United States Patent [19]

Cranston, III et al.

[11] **3,727,965**

[45] **Apr. 17, 1973**

[54] **LIFTING TOOL FOR BOUND PACKAGES**

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[73] Assignee: **Cranston Machiner Co., Inc.**, Oak Grove, Oreg.

[22] Filed: **July 12, 1971**

[21] Appl. No.: **161,499**

[52] **U.S. Cl.** .....**294/67 R**, 294/67 BB, 294/81 R

[51] **Int. Cl.**.....**B66c 1/18**

[58] **Field of Search** .....294/67 R, 67 B, 67 BA, 294/67 BB, 67 BC, 67 DA, 74, 81 R, 81 SF, 88; 214/114, 658, 730

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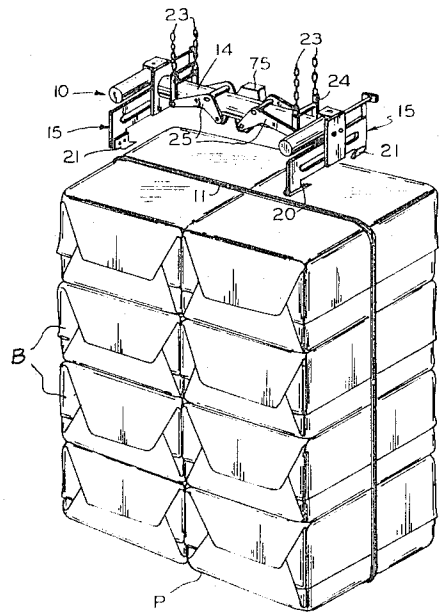
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Primary Examiner—Evon C. Blunk
Assistant Examiner—Johnny D. Cherry
Attorney—Lee R. Schermerhorn

[57] **ABSTRACT**

A pair of hooking devices is mounted for telescopic extension and retraction in opposite ends of a tubular horizontal lifting beam. Each hooking device is equipped with a pair of opposed fingers adapted to engage under a binding extending across the top of the package. One of the fingers is a lifting finger and the opposite finger serves as a holding dog to retain the binding on the lifting finger when the two fingers are closed together. The two hooking devices initially engage the binding at points inward from the opposite sides of the package. Lifting chains connected with pivotal bell crank arms on the beam slide the hooking devices outward from opposite ends of the beam to approach the opposite sides of the package as it is lifted.

