United States Patent [19]

Kelly

[11] **3,856,342**

[45] **Dec. 24, 1974**

[54] PANTOGRAPHIC CARGO HOIST

[76] Inventor: **James M. Kelly,** 15 Bailey Ave., Beverly, Mass. 01915

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[21] Appl. No.: **360,141**

[52] **U.S. Cl.**..... **294/67 R,** 224/45 F, 294/67 B, 294/86 R, 294/113

[51] **Int. Cl.**..... **B66c 1/16**

[58] **Field of Search**..... 294/15, 16, 62, 63 B, 67 R, 294/67 B, 67 BB, 67 BC, 67 D, 67 DA, 67 E, 67 EA, 74, 77, 86 R, 86 CG, 106, 111, 112, 113, 118, 119; 224/45 F, 50; 24/123 F

[56] **References Cited**

UNITED STATES PATENTS

283,598	8/1883	Gosnell	294/112 X
767,884	8/1904	Harris et al	224/45 F
832,343	10/1906	Scott	294/86 CG
2,311,767	2/1943	Lumbard	294/86 CG
2,432,351	12/1947	Strobl	224/50
2,705,461	4/1955	Campbell	294/77 X
2,809,860	10/1957	Arnold	294/77

FOREIGN PATENTS OR APPLICATIONS

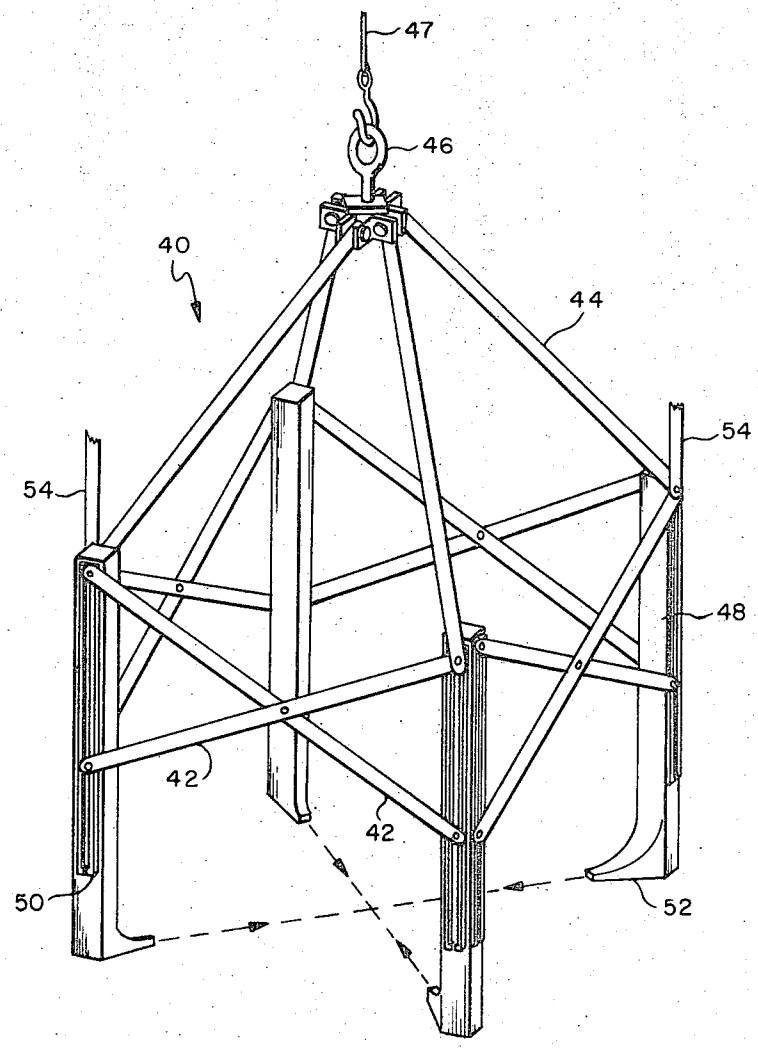
451,276	10/1927	Germany	224/45 F
272,680	6/1927	Great Britain	224/45 F

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Assistant Examiner—Johnny D. Cherry
Attorney, Agent, or Firm—Richard L. Stevens

[57] **ABSTRACT**

A hoist is provided wherein a clamping mechanism has four walls, each of the walls comprising a plurality of interconnecting pantographs, whereby the cross-sectional area of the clamping mechanism may be increased when the clamping mechanism is retracted to a release position. In this release position, the walls of the clamping mechanism are placed about a load to be lifted. The walls of the clamping mechanism are then extended to a clamping position decreasing the cross-sectional area, and engaging the sides of the load. The force required to lift the load is uniformly distributed over each of the sides of the load to be lifted.

