United States Patent

Wiseman

[15] **3,662,516**

[45] **May 16, 1972**

[54] BOX FLAP OPENER

[72] Inventor: **John A. Wiseman,** Anderson, Ind.

[73] Assignee: **Shuttleworth Machinery Corporation,** Huntington, Ind.

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[21] Appl. No.: **20,270**

[52] **U.S. Cl.** **53/76,** 53/382

[51] **Int. Cl.** **B65b 43/39**

[58] **Field of Search** 53/76, 382

[56] **References Cited**

UNITED STATES PATENTS

2,997,833	8/1961	Nigrelli et al.	53/382
3,075,332	1/1963	Krupp et al.	53/382

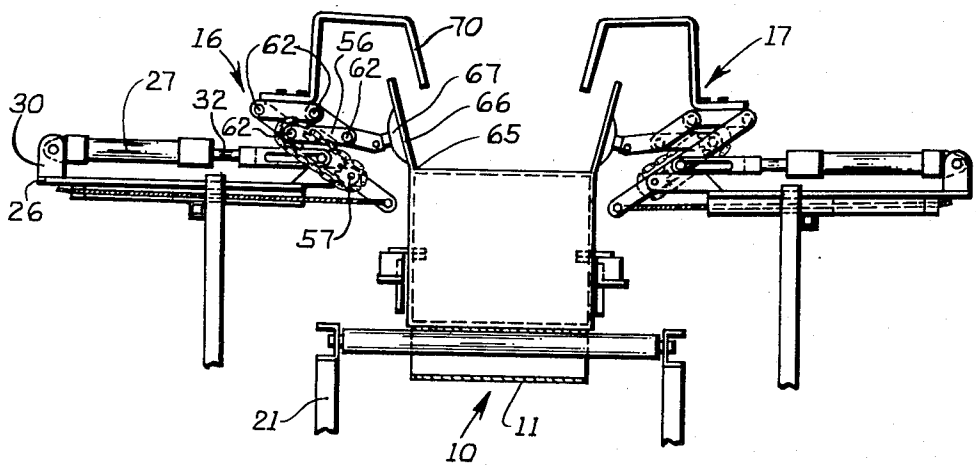
Primary Examiner—Travis S. McGehee

Attorney—Woodard, Weikart, Emhardt & Naughton

[57] **ABSTRACT**

A flap opener for a box including suction cups mounted on levers each arranged to pivot around the axis of the score line of the flap which is to be lifted by the respective lever and the respective suction cup. One alternative form of flap opener uses a parallelogram linkage to mount the lever so that the lever swings about the flap score line while at the same time being radially positioned relative to the box. The other alternative form of flap opener includes a lever which is positioned on one side of the box and, after the flap is opened, the box is pushed away from the lever by a hydraulic cylinder. Both alternative forms include means for holding the flap open after it has been opened.