20 Claims, 16 Drawing Figures



PATENTED APR 17 1973

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SHEET 1 OF 4

FIG. 1

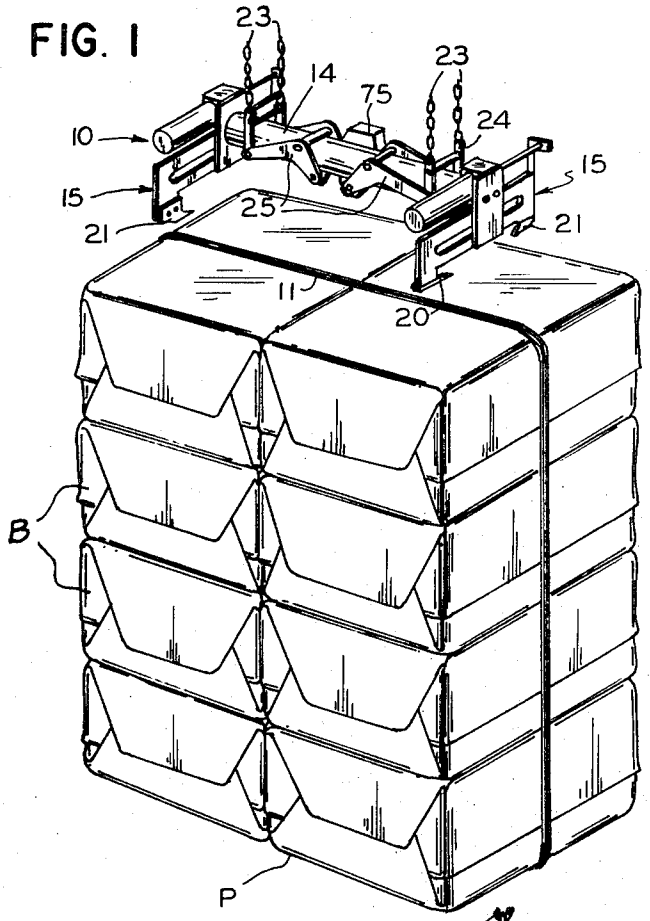


FIG. 16

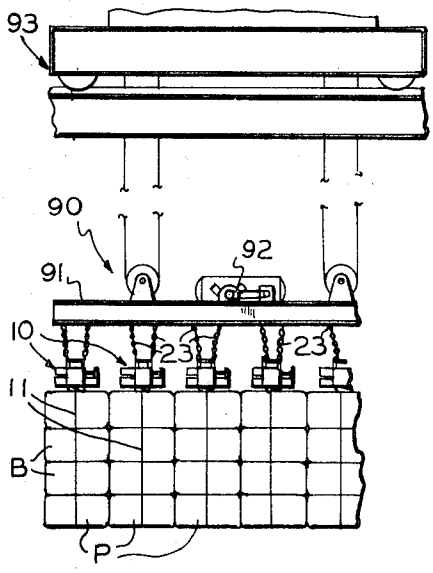


FIG. 9

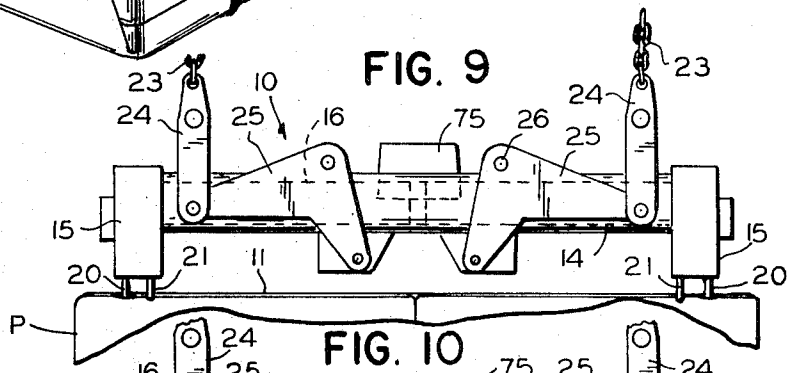


FIG. 10

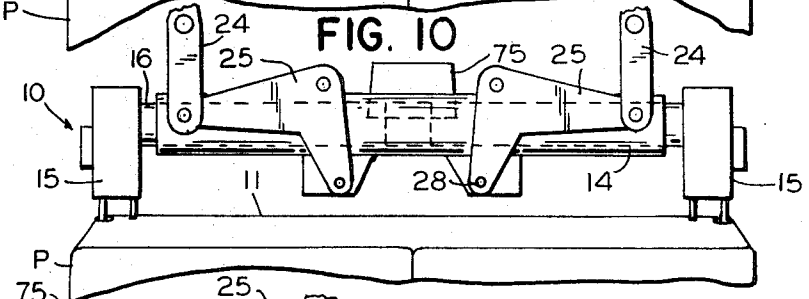
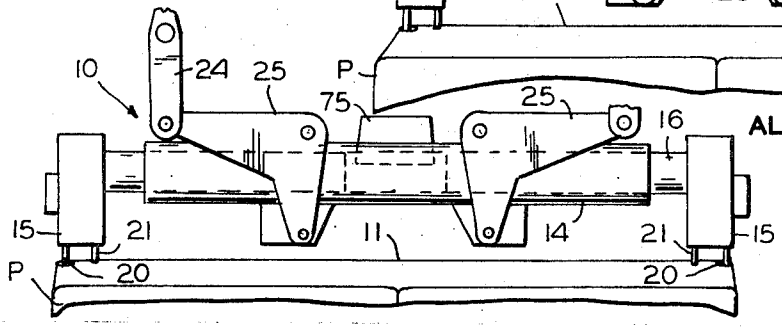


FIG. 11



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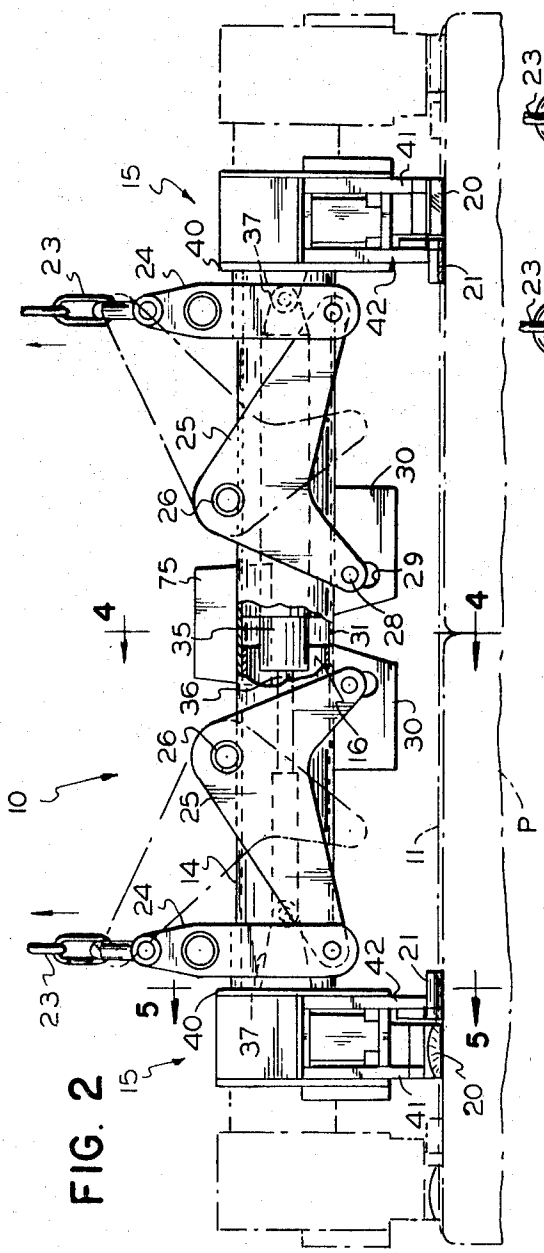


