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Johnson et al.

[11] **3,852,942**

[45] **Dec. 10, 1974**

[54] **APPARATUS FOR OPENING A CARTON FLAP**

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[73] Assignee: **Emhardt Corporation,** Bloomfield, Conn.

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[21] Appl. No.: **406,731**

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

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

[58] **Field of Search** ..... 53/382, 381 R

[56] **References Cited**

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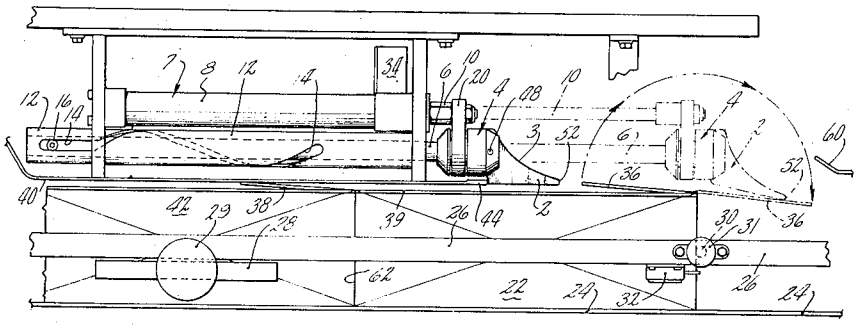
Primary Examiner—Travis S. McGehee

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[57] **ABSTRACT**

Means for opening the leading flap of a carton are provided by a device having a flap opener pivotably mounted on a translating shaft, which shaft also rotates as it translates, thus moving the flap opener through a helical path; the flap opener is spring loaded such that as it moves away from its rest position, the forward portion of the flap opener drops down to allow it to get under the flap, even if the flap is level with, or below, the upper edges of the panels of the carton; as the flap opener moves forward, it rotates so that in addition to moving under and into the flap, it also lifts the flap up and pushes it over the edge of the front panel of the carton to a horizontal full open position.