10 Claims, 7 Drawing Figures



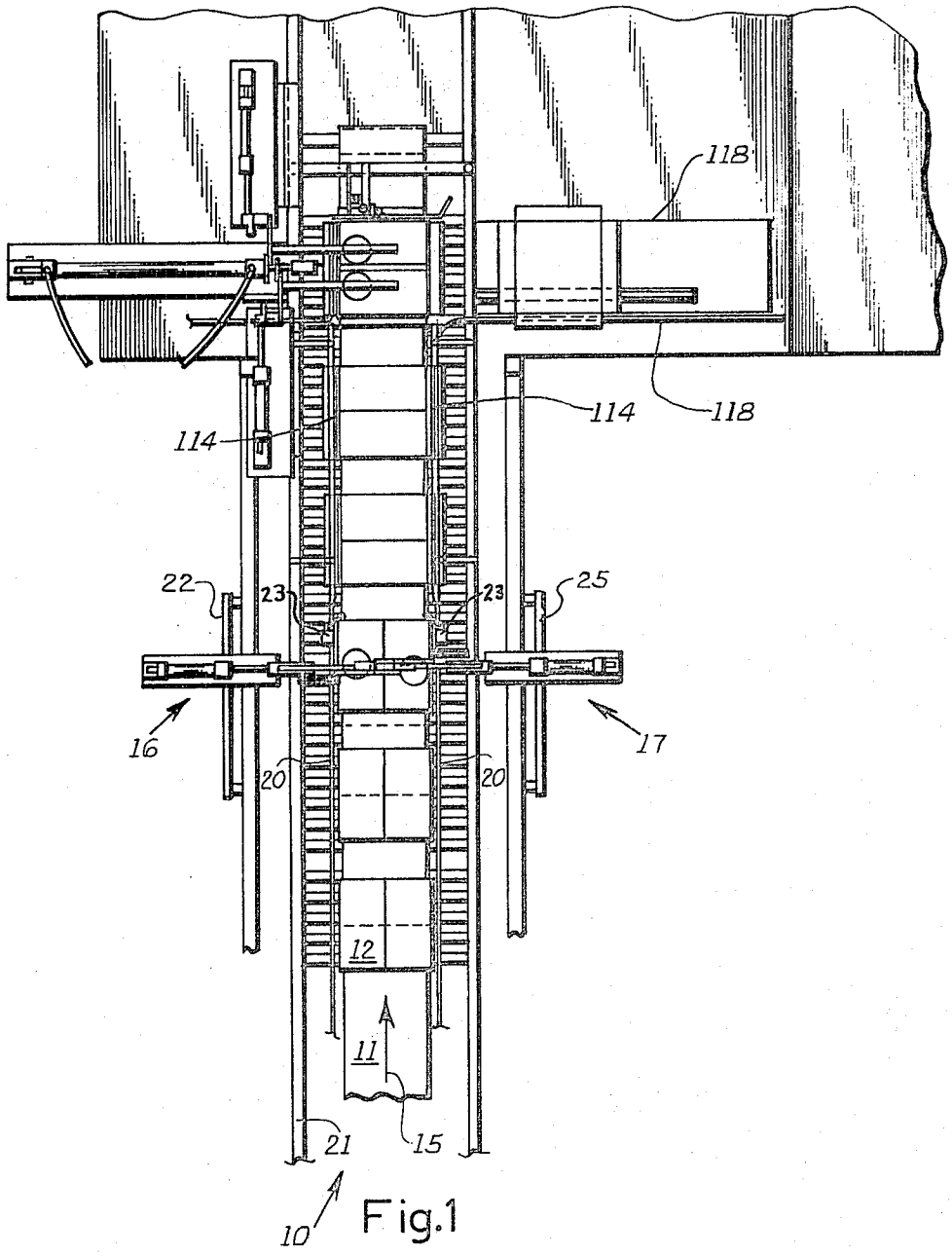


Fig.1

INVENTOR.
JOHN A. WISEMAN

BY
Woodard, Weikart, Emhardt & Naughton
ATTORNEYS

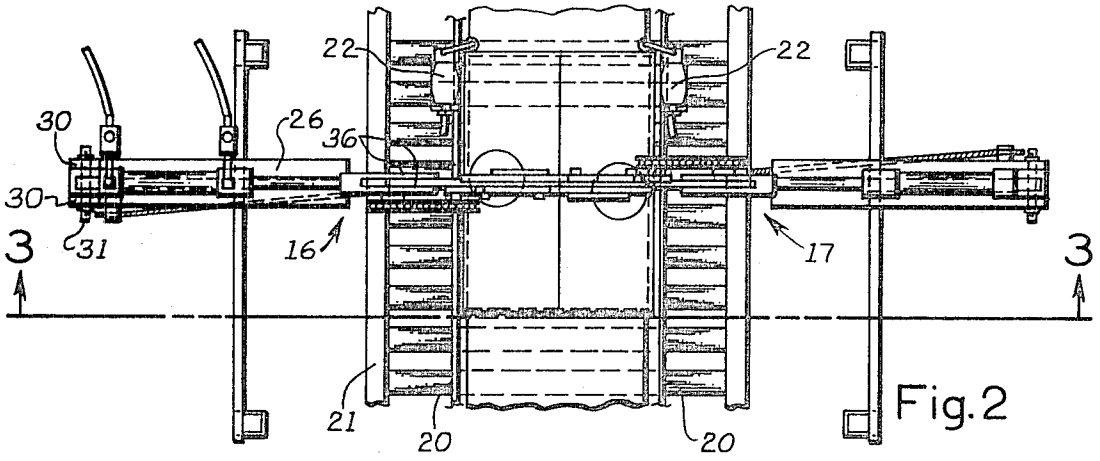


Fig.2

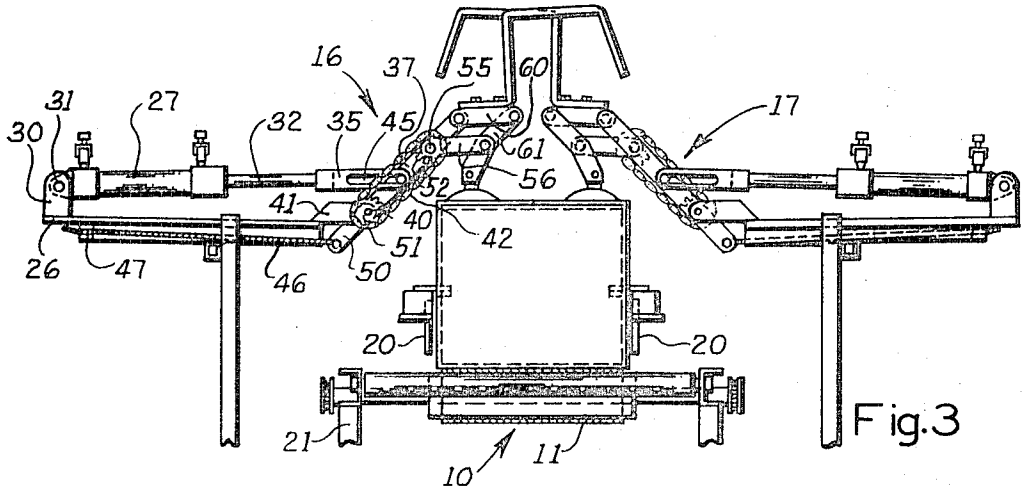


Fig.3

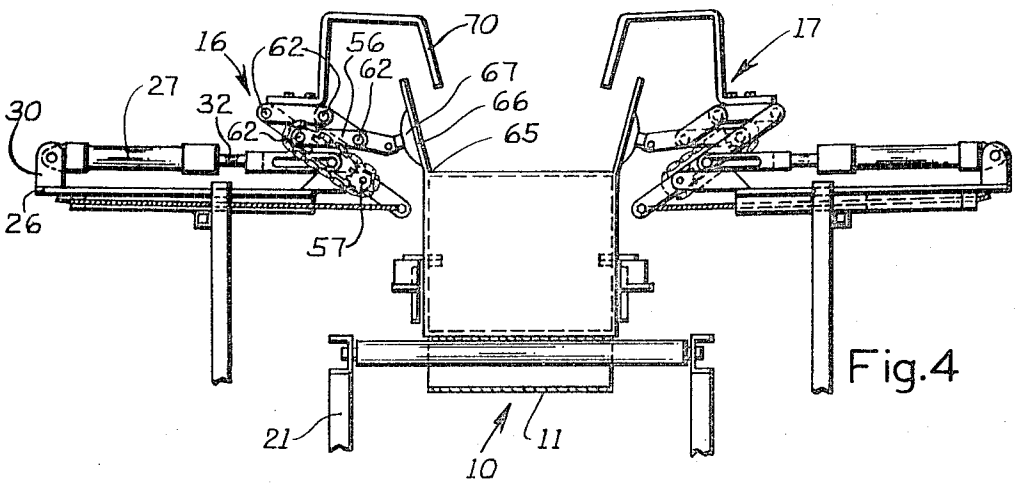


Fig.4

INVENTOR.
JOHN A. WISEMAN

BY
Woodard, Weikart, Emhardt & Naughton
ATTORNEYS

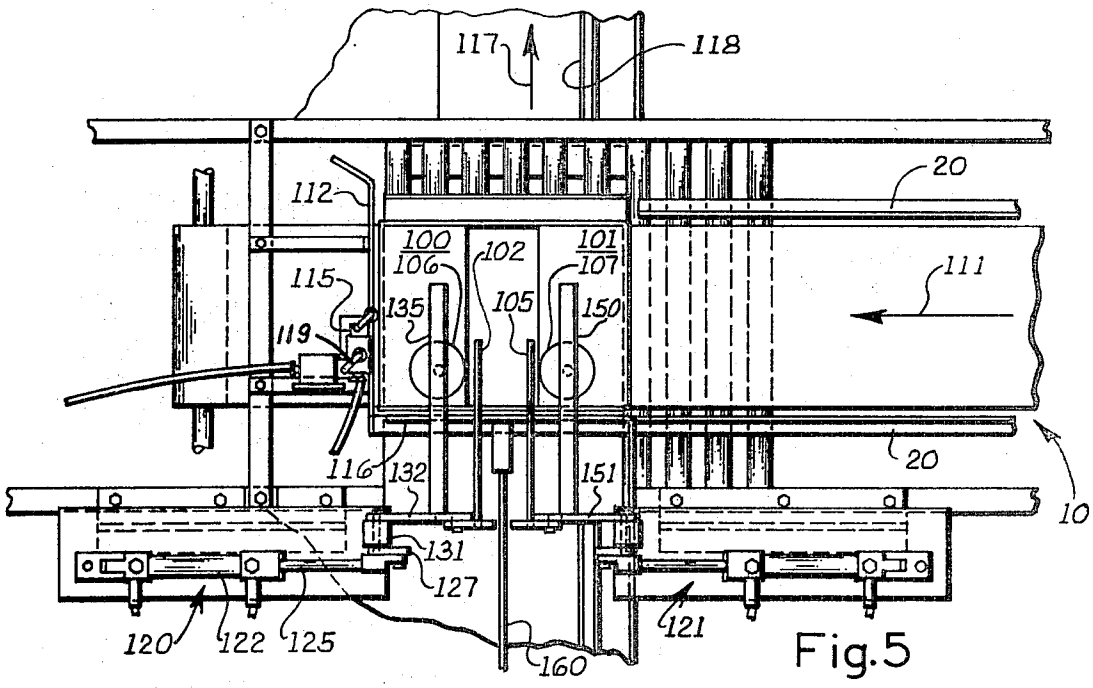


Fig.5

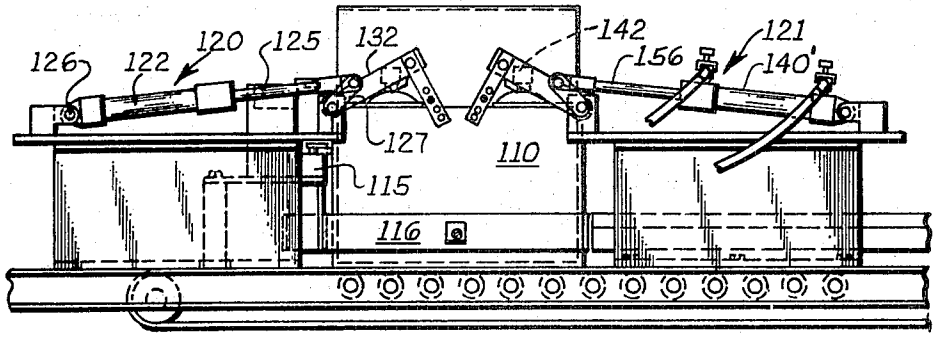


Fig.6

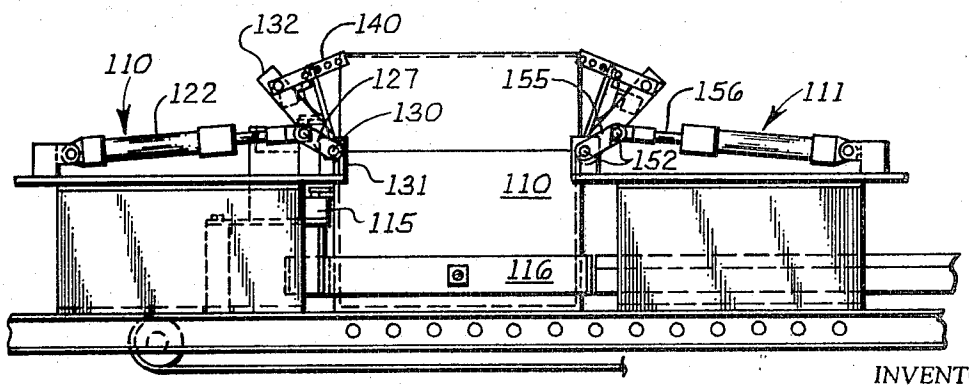


Fig.7

INVENTOR.
JOHN A. WISEMAN

BY
Woodard, Weikart, Emhardt & Naughton
ATTORNEYS

BOX FLAP OPENER

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to a box flap opener.

Description of the Prior Art

Various devices are available in the prior art for opening the flaps of boxes and include suction cups as shown for example in U.S. Pat. No. 3,224,166 to Johns et al. and kickers as shown for example, in U.S. Pat. No. 3,448,560 to Shuttleworth. One feature which is lacking in these devices