21 Claims, 11 Drawing Figures



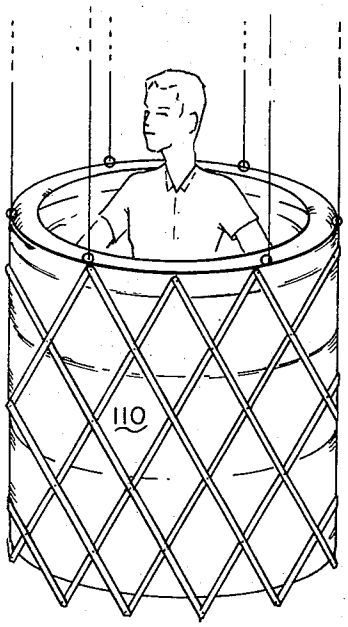


FIG. 8b

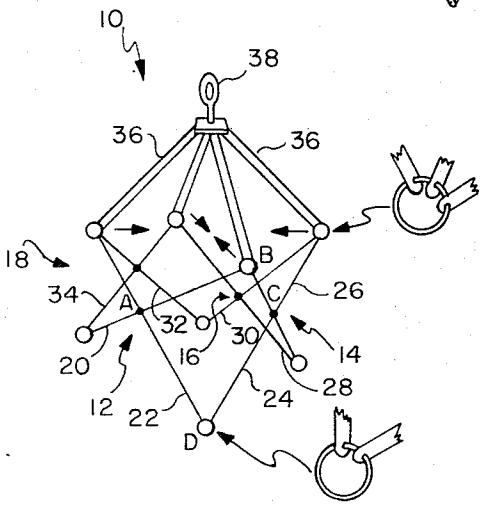


FIG. 1a

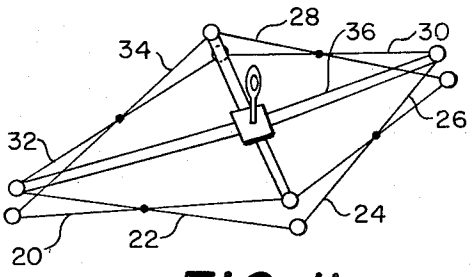


FIG. 1b

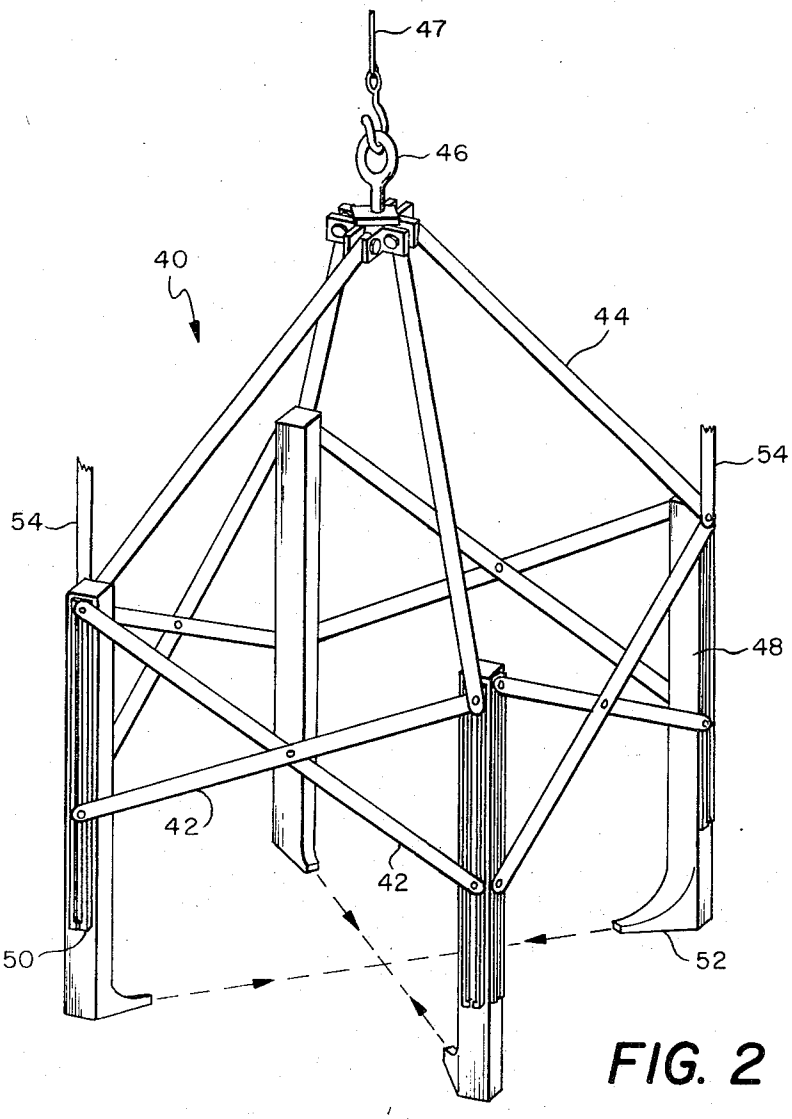


FIG. 2

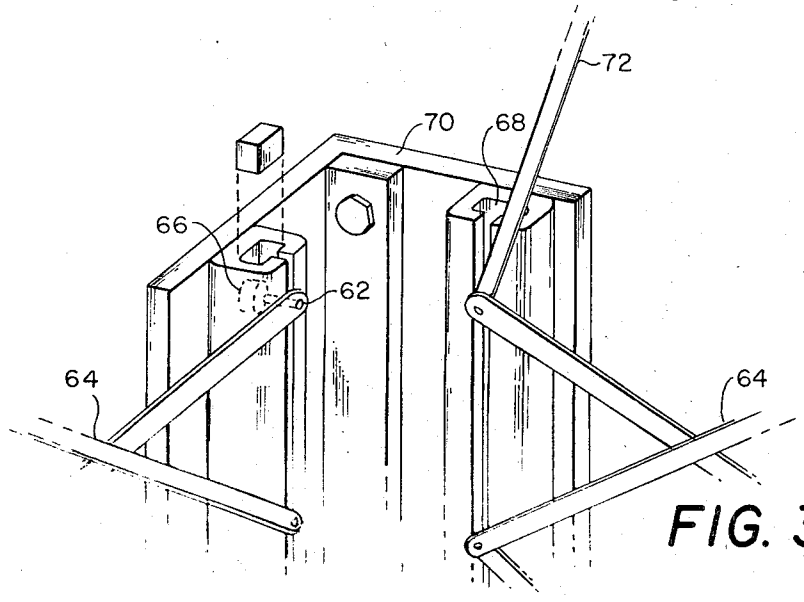


FIG. 3a

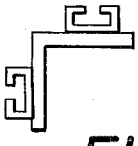


FIG. 3b

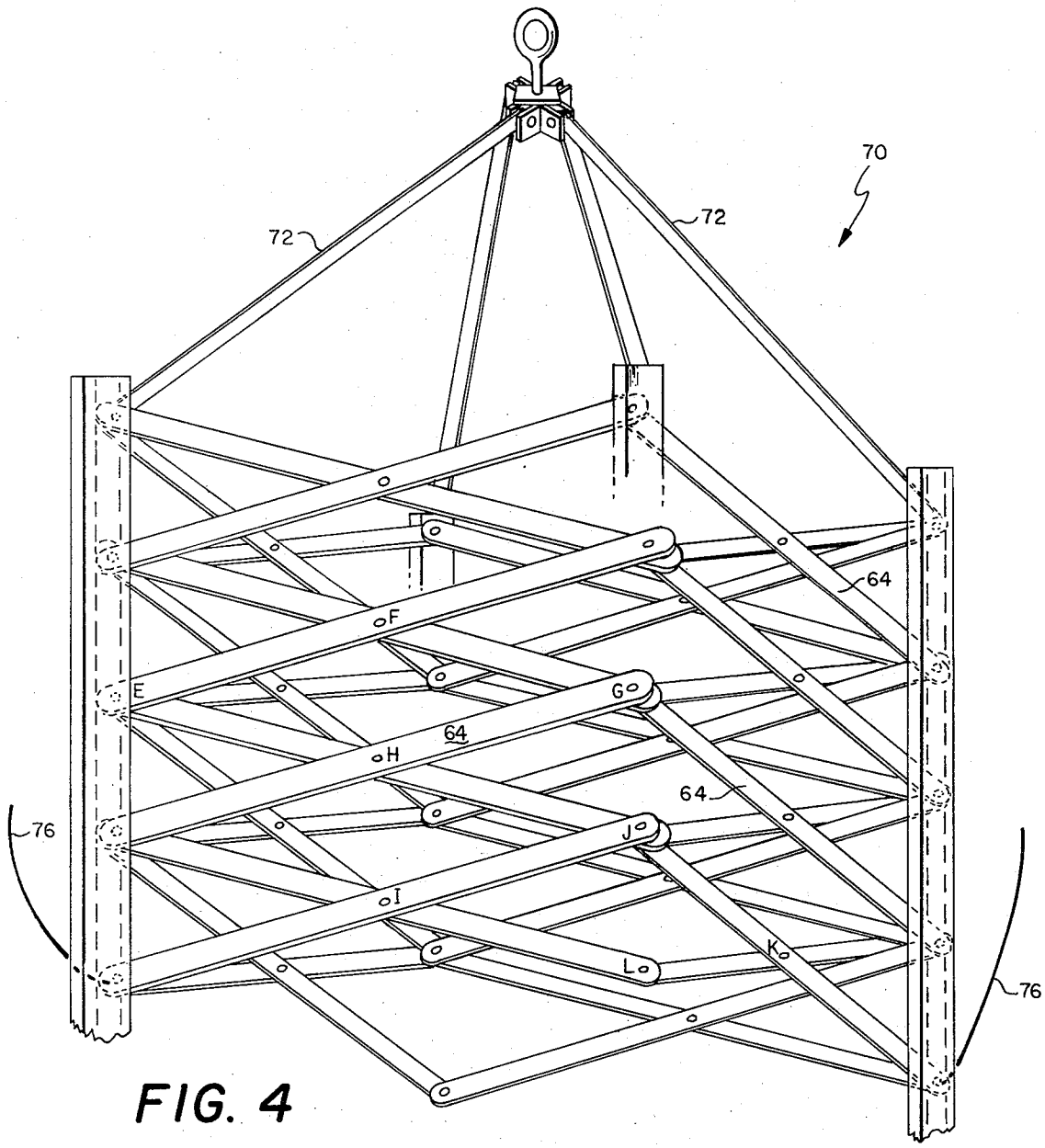


FIG. 4