FIG. 2

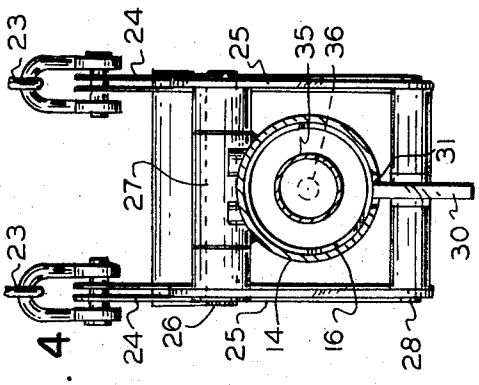


FIG. 4

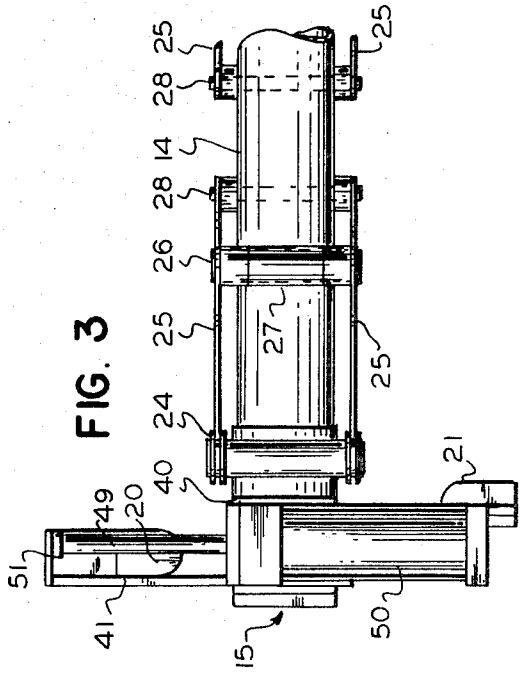


FIG. 3

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FIG. 5

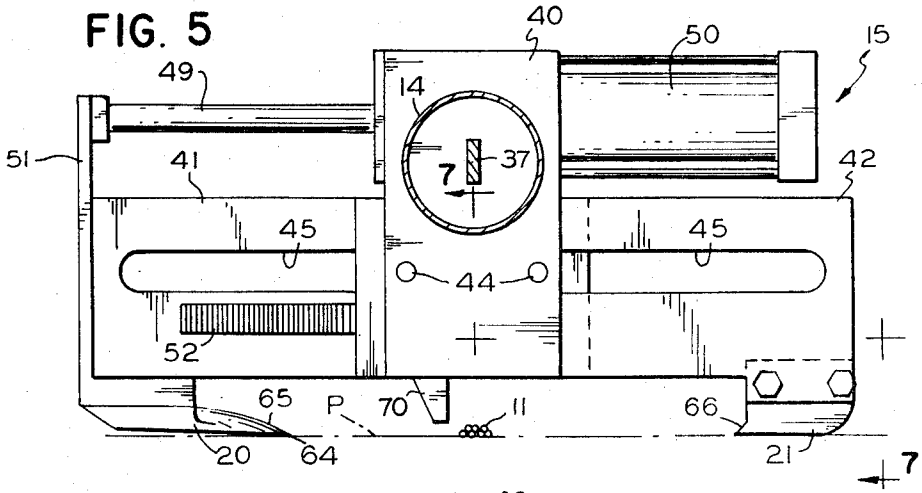


FIG. 6