but which is desirable is means for engaging or grasping the flap and swinging it about the score line of the flap. Without such an arrangement there is a tendency for a suction cup, for example, to become detached too quickly from the flap which it is designed to open. It is also desirable that improved means be provided for maintaining the flap open after it has been initially opened by the device.

SUMMARY OF THE INVENTION

One embodiment of this invention might include a flap opener for a box comprising a support for said box, said box having a flap which is hinged to the box for pivoting about an axis, means for attachment to a box, a mounting member for said means, said mounting member being pivotal about said axis, and means for pivoting said mounting member to move said attachment means against said flap to attach to said flap and for pivoting said mounting member to move said attachment means to pull said flap open.

Objects of the invention are to provide improved flap opening apparatus, to provide flap opening apparatus which maintains its connection to the flap for a longer period of time during opening thereof, to provide flap opening apparatus which maintains the flap open after initial opening, and to provide flap opening apparatus which is more consistantly successful in the opening of box flaps.

Related objects and advantages will become evident as the description proceeds.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of the flap opener apparatus.

FIG. 2 is a top plan enlarged fragmentary view similar to FIg. 1 of a portion of the apparatus.

FIG. 3 is a side elevation partially in section of the structure illustrated in FIG. 2.

FIG. 4 is a view similar to FIG. 3 but showing the apparatus in a different operating position.

FIG. 5 is a top plan enlarged fragmentary view similar to FIG. 1 of a different portion of the apparatus.

FIG. 6 is a side elevation of the structure illustrated in FIG. 5.

FIG. 7 is a view similar to FIG. 6 but showing the apparatus in a different operating position.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now more particularly to the drawings, there is illustrated a conveyor **10** which is arranged to move boxes horizontally by means of an endless belt **11** which is driven continuously to move the boxes **12** in the direction of the arrow **15**. The boxes are moved between a pair of side flap openers **16** and **17** which are substantially identical. Consequently, only representative opener **16** will be described. The conveyor **10** includes box side guides **20** which are fixed to the frame **21** of the conveyor. Mounted on the respective side guides are limit switches **23** both of which must be actuated to operate the openers **16** and **17**. The openers **16** and **17** are adjustably mounted on respective support members **22** and **25** and can be adjusted in the direction of the travel of the boxes. Preferably the openers **16** and **17** are positioned opposite to one another but in such a position that their parts do not interfere during operation.

