an enlarged sectional view taken on lines 7—7 of FIG. 1.

Referring now to the drawings in detail, the improved article clamping and turning mechanism, referred to generally by the reference 1, includes a base 2, and an upright frame structure 3. A pair of bearings 4, 5 mounted on horizontal arms 6, 7, respectively, of the frame 3, support a pair of stub shafts 8, 9 for rotation about a common horizontal axis. A rigid mounting bracket 10 is mounted on stub shafts 8, 9 for rotation therewith. Bracket 10 consists of a pair of spaced parallel side angles 11, 12 rigidly connected by a transverse structural angle member 13 and a counterweight member 14. A generally rectangular frame 15, consisting of spaced structural end elements 16, 17 and spaced side structural elements 18, 19, is rigidly mounted, as by welding, on the angle members 12, 11 of the rotatably mounted bracket 10.

As best seen in FIGS. 1 and 7, a pair of idler sprockets are mounted in vertically spaced relation in each of the corners of the rectangular frame 15 by a suitable mounting bracket. Sprockets 20, 21 are mounted on bracket 22 at the corner defined by end 16 and side 18, while sprockets 23, 24 are mounted by bracket 25 at the corner defined by end 17 and side 18. The sprockets 26, 27 are mounted on bracket 28 at the corner defined by end 17 and side 19, while sprockets 30, 31 are mounted on bracket 32 at the corner defined by end 16 and side 19. Since the sprockets and their mounting structure are similar, both structurally and functionally, only one will be described in detail, it being understood that the description is equally applicable to the remaining assemblies. The rigid mounting bracket 32 is fixed, as by welding, to the structural members of the rectangular frame as shown in FIG. 7, and is provided with a vertical bore 34 in which is mounted a shaft 35. Suitable means, such as set screw 36 extending through threaded boss 37, is provided to fix the shaft 35 against rotation and axial movement within bore 34. A shoulder 38 formed on shaft 35 retains sprocket 30 on shaft 35, and a collar 39 mounted on the end of shaft 35 by suitable means such as screws 40 retains the sprocket 31 on the shaft. Bushings 41, 42 are provided in the sprockets 30, 31, respectively, and a collar 43 is provided between sprocket 30 and shoulder 38 to minimize friction between the sprockets and the supporting shaft. Lubrication may be provided to the bushings through the lubrication fitting 44 mounting in the drilled passage 45 of shaft 35. Radially extending drilled passages 46, 47 extending from the longitudinal passage 45 and communicating with annular grooves 48, 49, respectively provide passage for lubrication to the bushings.

An endless chain 50 is mounted on the sprockets 21, 24, 27 and 31 and extends in a rectangular path thereover around the inner periphery of the rectangular frame 15. A second length of chain 51 is mounted on the sprockets 20, 23, 26 and 30 in vertically spaced relation to the chain 50. The piston rod 52 of a two-way, linear fluid motor 53 is connected as a link in the chain 51, as shown in FIG. 1 of the drawings. The fluid motor 53 is fixed mounted on frame member 18, as by mounting bracket 54. Fluid, under pressure, may be directed from a suitable fluid control valve, not shown, through suitable fluid conduits such as the flexible hoses 55, 56 to inlet ports 57, 58 on opposed ends of the fluid motor

53 so that piston rod 52 may be driven within the cylinder of motor 53, in either direction, along structural member 18 to thereby drive the chain 51 around the supporting sprockets. Suitable means, such as the turnbuckle 59 may be provided in the chains 50, 51 to maintain the desired tension in the chains.

A bracket 60 is rigidly mounted, as by bolts 61 on the structural member 19 of rectangular frame 15 between chains 50 and 51, and an elongated arm 62 is pivotally mounted, as by bolt 63 for rotation about a horizontal axis on bracket 60 inboard of the chains 50, 51. A pair of elongated solid links 64, 65 are mounted, as by pins 66, in the respective chains 50, 51 with the links 64, 65 being pivotally connected, as by bolts 67, 68, respectively to the arm 62. Thus, movement of either of the chains 50 or 51, acting through arm 62, will result in simultaneous movement of the other chain in the opposite direction and in an identical amount.

Chain 51 includes a pair of rigid links 70, 71 having enlarged ends 70a, 71a thereon attached to the piston rod 52, one on each end thereof, and a pair of elongated links 72, 73 connected, one between the link 70 and sprocket 20 and the other adjacent sprocket 30 between the sprockets 30 and 20. Chain 51 also includes a second pair of elongated links 74, 75 connected therein, with link 74 being located adjacent to sprocket 26 between sprockets 26 and 30, and link 75 being located adjacent sprocket 23 between sprockets 23 and 26. Similarly, chain 50 includes a first pair of elongated links 76, 77 connected therein with link 76 being located adjacent sprocket 31 between sprocket 31 and sprocket 27, and link 77 is connected adjacent sprocket 27 between sprockets 27 and 24. A second pair of elongated links 78, 79 are connected in chain 50, with link 78 being located adjacent sprocket 21 between sprockets 31 and 21, and link 79 being connected adjacent sprocket 24 between sprockets 21 and 24.