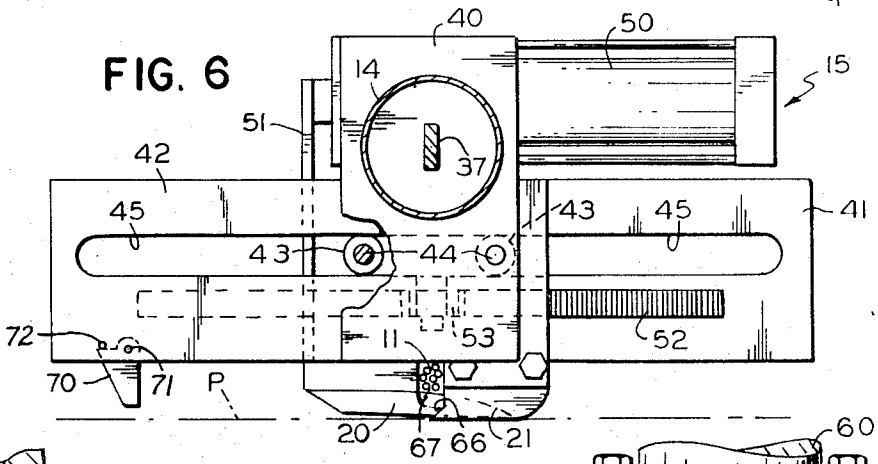


FIG. 7

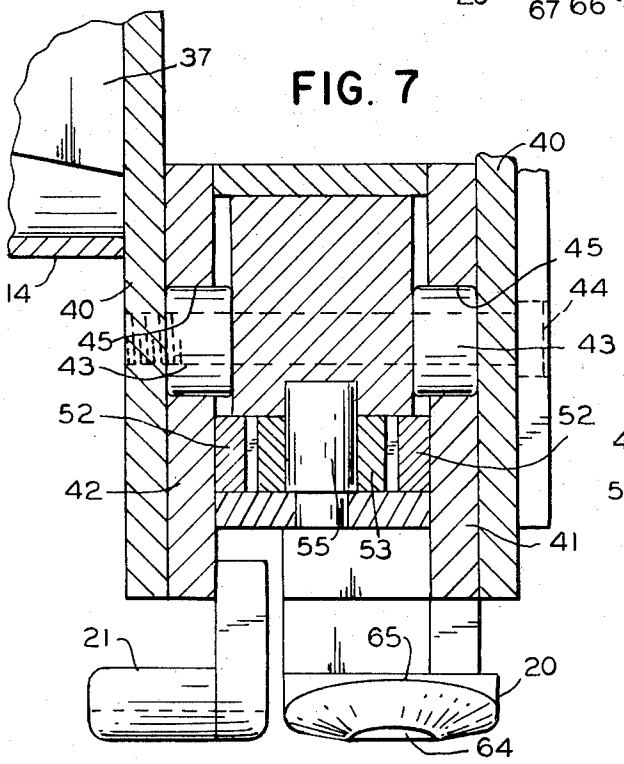
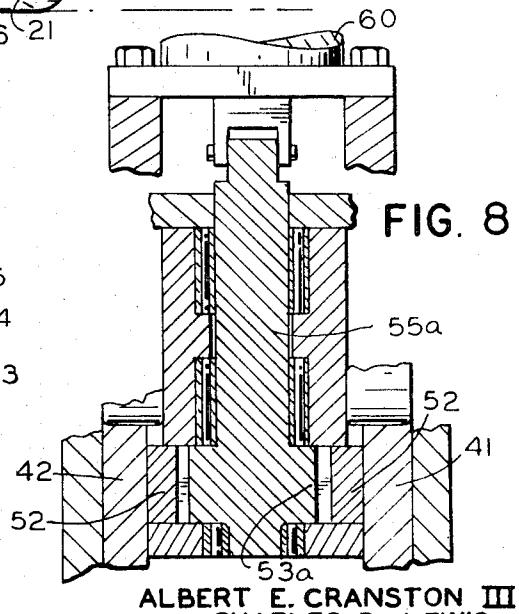


FIG. 8



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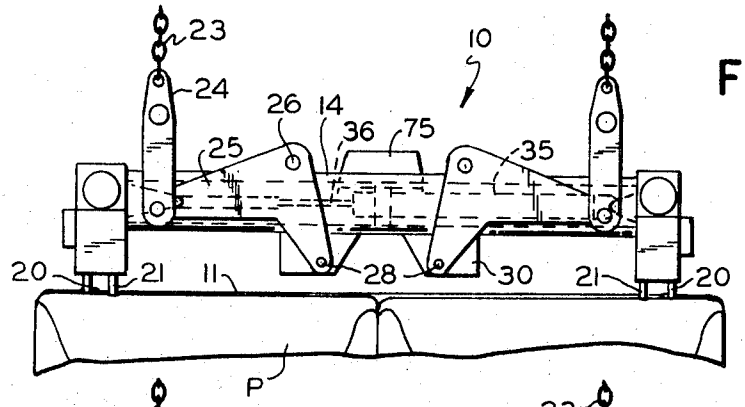