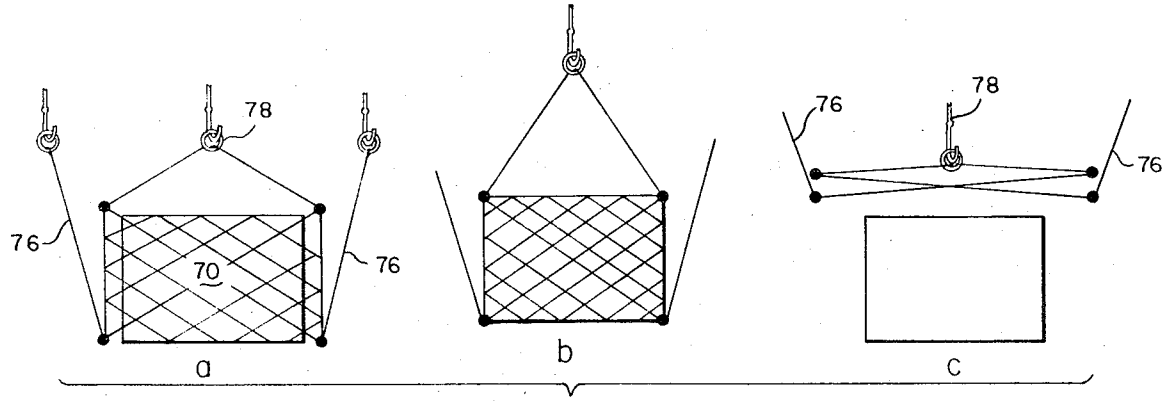


FIG. 5

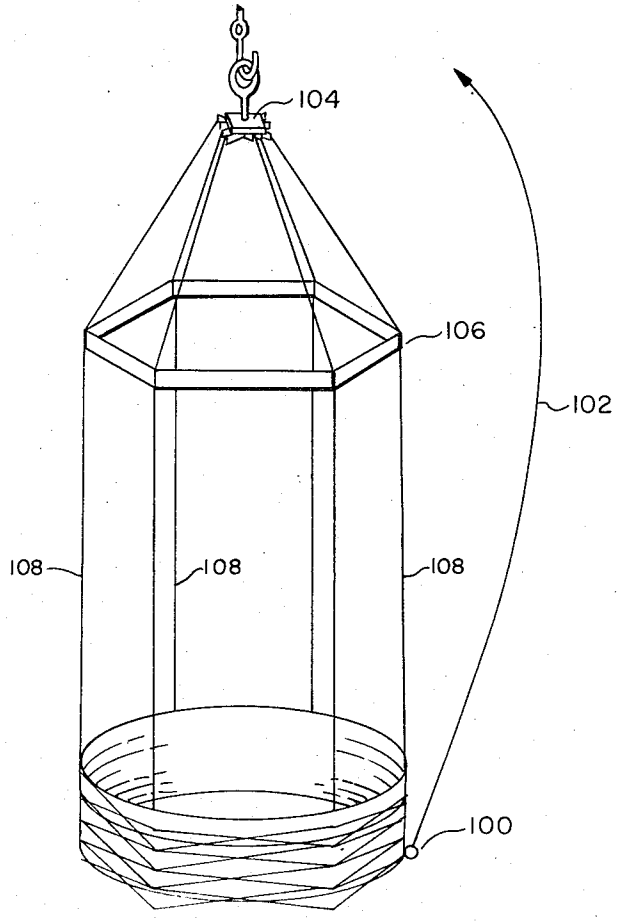


FIG. 8a

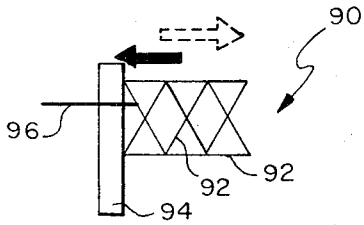


FIG. 7

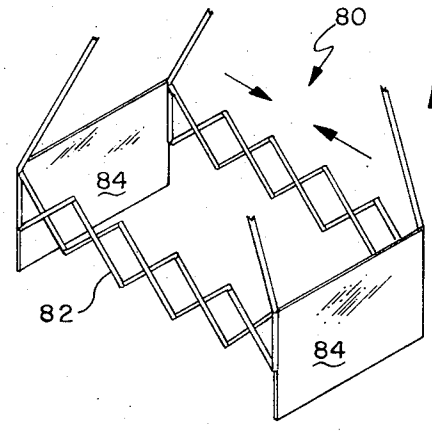


FIG. 6

PANTOGRAPHIC CARGO HOIST

BACKGROUND OF THE INVENTION

In lifting loads such as palletized or containerized cargo by hoisting mechanisms, one method employed is to secure a lifting hook to a ring or similar structure. The ring is normally secured to one or more straps which engage the load to be lifted. Another method employed is to use various clamping mechanisms which engage either the sides of the load or the bottom of the load. See, for example, U.S. Pat. Nos. 529,840; 2,472,262; and 3,380,602. Where a sling arrangement is employed, the forces acting on the load are concentrated in a few localized areas on the surface of the load. Accordingly, in some instances, the load lifted is crushed or damaged at these areas of increased force. When the load is lifted from the bottom, such as by a clamp, an additional difficulty encountered is that either manual labor or an elaborate structural mechanism is required to insure that the clamp is properly secured to the bottom of the load.