A first pair of parallel spaced clamping bars 80, 81 are mounted on chains 50, 51, with the clamping bar 80 being supported, as by bolts 82 extending through an elongated slot 83 in the elongated links 72, and 76. The clamping bar 81 has its opposite ends mounted, as by bolts 84, on elongated links 74 and 79, respectively. A second pair of elongated spaced clamping bars 85, 86 are mounted in spaced parallel relation on chains 50 and 51, with the clamping bars 85, 86 extending in generally perpendicular, underline relation (see FIG. 1) to clamping bars 80 and 81. Clamping bar 85 has one end mounted, as by bolts 87, to the elongated link 75 in chain 51, and the other end mounted on elongated links 78 of chain 50. Similarly, clamping bar 86 has one end mounted, as by bolt 88 extending through an elongated slot 89 in the link 73 of chain 51, and its other end similarly mounted to link 77 in chain 50. Preferably, resilient pads 95 are mounted, as by bolts 96, on the clamping face of bars 80, 81, 85 and 86.

A mounting bracket 90 rigidly supported on structural element 18 of the rectangular frame 15 supports an electrical switch 91 having an actuating arm 92 in engagement with chain link 70 for actuation by the enlarged end 70a thereof upon movement of the piston 52 within fluid motor 53. Similarly, bracket 93 supports a switch 94 having an actuating arm 95 in contact with link 71 for actuation by the enlarged end 71a thereof upon movement of the chain 51 by the piston rod 52. Switches 91 and 94 are connected in the electric control circuit for the valve mechanism which directs pressure fluid to the fluid cylinder 53. For example, when it is desired to clamp a group of articles A, fluid under pressure is directed through line 56 to inlet 57 to force the piston rod 52 to the right as viewed in FIG. 1. After a predetermined movement of the piston rod 51, the enlarged end 71a of link 71, acting through arm 95, will actuate switch 94 to condition the control circuitry to stop the flow of fluid into the fluid motor 53 and the clamping arms will be retained in the clamping position. Conversely, to release

a group of articles clamped between the clamping bars, fluid under pressure is directed through line 55 to inlet 58 to force piston rod 52 to the left. After a predetermined movement of the piston rod, the enlarged end 70a of link 70, acting through arm 92 will actuate switch 91 to condition the control circuit to stop the flow of fluid to the fluid motor 53.

As shown in FIGS. 1 and 2, the clamping mechanism may be rotated to simultaneously transfer and invert a group of articles 97 from the full-line position on an article conveyor 100 to the phantom line position disposed above an open carton 101 on conveyor 102. This is accomplished by a motor 103, acting through a reversible transmission 104 incorporating a suitable electrically controlled clutch-brake mechanism. The output shaft 105 on reduction gear mechanism 104 is connected through pulley 106, the belts 107, pulley 108, and key 109 to the stub shaft 9. Since bracket 10 is rotatably fixed on stub shaft 9, rotation of this shaft 9 by the motor 103 and reduction gear mechanism 104 will be effective to rotate the clamp mechanism between the full line clamping and the phantom line releasing positions shown in FIGS. 1 and 2. By employing a reversible transmission 104, the clamp mechanism may be oscillated through a 180° arc above the conveyors 100 and 102 to alternately position the clamp at the clamping and releasing positions.

A switch 110 having an actuating arm 111 is mounted on arm 7 of frame 3 in position to be actuated by a cam surface 112 rigidly mounted on angle 12 when the clamping mechanism is in the clamping position disposed above the article conveyor 100. A similar switch 113 having an actuating arm 114 is mounted on arm 7 in position to be actuated by the cam surface 112 when the clamping mechanism is in the phantom line position disposed above the carton conveyor 101. Switches 110 and 113 are connected in electric control circuit for the transmission 104 to stop the rotation of the clamping mechanism when it has reached the clamping or the releasing position, and to condition the transmission to reverse the direction of movement between the clamping and releasing positions.

The switches 91 and 94 are also connected in the control circuit for the transmission to prevent movement of the clamping mechanism from the clamping position until the fluid motor 53 has been actuated to clamp articles disposed between the clamping bars and to actuate switch 94, and to prevent movement of the clamping mechanism from the releasing position until the fluid motor 53 has been actuated to release articles clamped between the clamping bars and to actuate switch 91. Similarly, the switches 110 and 113 are connected in the electrical circuit for the valve controlling the flow of fluid to motor 53 so that the motor will automatically be actuated to clamp articles when the clamping mechanism reaches the clamping position above the article conveyor, and to release articles clamped thereby when the clamping mechanism reaches the releasing position.