FIGS. 2–4 show the opener **16** as including a base **26** and a hydraulic cylinder motor **27** pivoted to the base **26** by the projections **30** and pin **31** extending through said projections. The piston **32** of the motor **27** has mounted on its distal end a slotted clevis **35**. The bifurcations **36** of the clevis straddle a lever **37** which is pivoted at **40** to a bracket **41** fixed to the base **26**. The lever **37** has fixed thereto a pin **42** which rides in a pair of slots **45** in the clevis **35**. When the piston **32** is fully extended as in FIG. **3**, the lever **37** can travel to the position illustrated in FIG. **3** under the action of a tension spring **46** which is secured at one end to a bracket **47** fixed to the base **26** and is secured at its other end to the lower end **50** of the lever **37**. The retracted position of the piston **32** is shown in FIG. **4**.

A pair of sprockets **51** and **52** and a chain **55** on the sprockets are used to keep the link **56** always in a position which is parallel to its initial position. In other words, the position of the link **56** in FIG. **3** is parallel to the position of the link **56** in FIG. **4**. This relationship is maintained by fixing the sprocket **51** to the bracket **41** by the pin **57** which provides the pivot location **40**. The sprocket **52** is fixed to the link **56** and has the same number of teeth as the sprocket **51**. Consequently, the chain **55** always maintains the sprocket **52** oriented in the same position (i.e. with its topmost tooth upward and its bottomost tooth downward) even though the lever **37** moves the sprocket **52**.

The link **56** along with a link **60** equal in length to the link **56**, a cup mounting member **61** and a lever **37** form a parallelogram. In other words, the pins **62** which connect these four members together have their axes arranged in a parallelogram configuration. Of course, the members **56**, **60**, **61** and **37** are connected pivotally so that the parallelogram configuration can change from that of FIG. **3** to that of FIG. **4** and vice versa. The length of the link **56** is equal to the length of the link **60** as to distance between the axes of the pins **62**. This length is also equal to the distance from the fixed pivot point or axis **40** to the score line or axis **65** of pivoting of the flap **66** on the box **65**.

It can be appreciated therefore that the cup mounting member **61** pivots around the score line **65** in moving to the positions of FIGS. **3** and **4** and to other positions. A suction cup **67** is fixed to the cup mounting member **61**. When the cup **67** is moved to the position of FIG. **3** it comes down upon the flap **66** and is thereby attached by suction to the flap. Because the cup mounting member pivots about the score line **65**, the cup **67** is not pulled loose from the flap and instead maintains its orientation and connection as the cup pivots the flap and both move together from the position of FIG. **3** to the position of FIG. **4**.

The cup **67** can only hold the flap **66** for a short period of time because the box is moving on the conveyor **10**. Therefore additional means are provided for maintaining the flaps open after they have been initially opened by the suction cups **67**. This additional means is the arm **70** which is fixed to the top of the link **60**. When the flap is down as shown in FIG. **3**, the arm **70** is in the position shown in FIG. **3**. When the flap moves to the position of FIG. **4**, the arm **70** keeps its same attitude or orientation but the arm first moves up and then down again to the position of FIG. **4**. Of course, the arm **70** is at its highest position when the lever **37** is vertical. When the arm **70** is in the position of FIG. **4**, the flap **66** is held open by the arm **70** when the cup **67** becomes detached from the flap **66**.

Referring now to FIGS. **5**, **6** and **7**, a further flap opener is illustrated which is arranged to open the front and rear flaps of the box. In practically all cases the box is not square and instead is longer in the front to rear direction with the two flaps **100** and **101** being spaced from one another when closed by a spacing of at least 1 inch. This spacing is used to permit placing the rods **102** and **105** behind the flaps **100** and **101** to hold them open as the box moves against a plow (not shown) such as is shown, for example, in the U.S. Shuttleworth Pat. No. 3,448,560. The flaps are opened in the first instance by vacuum cups **106** and **107** and the rods hold the flaps open as the box **110** moves away from the viewer of FIG. **6** and **7**.