Accordingly, with the present hoisting devices, the forces required to lift the load act on a certain specified area of the load, or, in the case of lifting or clamping mechanisms, additional labor and/or structures are required to insure that the load is properly clamped.

SUMMARY OF THE INVENTION

My invention is directed to a method and apparatus for lifting loads. More particularly, the method and apparatus of my invention provide a lifting mechanism wherein a load to be lifted may be secured in such a way that the force required to lift the load is uniformly distributed over surfaces of the load. In one embodiment of my invention, a retractable structure is adapted to engage substantially the entire surface of the load to be lifted. A clamping mechanism is provided which is comprised of a plurality of interconnected parallelograms pivotally connected such that each parallelogram functions as a pantograph. The pantographs may be entirely within one wall of the clamping mechanism, two-dimensional, or may be bisected by an imaginery line which would define the edge of the walls of the clamping structure, that is, a three-dimensional pantograph. The walls of the clamping mechanism are structured such that when retracted to a release position, the volume defined by the inner surface of the walls increases in cross-sectional area. When the clamping structure is extended to a clamping position, the volumetric area or cross-sectional area is reduced and the walls of the mechanism engage the load to be lifted in a manner such that the lifting force is uniformly distributed over the entire clamped surfaces of the load to be lifted.

In a preferred embodiment of the invention, the clamping mechanism comprises four substantially uniform walls, each wall having a uniform number of interconnected pantographs. The walls of the clamping mechanism are adapted to reciprocate between a clamping position and a release position, wherein the volume or the cross-sectional area defined by the inner walls of the clamping mechanism decreases as the clamping mechanism moves from its release to its clamping position. In this embodiment, the pressure required to lift a load is uniformly distributed over the four engaged surfaces of the load. When the load has been moved, the clamping structure is retracted to its release position.

The apparatus of my invention comprises a clamping mechanism having a plurality of walls, each of said walls including at least two sides of a pantograph, the walls of the clamping structure including in their entirety a plurality of interconnected pantographs, at least two of said pantographs having a common corner, and means to elongate the walls to a clamping position, whereby the cross-sectional area is diminished and the walls may engage a load to be moved.

The method of my invention includes placing a clamping mechanism about a load to be lifted, diminishing the cross-sectional area of the mechanism to engage the walls of the load in a uniform manner, lifting the load so engaged whereby the force required to lift the load is uniformly distributed over the engaged surfaces, and discharging the load so engaged by increasing the cross-sectional area of the clamping mechanism.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1(a) and (b) are isometric views of a simplified embodiment of the invention;

FIG. 2 is an isometric view of one embodiment of the invention;

FIG. 3(a) is an isometric view of an embodiment(s) of the invention used to secure the bar members in a movable manner, and FIG. 3(b) is a plan view of an alternative embodiment of FIG. 3(a);

FIG. 4 is an isometric view showing the preferred embodiment of the invention;

FIGS. 5 (a), (b), and (c) are schematic illustrations showing the operation of the invention;

FIG. 6 is a schematic showing an alternative embodiment of the invention, wherein only two sides are pantographic;

FIG. 7 is a schematic showing a further alternative embodiment of the invention; and

FIGS. 8(a) and 8(b) are schematic illustrations of an embodiment of the invention including a plurality of sides.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1(a) is shown in isometric form and in open configuration a simplified embodiment of the invention with the clamping mechanism shown as **10,** and which includes four walls, a front wall **12,** a right wall **14,** a back wall **16,** and a left wall **18.** The walls are comprised of slat-like or bar members **20** and **22, 24** and **26, 28** and **30,** and **32** and **34,** respectively. Each set of members is pivotally connected at the center, such as by a pin, and forms two sides of a three-dimensional pantograph. The members **20** and **22,** and **24** and **26** form a pantograph ABCD. In the structure as shown, there are four three-dimensional, interconnected pantographs, each connected set of pantographs having a common corner. The corners which are common to the sides of the pantograph which form each part of the wall and are at right angles are hinged to one another, such as shown in the exploded view. Of course, ball and socket joints, tongue and groove configurations, or any structure which will allow the requisite flexibility may be used. Lift bars **36** are pivotally hinged to the upper corners of the bar members, such as by the configuration shown, and to ring member **38.** The ring may be