The two endless chains 50 and 51 under tension form, in effect, four pairs of parallel, vertically spaced support elements with one pair of elements extending along each side of the rectangular frame 15. As the piston rod 52 is moved within motor 53, the chain 51 will be driven around its mounting sprockets to move one support element of each of the four pairs of the support elements in a longitudinal direction, and the pivoted arm 62 will drive the chain 50 in a direction opposite the chain 51 so that the other support element of each pair will be moved in the opposite direction a like distance. Thus, by mounting one end of the respective clamping bars to a support element of one chain and the other end to the support element of the other chain on the opposite parallel side of the rectangular frame 15, the clamping bars will be moved laterally upon movement of the motor 53. With the arrangement of clamping bars described herein above, an open centered, rectangular clamping mechanism is provided which is capable of simultaneous clamping and

releasing a group of articles from four sides. Further, by using a fluid cylinder to actuate the mechanism, the clamping mechanism is very fast acting. Also, since the pressure of the fluid directed to the motor 53 determines the maximum clamping force, slight variations in size or alignment will not effect the total load applied to clamp the articles.

While I have described a preferred embodiment of my invention, I wish it understood that I do not intend to be restricted solely thereto but that I do intend to include all embodiments thereof apparent to one skilled in the art and which come within the spirit and scope of my invention.

What I claim is:

1. An article clamping mechanism comprising a frame, a first endless flexible support member mounted on said frame for movement around a first generally rectangular path, a second endless flexible support member mounted on said frame for movement around a second generally rectangular path in overlaying parallel relation to said first rectangular path, driving means for simultaneously moving each of said elongated support members about their respective paths in opposite directions, and clamping bar means mounted on said elongated support members for movement therewith upon movement of said support members about their respective paths by said driving means to clamp or release articles disposed within said rectangular path.

2. The article clamping mechanism defined in claim 1 wherein said clamping bar means comprises a first pair of elongated clamping bars mounted in substantially parallel spaced relation to one another on said support members for movement therewith toward and away from one another.

3. The article clamping mechanism defined in claim 2 wherein said first pair of clamping bars each have one end mounted on said support members along opposed parallel sides of said rectangular paths, each said clamping bars having one end mounted on one of said support members and the other end mounted on the other of said support members.

4. The article clamping mechanism defined in claim 3 wherein the respective clamping bars of said first pair are mounted with one of its ends on a respective one of said support members along one side of its rectangular path.

5. The article clamping mechanism defined in claim 4 wherein said driving means comprises a reversible fluid motor.

6. The article clamping mechanism defined in claim 2 further comprising a second pair of elongated clamping bars mounted in substantially parallel relation to one another and in substantially perpendicular relation to said first pair of clamping bars on said support members for simultaneous movement therewith toward and away from each other.

7. The article clamping mechanism defined in claim 6 wherein said driving means comprises a reversible fluid motor connected to one of said support members and operable to drive said one support member in either direction about its rectangular path.

8. The article clamping mechanism defined in claim 7 wherein said driving means further comprises an elongated link pivotally supported intermediate its ends for rotation about an axis extending between said support

members at one side of said rectangular paths, said elongated link having its ends pivotally connected one to each of said support members whereby movement of one of said support members will pivot said link about said axis to move the other of said support members in a direction opposite to the direction of movement of said one support member.

9. The article clamping mechanism defined in claim 6 further including means pivotally supporting said frame for rotation about an axis generally parallel to and spaced from one side of said rectangular path, and means for oscillating said frame about said axis.

10. The article clamping mechanism defined in claim 6 wherein said elongated support members each comprise a length of chain supported for movement about a generally rectangular path by sprockets mounted on said frame.

11. An article clamping neck comprising:

(a) a frame,

(b) first and second elongated members mounted on said frame, said members being positioned in a first plane and being parallel to each other,

(c) third and fourth elongated members mounted on said frame and being positioned in a second plane overlying said first plane, said third elongated member being parallel to and overlying said first elongated member and said fourth elongated member being parallel to and overlying said second elongated member,

(d) a first clamping bar having one end connected to said first member and its other end connected to said fourth member,

(e) a second clamping bar parallel to said first clamping bar having one end connected to said second member and its other end connected to said third member, and

(f) driving means for simultaneously moving said first and fourth members in one direction and said second and third members in the opposite direction to move said clamping bars toward or away from one another.

12. The article clamping mechanism defined in claim 11 further including means pivotally supporting said frame for rotation about an axis generally parallel to and spaced from one side of said frame, and means for oscillating said frame about said axis.

13. The article clamping mechanism defined in claim 12 wherein said first and second elongated members comprise a first length of chain and said third and fourth elongated members comprise a second length of chain with the respective length of chain being supported for movement about a generally rectangular path by sprockets mounted on said frame.

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U.S. Cl. X.R.

294—67, 86, 87