After the flap openers **16** and **17** operate on the box, it is moved by the conveyor **10** in the direction of the arrow **111** (FIG. **5**). The flaps are held open by the guide means **114** mounted on the frame **21** of the conveyor. The conveyor moves the box until the box engages the stop **112** and the limit switch **115** whereupon the flaps **100** and **101** are opened and the box is pushed by the pusher bar **116** away from the viewer of FIGS. **6** and **7** in the direction of the arrow **117** (FIG. **5**). As mentioned suitable flap plow structure (not shown) is provided to maintain the flaps open once they have been opened by the vacuum cups and rods. Also suitable box guide rails **118** are mounted on the frame **21** for guiding the box in the direction of the arrow **117** as it is pushed by pusher bar **116**.

The apparatus of FIGS. **5**, **6** and **7** operates by the same concept as the apparatus of FIGS. **1 – 4**; that is, the pivoting action is about a score line. Each of the vacuum cups **106** and **107** is mounted on and operated by a respective opener assembly **120** and **121**, respectively. The opener assembly **120** includes a hydraulic cylinder motor **122** having a piston **125**. The motor **122** is pivoted at **126** to the conveyor frame **21** and the piston **125** is pivoted to a lever **127**. The lever **127** is pivoted to the frame **21** for pivoting about the axis of the pin **130** which extends through the post **131**. A further lever **132** is fixed to the pin **130**. The further lever **132** has mounted thereon a suction cup mounting rod **135** to which the suction cup **106** is secured. It can be appreciated therefore that the suction cup **106** is pivoted about the score line of the flap **100**.

Also mounted on the lever **132** is a rod mounting member **140**. The rod mounting member **140** is pivotally secured by pin **141** to the lever **132** and is normally held by gravity in the position of FIG. **7**, that is, against a stop **142** fixed to the lever **132**. When the member **140** is so positioned by gravity, it can hold the flap **100** open in the position illustrated in FIG. **7**, by means of the rod **102** which is secured to the member **140**. As shown in FIGS. **5** and **6**, however, the flap is not so held and instead is closed. When the lever **132** is pivoted to the position illustrated in FIGS. **5** and **6**, the suction cup **106** is in engagement with the flap **100** and is attached thereto ready to lift the flap and swing it to the position of FIG. **7**. The rod **102**, however, rests on top of the box **110** and, because the lever **140** is thereby pivoted on the lever **132**, the rod **102** moves out to the illustrated position of FIG. **5**, that is, beyond the edge of the flap **100**.

When the flap is lifted or swung by the vacuum cup **106**, the lever **140** pivots on the lever **132** until the rod **102** drops behind the flap **100**. Then when the box is caused to detach from the suction cups by the operation of the pusher bar **116**, the flap **100** is still held open by the rod **102**. It can be appreciated therefore that the hydraulic cylinder **122** should be timed or set up to operate so that the piston **125** is projected, the suction cup **106** attached and the piston substantially retracted before the pusher bar **116** moves any appreciable distance to push the box in the direction of the arrow **117**. The starting of operation of the cylinder **122** as well as the cylinder **140'** forming a part of the assembly **121** is caused by the limit switch **115** which is engaged by the box **110** when the conveyor **10** forces the box against the limit switch **115**. After the flap **100** is opened the push off bar cylinder is actuated by the limit switch **119** the actuating arm of which is engaged by the opened flap **100**.

The construction and operation of the opener assembly **121** is substantially the same as the opener assembly **120**. Similarly to the assembly **120**, the assembly **121** includes suction cup **107**, cup mounting rod **150**, lever **151**, pin **152**, lever **155**, hydraulic cylinder **140'** and piston **156**. Both the opener assembly **120** and **121** operate through their cycles simultaneously so that both the flaps **100** and **101** are opened generally simultaneously prior to push off by the bar **116**. The piston **160** is for the push out cylinder which moves the bar **116**.

While the invention has been disclosed and described in some detail in the drawings and foregoing description, they are to be considered as illustrative and not restrictive in character, as other modifications may readily suggest themselves to persons skilled in this art.

I claim:

1. A flap opener for a box comprising a support for said box, said box having a flap which is hinged to the box for pivoting about an axis, first means for attachment to a flap, a mounting member for said means, said mounting member being pivotal about said axis, and second means connected to said first means by said mounting member and operable to move said first means against said flap to attach to said flap and to move said first means pivotally about said axis while restrained against movement toward and away from said axis to pull said flap open.