secured to a hoist (not shown) or run on a tracked beam (not shown) or secured to any conventional lifting mechanism as desired. In the operation of this simplified embodiment of the invention, the clamping mechanism **10** may be placed manually over the load to be lifted. The ring is then moved upwardly, decreasing the cross-sectional area defined by the walls of the clamping mechanism **10.** The walls of the mechanism will engage the surfaces of the load to be lifted, uniformly distributing the lifting force over the engaged surfaces. The load is lifted by the upward movement of the entire assembly. It should be noted that the lift bars **36** are not fixed in a rigid position. This is to insure that the walls may move laterally to accommodate the change in cross-sectional area of the clamping mechanism when it is moved between its release and clamping positions.

In FIG. **1**(b), the clamping mechanism **10** is shown in folded configuration, i.e., lying flat. This is achieved by having the length of the lift bars **36** less than the length of the bar members. In this particular embodiment, the ratio of the length of the lift bar to the bar member is approximately 1: $\sqrt{2}$.

An alternative embodiment of the invention is shown in FIG. **2**, where a clamping mechanism **40**, similar to that shown in FIG. **1**, comprises bar members **42**; lift bars **44**, and ring member **46.** The lift bars are pivotally secured to the ring member **46.** Arms **48** are pivotally secured at the upper ends to the bar members **42** and the lift bars **44.** The arm **48** is characterized by an outer groove or channel **50** therein, and terminates in a fluke or tooth **52.** The tooth **52** is shown as being an integral part of the arm, but preferably the tooth is removable so that teeth of different sizes and shapes may be interchanged. The lower corners of the members **42** are received in a slideable manner in the channel **50,** such as in a tongue and groove arrangement. This embodiment finds applicability in replacing clam shovels, etc., used in construction, such as in demolition work. To facilitate the moving of the clamping mechanism between its release and clamping positions, cables **54** are pivotally secured to the upper portions of the arms **48.** The cables are adapted to be actuated independently of the cable **47** to which the ring **46** is attached and functions in a manner similar to the cables adapted to open a clam shovel in order to discharge a load. The teeth **52** may be replaced if broken or worn as desired, and either the cable **47** or the cables **54** may be power-operated as desired, such as hydraulically. Also, cables such as **54** may be placed or engaged to all four arms, and the cables may be secured at any position on the arms, such as a lower position.

FIG. **3**(a) is an isometric view of a channel and bearing arrangement used in the preferred embodiment, FIG. **4,** of the invention. A pin **62** passes through the end of each of bar members **64** and has a ball bearing **66** secured at the other end thereof. Bearing **66** is received in a channel **68** which is secured to an angle iron **70.** The lower portions of the lift bars **72** are pinned to the top portions of four alternating bar members **64** which are received in channel **68.** If desired, the lift bars **72** may be pinned to all eight tops of the bar members **64** rather than to the four alternating members. The top and bottom of the channels **68** are capped or plugged to prevent the iron **70** from sliding off.

FIG. **4** shows a pantograph of the preferred embodiment including clamping mechanism **70** comprised of a plurality of interconnecting bars **64,** each alternating topmost bar **64** secured at the top thereof to lift bars **72** (one such securement is shown in FIG. **3**(a), which lift bars in turn are pivotally secured to the hook arrangement **78.** Cables **76** are secured to the lower ends of the corners of at least two of the lowermost bars **64** and operate independently of the ring assembly **78** to withdraw the mechanism **70** to its release position. As shown in FIG. **4,** the individual pantographs are now of two types, those which are solely two-dimensional and lie entirely within the plane of one wall, such as EFGH, and those three-dimensional pantographs, such as IJKL. Each succeeding set of two-dimensional pantographs has two common sides and one common corner. The three-dimensional pantographs in this preferred embodiment also have the same characteristics.