FIG. 12

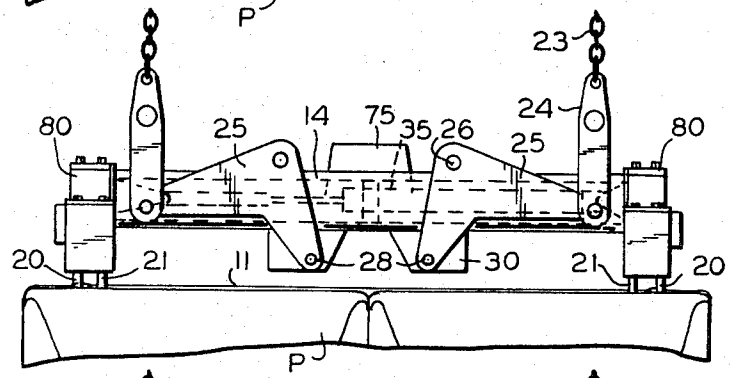


FIG. 13

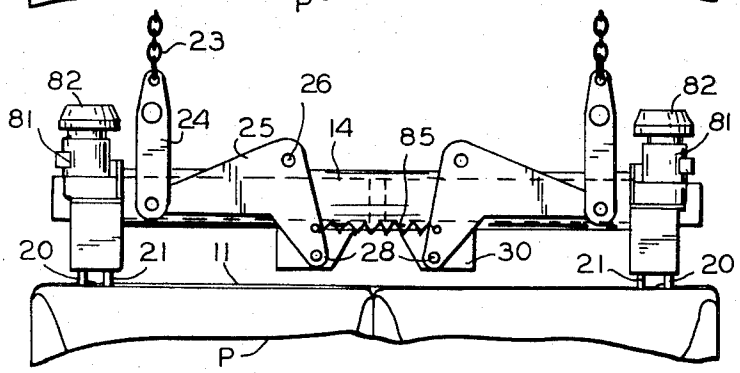


FIG. 14

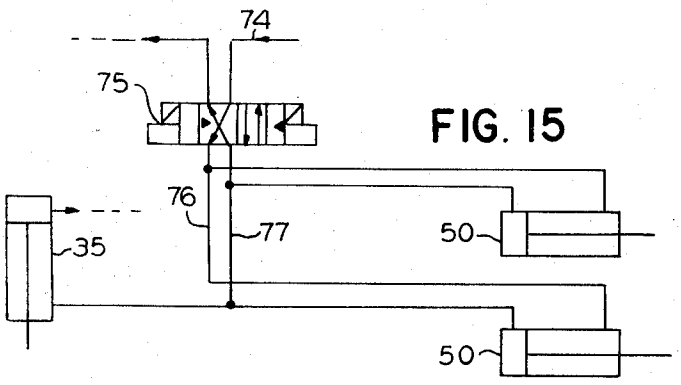


FIG. 15

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LIFTING TOOL FOR BOUND PACKAGES

BACKGROUND OF THE INVENTION

This invention relates to a lifting tool for bound packages and has particular reference to a device for lifting a bundle or package directly by its binding.

There is a need for better means to handle large and heavy wirebound or strapped bundles and packages. Present handling equipment for such bundles is too slow and cumbersome, particularly where the bundles must be lifted. It is desired to provide lifting and handling equipment capable of handling a plurality of such bundles bound together in a unit package.

Objects of the invention are to provide an improved lifting tool for bound bundles and packages, to provide a device for lifting such bundles by their tops, making pallets unnecessary, to provide a device for directly grasping the binding wires or strapping of a bundle without resort to special fittings and accessory devices, and to provide power-operated apparatus of the type described which is capable of grasping the binding on top of a bundle without manual assistance or manipulation.

SUMMARY OF THE INVENTION

The present apparatus comprises a pair of hooking devices extendable and retractable in opposite ends of a tubular lifting beam. Each hooking device is equipped with a pair of opposed fingers adapted to engage under a binding extending across the top of the package. One of the fingers is a lifting finger and the opposite finger serves as a holding dog to retain the binding on the lifting finger when the two fingers are closed together. The two hooking devices initially engage the binding inward from the opposite sides of the package.

Lifting chains connected with pivotal bell crank arms on the beam slide the hooking devices outward from opposite ends of the beam to approach the opposite sides of the package as it is lifted. This provides a stable and secure suspension for a single bundle or a plurality of bundles bound together without special fittings or accessory devices and makes pallets unnecessary.

The invention will be better understood and additional objects and advantages will become apparent from the following description of the preferred embodiments illustrated in the accompanying drawings. Various changes may be made in the details of construction and arrangement of parts and certain features may be used without others. All such modifications within the scope of the appended claims are included in the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view showing a lifting tool embodying the invention approaching the top of a package to pick up the package;

FIG. 2 is a side elevation view of the tool in FIG. 1, showing the tool in full lines in a preliminary position and in lifting position in broken lines;

FIG. 3 is a top plan view of the left side of the tool in FIG. 2;

FIG. 4 is a view on the line 4—4 in FIG. 2;

FIG. 5 is a view on the line 5—5 in FIG. 2 with the lifting fingers in open position;

FIG. 6 is a similar view with the lifting fingers in closed position;

FIG. 7 is view on the line 7—7 in FIG. 5;

FIG. 8 is a view similar to FIG. 7 showing a modification having a rotary motor to close and open the lifting fingers;

FIG. 9 is a view similar to FIG. 2, showing the initial positions of the parts preliminary to lifting;

FIG. 10 is a similar view showing the parts approaching lifting position;

FIG. 11 is a similar view showing the parts in lifting position;

FIG. 12 is a view similar to FIG. 2 for comparison with certain modifications in subsequent figures;