2. The flap opener of claim **1** wherein said means for attachment comprises a suction cup.

3. A flap opener for a box comprising a support for said box, said box having a flap which is hinged to the box for pivoting about an axis, means for attachment to a box, a mounting member for said means, said mounting member being pivotal about said axis, and means for pivoting said mounting member to move said attachment means against said flap to attach to said flap and for pivoting said mounting member to move said attachment means to pull said flap open, and wherein said means for attachment comprises a suction cup, said means for pivoting said mounting member comprises a base fixed in relation to said support; a lever pivoted to said base; means connected between said lever and said base for pivoting said lever; a pair of parallel links connecting said suction cup mounting member to said lever; a sprocket and chain coupling between one of said links and said base and including a pair of sprockets of equal number of teeth one fixed to said base and one fixed to said one lever with a chain coupling said sprockets; said lever, links and suction cup mounting member being connected together in the shape of a parallelogram with the connections being pivotal and with said links forming two parallel sides and said lever and cup mounting member forming two parallel sides.

4. The flap opener of claim **3** additionally comprising a rigid arm fixed to one of said links; said rigid arm having an inverted U-shape configuration, said arm having a distal end portion which is positioned to block closure of said flap after said flap has been opened by said suction cup.

5. The flap opener of claim **3** wherein said means connected between said lever and said base for pivoting said lever comprises a fluid cylinder motor and a spring, said spring being connected between said lever and said base, said fluid cylinder motor having a piston, a slotted clevis mounted on said piston, and a pin secured to said lever and extending through the slot in said slotted clevis.

6. The flap opener of claim **2** wherein said second means comprises a base fixed in relation to said support; a first lever pivoted to said base; means connected between said lever and said base for pivoting said lever; an elongate bar connecting said suction cup mounting member to said lever; said lever being pivotal about said axis and positioned on one side of said box, and means for pushing said box away from said lever.

7. A flap opener for a box comprising a support for said box, said box having a flap which is hinged to the box for pivoting about an axis, means for attachment to a box, a mounting member for said means, said mounting member being pivotal about said axis, and means for pivoting said mounting member to move said attachment means against said flap to attach to said flap and for pivoting said mounting member to move said attachment means to pull said flap open, and wherein said means for attachment comprises a suction cup, said means for pivoting said mounting member comprises a base fixed in relation to said support; a first lever pivoted to said base; means connected between said lever and said base for pivoting said lever; an elongate bar connecting said suction cup mounting member to said lever; said lever being pivotal about said axis and positioned on one side of said box, and means for pushing said box away from said lever, and additionally comprising conveyor means adapted to move said box in a direction on said support, a stop fixed with relation to said support and arranged to stop the box against further movement in said direction on said support, said means for pushing said box being arranged to push said box perpendicularly of the direction of movement of said box on said support.

8. The flap opener of claim 7 additionally comprising a first limit switch fixed relative to said support and arranged to sense a box stopped by said stop, said first limit switch being arranged to operate said means for pivoting said lever, a second limit switch fixed relative to said support and arranged to sense when a flap has been opened, said second limit switch being arranged to operate said means for pushing said box.

9. The flap opener of claim 6 additionally comprising an elongate rod extending parallel to said elongate bar, a second lever pivoted to said first lever and having said rod secured thereto, stop means fixed to said first lever and limiting downward swinging of said second lever relative to said first lever, said rod being positioned to be cammed by said box beyond the edge of said flap when said cup engages said flap whereby said rod will pivot behind said flap under action of gravity when said flap is opened.

10. A flap opener for a box comprising a support for said box, said box having a flap which is hinged to the box for pivoting about an axis, first means for attachment to a flap, a mounting member for said means, said mounting member being pivotal about said axis from completely on one side of said axis to completely on another side of said axis, and second means for pivoting said mounting member to move said first means against said flap to attach to said flap and for pivoting said mounting member to move said first means to pull said flap open.

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