In the operation of the preferred embodiment of the invention, referring to FIG. **5**(a), the mechanism **70** in its release position is placed about a load to be lifted. The cables **76** are then slackened, and force such as by a crane hook (not shown) is applied lifting upwardly the ring assembly **78.** As this ring assembly moves upwardly, the cross-sectional area of the pantograph diminishes, whereby the load is engaged by the inner surfaces of each of the pantographs and the mechanism is in its clamping position. The load is lifted or moved and the force acting on the load is uniformly distributed over the engaged walls of the load, FIG. **5**(b). When the load has been moved, this process is simply reversed; namely, the entire assembly is moved and the load placed where desired. The force lifting the ring assembly **78** is released, allowing the pantograph to collapse about the load. However, if the pantograph does not collapse of its own weight, and to insure removability, an upward force is applied to cables **76,** such as by a crane hook, to draw the pantograph **70** into its release position, increasing the cross-sectional area of the mechanism **70.** The entire assembly is then moved upwardly from the load, FIG. **5**(c). This also eliminates manual labor and insures its removability by providing this mechanism to lift the entire structure in its released position.

For some types of cargo to be lifted, it may be more desirable to apply a uniform distribution of force only to the corners of the cargo. In FIG. **3**(b) is shown a plane view of a reversed structure arrangement of FIG. **3**(a). In this embodiment also, inner surfaces thereof may be lined with a material which would provide an adhesive engagement with the corners of the load to be lifted. This adhesive material, such as a rubber-like material, would also provide additional cushioning as desired. Further, this outer channel arrangement may be used for the embodiment of FIG. **2.**

Depending on the nature of the load being lifted, the inner surfaces of the angle iron or the bar members may be shaped to provide a biting or tooth-like engaging action on the engaged surfaces of the load to be lifted, such as a sawtooth configuration. Also, the engaged surfaces of the load may be structured to provide mating engagement with the shaped inner surfaces.

Referring to FIG. **6,** a schematic illustration is shown of a two-sided clamping mechanism **80.** The mechanism **80** comprises a plurality of bar members **82** which function in a manner as described for the other embodiments. At either end thereof are panel members **84** which may or may not be movable. This embodiment has particular application, wherein specialized sizes of

United States Patent [19]

Muller

[11] **3,856,343**

[45] **Dec. 24, 1974**

[54] **BOTTLE GRIPPER FOR PACKING AND UNPACKING MACHINES**

[75] Inventor: **Friedhelm Muller,** Dortmund-Wickede, Germany

[73] Assignee: **Holstein & Kappert Maschinenfabrik "Phonix" GmbH,** Dortmund, Germany

[22] Filed: **Dec. 6, 1972**

[21] Appl. No.: **312,732**

[52] **U.S. Cl.** ..... **294/99 R,** 294/63 A, 294/90

[51] **Int. Cl.** **B66c 1/46**

[58] **Field of Search** ..... 294/63 A, 64 R, 65, 87, 294/90, 93, 99 R; 53/95, 247, 307, 367; 214/1 BS, 1 BT, 1 BH, 1 BV, 6 FS, 8.5 D, 309

[56] **References Cited**

UNITED STATES PATENTS

2,308,209	1/1943	Schmutzer et al.	294/65
2,607,620	8/1952	Oliveri	294/64 R
2,873,996	2/1959	McHugh	294/64 R
2,929,653	3/1960	Hund et al.	294/64 R
3,171,681	3/1965	Roller	294/90 X

Primary Examiner—Richard A. Schacher
Assistant Examiner—Johnny D. Cherry
Attorney, Agent, or Firm—Toren, McGeady and Stanger

[57] **ABSTRACT**

A bottle gripper for packing and unpacking machines is formed of an upwardly extending double collar including an inner elastic wall and an outer elastic wall spaced radially outwardly from the inner wall with the two walls connected together at their lower ends. The space between the walls can be charged with a pressure medium. A connecting piece extends across the upper end of the outer wall with a bead formed on the outer wall which seats within a groove formed in the connecting piece. The outer wall is tightly enclosed by an upwardly extending inelastic sleeve. In one arrangement webs extend between the inner and outer walls dividing the space therebetween into individual cavities. In another arrangement, a guide is formed on the interconnected lower ends of the two walls and the inner surface of the guide has a frusto-conical shape.

5 Claims, 4 Drawing Figures