FIG. 13 shows a modification in which the lifting fingers are closed and opened by a rotary fluid motor;

FIG. 14 is a similar view showing another modification in which the lifting fingers are closed and opened by reversible electric motors;

FIG. 15 is a diagram of the pneumatic system in the first embodiment shown in FIGS. 1 to 7 and 9 to 11; and

FIG. 16 shows a gang of the lifting tools for handling a plurality of the package units in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows a typical application of the invention wherein the lifting tool 10 is being lowered onto the top of a unit package P which consists of eight individual bundles B bound together by a number of turns of binding wire 11. By way of example, the bundles B are paper wrapped bales of wood pulp which are quite bulky as well as heavy. A typical package P of such material weighs approximately 4,000 pounds, is 60 to 80 inches high and measures 52 to 68 inches on a side.

A tubular beam 14 supports a pair of hooking devices 15 for extension from opposite ends of the beam. Each hooking device 15 is mounted on the outer end of a tube 16 which slides in the beam tube 14 as shown in FIG. 2. Each hooking device 15 is equipped with a pair of fingers 20 and 21 which are arranged to close together under the binding wire 11 to lift the package P.

After the lifting fingers 20 and 21 have been engaged under the binding wire 11 at points inward from opposite sides of the package, the tool 10 is lifted and the weight of the package applies mechanical leverage to the lifting means to extend the hooking devices 15 outward toward the opposite sides of the package, sliding the lifting fingers 20 and 21 along the binding wires 11. When the tool 10 is to be released from the package, the package is supported on its bottom, the hooking devices 15 are retracted inward to the ends of beam 14 and the fingers 20 and 21 are spread apart to release the binding wires.

At each end of beam 14 a pair of lifting chains 23 is connected to a yoke 24 on the upper ends of a pair of bell crank arms 25. Arms 25 are pivotally mounted on a horizontal pin 26 in ears 27 on the upper side of beam 14. A pin 28 in the lower ends of arms 25 extends through a vertical slot 29 in an ear 30 on the under side of each tube 16. Ear 30 travels in a longitudinal slot 31 in the under side of beam 14. Thus, a lifting force applied to the chains 23 slides the tubes 16 and hooking devices 15 outward away from the opposite ends of beam 14.

When the tool **10** is lowered onto the top of the package as shown in FIG. **1**, the four fingers **20** and **21** in open position as shown provide a four point stable support for the tool. As lifting chains **23** are relaxed, the weight of tool **10** presses the fingers **20** and **21** into the bundle wrappers so that when the fingers are closed together they slide under the binding wires **11** without tearing the bundle wrappers. Slot **31** permits sufficient relative rotation of hooking devices **15** on the axis of beam **14** to accommodate uneveness of the top surface of the package.

When the chains **23** are relaxed after carrying the package, the hooking devices are retracted back to the ends of beam **14** by a fluid pressure cylinder **35** and piston rod **36** contained within the beam. The opposite ends of the cylinder and piston rod are connected to brackets **37** on guide blocks **40** in the hooking devices.

Referring now to FIGS. **5** to **7**, a guide block **40** is mounted on the outer end of each sliding tube **16**. Each guide block **40** supports a pair of slide bars **41** and **42** for horizontal reciprocation transversely to tube **16** and beam **14**. Finger **20** is mounted on the outer end of slide bar **41** and finger **21** is mounted on the outer end of slide bar **42**. The slide bars are supported and guided in their reciprocating movements by pairs of rollers **43** on horizontal pins **44** in the guide block **40**. The rollers **43** are disposed in slots **45** in the slide bars.

Both slide bars are reciprocated by a piston rod **49** in a double acting fluid cylinder **50**. The rod end of cylinder **50** is mounted in guide block **40** and piston rod **49** is connected to a bracket **51** on the outer end of slide bar **41**. The confronting surfaces of slide bars **41** and **42** are equipped with rack teeth **52** engaging the teeth on opposite sides of a pinion gear **53** which is mounted for rotation on a vertical stub shaft **55** on the under side of guide block **40**. Thus, the slide bar **41** and finger **20** are driven directly by piston rod **49** on the slide bar **42** and finger **21** are driven through pinion **53** to move in opposite directions from slide bar **41**. Extension of piston rod **49** opens the fingers **20** and **21** as shown in FIG. **5** and retraction of the piston rod closes the fingers together in overlapping relationship as shown in FIG. **6**.

In the modification shown in FIG. **8**, the fingers **20** and **21** are opened and closed by a rotary motor **60** which may be a pneumatic, hydraulic or electric motor. Motor **60** is mounted vertically above guide block **40** and connected with a shaft **55***a* carrying the pinion **53***a*. In this modification the rotary motor **60** takes the place of the reciprocating motor **50** in FIGS. **5** and **6**.

Finger **20** is designated as a wire shoe or lifting pin, having a relatively long, gradually sloping and rounded wedging top surface **65** extending back from a blunt point **64** to force itself under the binding wires **11** when the fingers are closed on the binding wires. When the fingers are closed, the binding wires **11** and, consequently, the package **P** are supported by the finger **20**.

Finger **21** is designated as a holding or retaining dog in that it has a relatively short and steeply sloping top surface **66** at an angle of about 45° to horizontal. This dog shoe is not intended to force itself under the wires to a very great extent nor to provide a lifting function when the package is lifted. It functions primarily as an abutment which engages the wires as the fingers close and holds the tool in operative position as the finger **20** passes under the wires **11**.

The fingers **20** and **21** are disposed in side by side relationship as shown in FIG. **7**. In closed position in FIG. **6** the finger **20** extends under the wires **11** and cooperates with the finger **21** to form a closed pocket **67** on the under side of guide block **40**, confining and containing the wires **11** so that the package is securely held. Pocket **67** is formed by the points of the two fingers passing each other in the closing movement as the wires **11** are lifted away from the top surface of the package by the sloping ramp surface **65** on finger **20**. These hooking devices will also operate on flat strappings, cables and chains as well as the wire type of binding **11**.

Beam **14** is of less length than the distance across the top of the package spanned by the wires **11** whereby the hooking devices **15** are spaced inward from the opposite sides of the package in the initial placement of the tool on the top of the package as shown in FIG. **9**. In FIG. **9** the lifting chains **23** are slack and the tool **10** is resting on its four fingers **20** and **21** on the top of the package with the beam **14** parallel to and directly above the wires **11** as shown in FIG. **5**. This places the open fingers **20** and **21** at a distance on opposite sides of the wires **11**.

The closing of the fingers **20** and **21** as above described gathers the wires **11** into the pocket **67** as shown in FIG. **6**. With the hooking devices **15** thus spaced away from the sides of the package, the wires **11** are readily lifted by the top ramp surfaces **65** on fingers **20** to raise the wires away from the top of the package. As the chains **23** are tightened to lift the package, the wires **11** are lifted higher above the top of the package and, at the same time, the tension in chains **23** moves the hooking devices **15** outward as shown in FIG. **10**. Still further tensioning of the chains extends the hooking devices **15** outward to the sides of the package as shown in FIG. **11** and lifts the package. This is the carrying position of the tool.

In order to release the tool form the package, the package is brought to rest on a support and the chains **23** made slack. Binding wires **11** are released by opening the fingers **20** and **21** to their FIG. **5** position. During this opening movement stripper pawl or dog **70** strips the wires **11** off the finger **20**. While this action is taking place, fluid pressure is introduced into the rod end of cylinder **35** to retract hooking devices **15** back to their FIG. **9** positions. Moving the fingers **20** and **21** inward away from the sides of the package facilitates the disengagement of the fingers from wires **11** and the tool **10** may then be lifted clear of the package as shown in FIG. **1**.

As shown in FIG. **6**, stripper dog **70** is pivotally mounted on a pin **71** on slide bar **42**. Dog **70** is rotatable counterclockwise on pin **71** but clockwise rotation is prevented by a stop pin **72** on slide bar **42**.

The diagram in FIG. **15** illustrates a simple system for pneumatic operation of the cylinders **35** and **50** as above described. Valve **75** is preferably a double solenoid valve with manual override mounted on the tool as shown in FIG. **1**. The valve may be operated by a remote control switch, by radio or by direct manual manipulation. When line **76** is pressurized from a supply line **74**, air pressure in the rod ends of cylinders

50 closes the fingers 20 and 21 for lifting of the package and the lifting of the package extends the hooking devices 15 as described in connection with FIG. 11. When the tool is to be disengaged from the package, valve 75 is shifted to pressurize line 77, the air pressure in the head ends of cylinders 50 opening the fingers 20 and 21 as shown in FIG. 5 and air pressure in the rod end of spreader cylinder 35 retracting the hooking devices 15 to their FIG. 9 positions.

In a similar manner the cylinders 35 and 50 may be operated by a hydraulic system. FIG. 12 may be considered as illustrative of the tool in FIG. 1 with either pneumatic or hydraulic operation of these cylinders.

FIGS. 13 and 14 illustrate modifications of the tool using a rotary motor to open and close the fingers 20 and 21 as explained in connection with FIG. 8. In FIG. 13 a rotary air or hydraulic motor 80 rotates the shaft 55*a* in FIG. 8 to open and close fingers 20 and 21 and the hooking devices 15 are retracted by a cylinder 35 as described in connection with FIG. 2. Extension of hooking devices 15 is by lifting arms 25 as previously described.

In FIG. 14 the shaft 55*a* in FIG. 8 is driven by reversible electric motor 81 equipped with a brake 82. The brake is spring actuated and solenoid released whereby the brake is applied whenever the motor is deenergized. In this modification the hooking devices 15 are retracted by tension springs 85 acting on the bell crank lifting arms 25 and the cylinder 35 is not used.

FIG. 16 shows a multiple lifting device 90 having a frame 91 carrying a plurality of lifting tools 10 for the group of packages P, each containing bundles B secured together by bindings 11. Frame 91 carries an air compressor 92 to supply the pneumatic systems in the lifting tools and the whole array is suspended from a travelling crane 93.

Having now described our invention and in what manner the same may be used, what we claim as new and desire to protect by letters patent is:

1. Apparatus for lifting a package by its binding comprising a beam, a pair of hooking devices mounted on opposite ends of said beam to engage said binding and provide two-point support for said package, means to extend said hooking devices away from each other on said beam comprising pivotal lifting arms on said beam arranged to extend said hooking devices when said beam is lifted, and means to retract said hooking devices toward each other on said beam, each of said hooking devices comprising a pair of opposed fingers mounted for closing and opening lengthwise movements toward and away from each other, said fingers closing together in side by side relation with at least one of said fingers being arranged to pass under said binding and the other finger being arranged to retain said binding on said one finger, and a motor arranged to close and open said fingers.

2. A device as defined in claim 1, said one finger being longer than said other finger, said one finger being a lifting hook and said other finger being a holding dog.

3. A device as defined in claim 2, said fingers being mounted on opposite ends of a pair of slide bars having horizontal side by side sliding movement.

4. A device as defined in claim 3 including A pivotal stripper dog on the slide bar carrying said dog finger arranged to strip said binding from said lifting hook finger when said fingers move away from each other.

5. A device as defined in claim 3 including a pinion gear between said slide bars, and rack teeth on said slide bars engaging opposite sides of said pinion gear for movement of the slide bars in opposite directions.

6. A device as defined in claim 5, said motor comprising a fluid pressure cylinder and piston connected with one of said slide bars for opening and closing said fingers.

7. A device as defined in claim 5, said motor comprising a rotary motor driving said pinion gear for opening and closing said fingers.

8. Apparatus for lifting a package by its binding comprising a pair of hooking devices arranged to engage said binding at two points on top of the package spaced inward from opposite sides of the package, means for retaining said binding in said engagement with said hooking devices, means for sliding said hooking devices away from each other along said binding toward said opposite sides of the package, means for lifting said hooking devices whereby the package is lifted, said sliding means being incorporated in said lifting means and operable by sald lifting means when said hooking devices are lifted, means for retracting said hooking devices toward each other and away from said opposite sides of the package when the package is rested on its bottom, and means for opening said retaining means to release said apparatus from the package.

9. Apparatus as defined in claim 8, each of said hooking devices comprising a pair of opposed fingers mounted for closing and opening lengthwise movements toward and away from each other, and fingers in closed position overlapping each other in side by side relation, said retaining means comprising one of said fingers, and a motor arranged to close and open said fingers.

10. Apparatus as defined in claim 8 including a beam supporting said hookIng devices for sliding movement therealong.

11. Apparatus as defined in claim 10, said sliding means and lifting means including pivotal lifting arms on said beam operable on said hooking devices.

12. Apparatus as defined in claim 11, said beam being tubular and said hooking devices being mounted on the other ends of elongated telescopic members slidable in opposite ends of said beam.

13. Apparatus as defined in claim 12, said hooking devices being rotatable relative to each other on the axis of said beam for adjustment to surface irregularities on the toP of the package.

14. Apparatus as defined in claim 12 including pivotal connections for said lifting arms on said beam, longitudinal slots in said beam, ears on said telescopic members slidable in said slots, pivotal connections between said ears and one end of said lifting arms, and lifting chains for said apparatus connected to the opposite ends of said lifting arms.

15. Apparatus as defined in claim 8, said retracting means comprising a fluid pressure cylinder and piston in said beam.

16. Apparatus as defined in claim 8, said retracting means comprising springs.

17. Apparatus for lifting a package by a tensioned binding on the package comprising a horizontal beam

adapted to be positioned over and parallel with a portion of said tensioned binding extending across the top of the package, a pair of hooking devices on said beam, each hooking device having a pair of opposed horizontal fingers arranged to rest on top of the package on opposite sides of said tensioned binding and support said apparatus on the package, and means for closing each pair of said fingers together in side by side relation causing at lease one finger of each pair to pass under said tensioned binding, whereby the package may be lifted by said beam.

18. Apparatus as defined in claim **17**, said fingers of each pair being mounted on a pair of slide bars having horizontal side by side sliding movement, said one finger of each pair being a lifting finger and the opposed finger being a holding dog, and a stripper dog on the slide bar carrying said holding dog finger arranged to strip said binding from said lifting finger when said fingers are moved away from each other.

19. Apparatus as defined in claim **17** including means to extend said hooking devices away from each other on said beam, and means to retract said hooking devices toward each other on said beam.

20. Apparatus as defined in claim **17**, said hooking devices being rotatable relative to each other on the axis of said beam for adjustment to surface irregularities on the top of the package.

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