14 Claims, 9 Drawing Figures



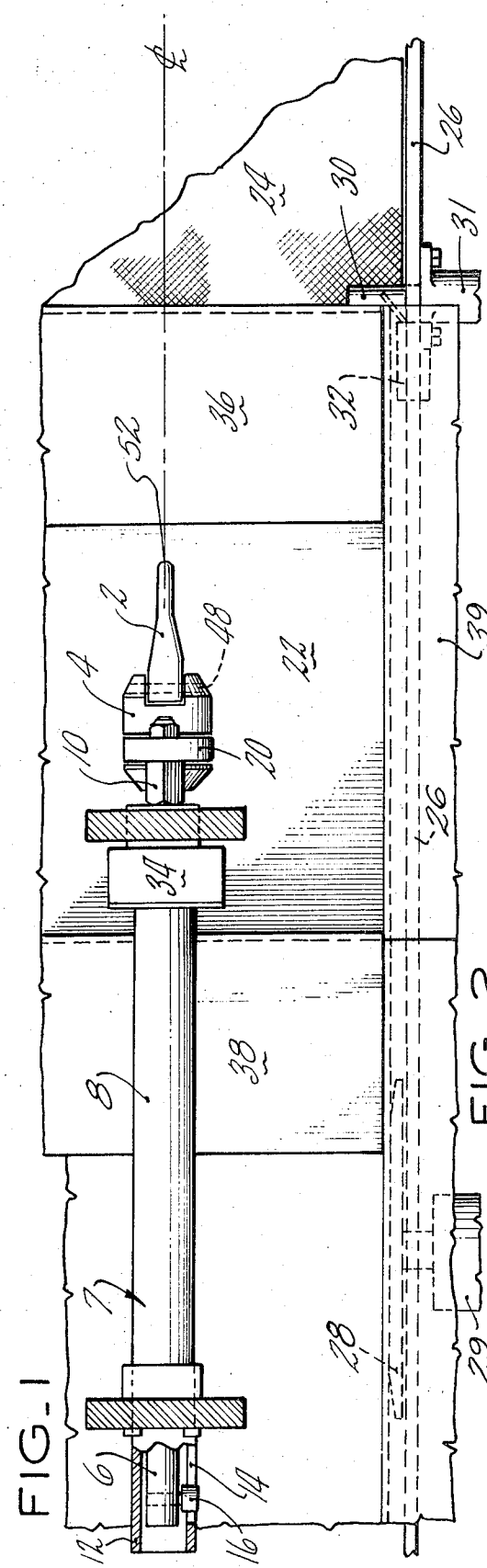


FIG_1

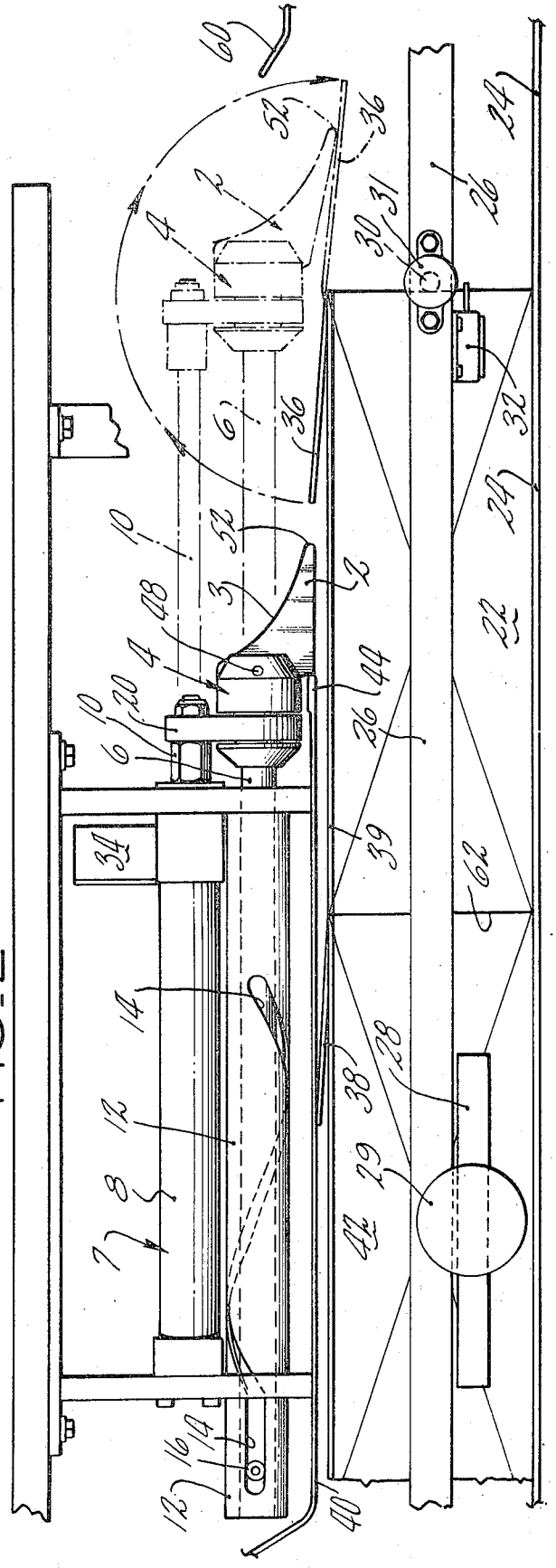


FIG_2

FIG_3

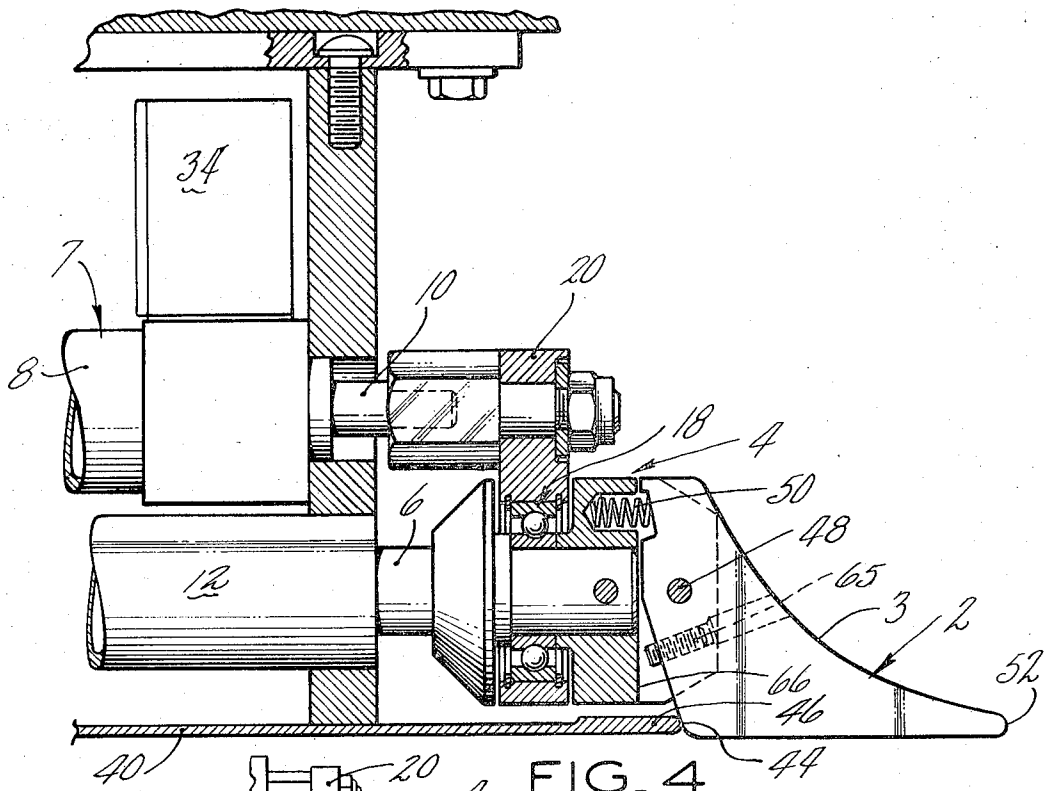


FIG_4

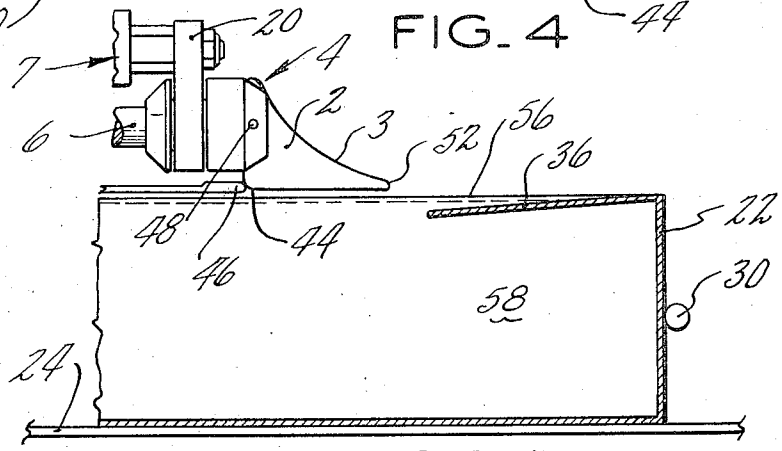


FIG_5

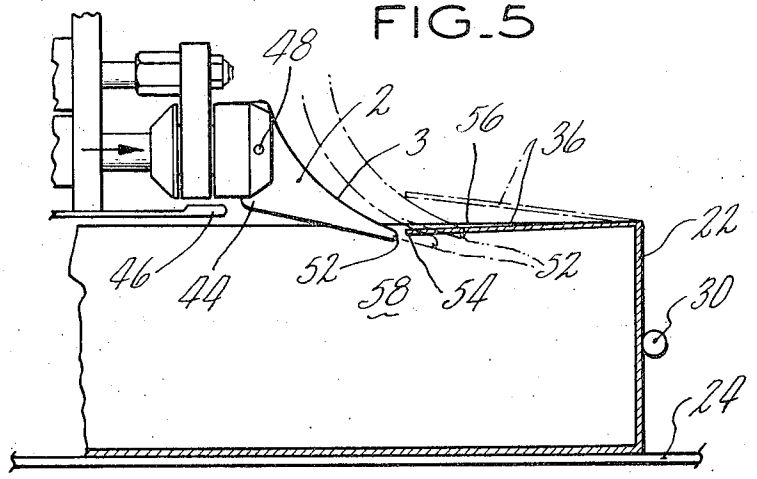


FIG. 6

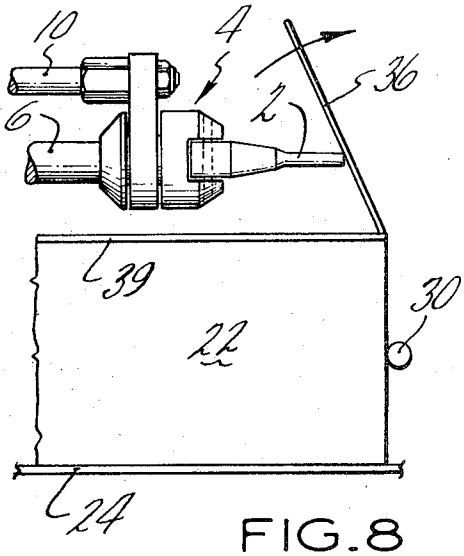


FIG. 7

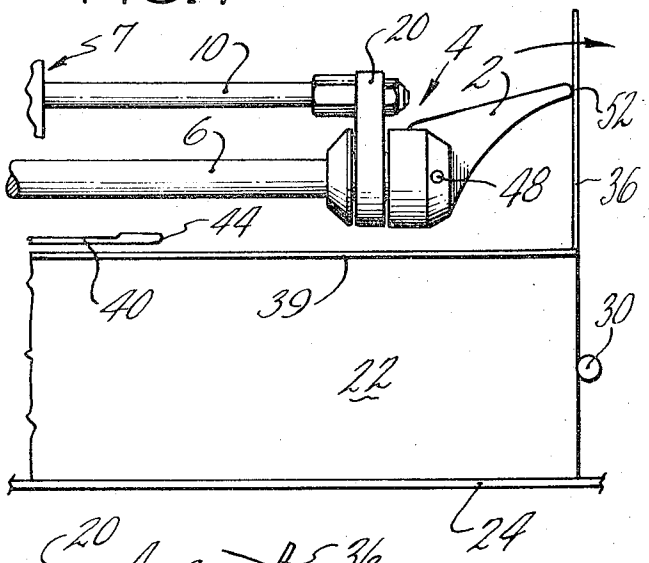


FIG. 8

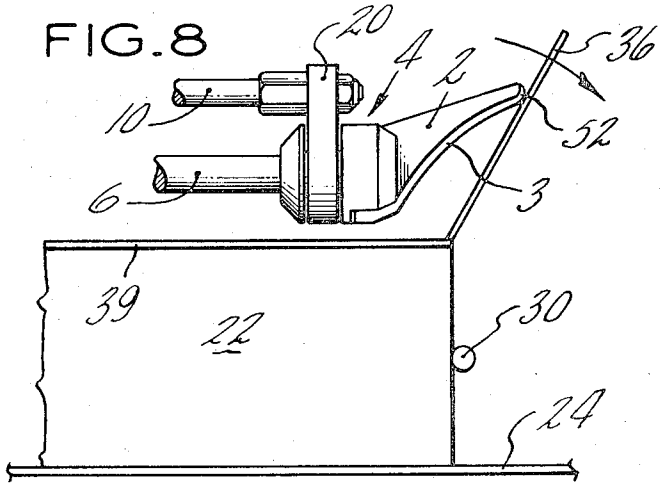
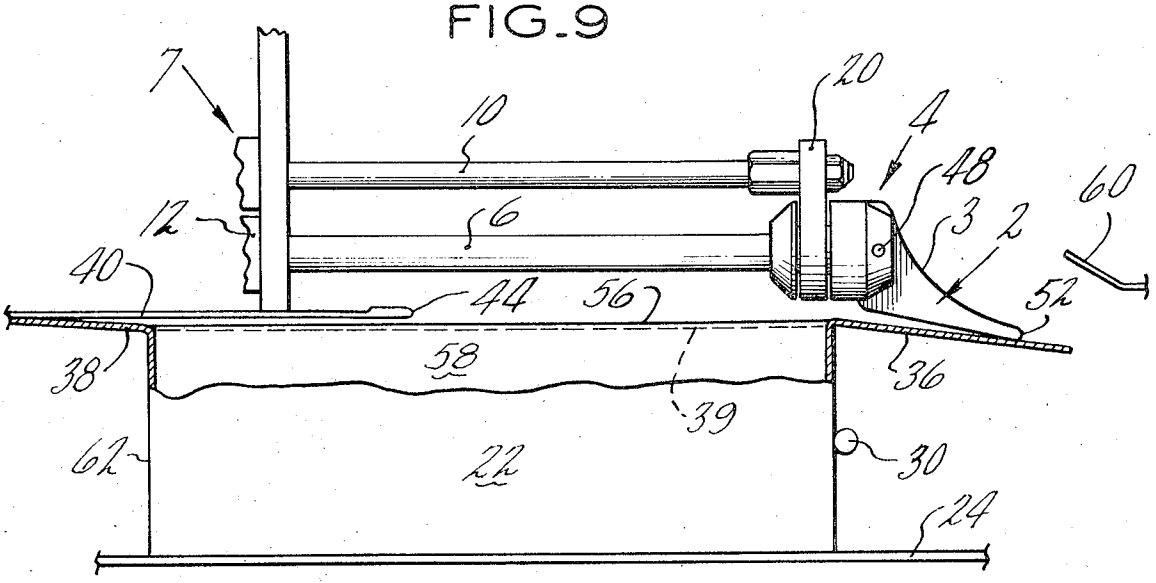


FIG. 9



APPARATUS FOR OPENING A CARTON FLAP

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a carbon flap opener and particularly to a flap opener for the leading flap of a carbon which flap opener is capable of getting under the level of the flap in the closed position, lifting the flap upwardly and pushing it over into its full open position.

2. Description of the Prior Art

Many attempts have been made to devise efficient, smooth operating, and reliable leading flap openers with varying degrees of success. For example, flaps may be opened manually, a good but slow and expensive method. Flap "kickers," such as shown in U.S. Pat. No. 2,890,560, for example, are also known. Another method of opening a leading flap is to utilize a pin fixed to a rotating chain, for example, as shown in U.S. Pat. Nos. 2,918,773 and 3,224,165. To the best of our knowledge, however, none of the prior art flap openers work entirely satisfactorily. One problem with prior art flap openers which is particularly vexing is encountered when attempting to open the leading flap of a carton, which flap has not been "pre-broken," that is, there is no crease at the junction of the flap and the panel of the carton. The prior art devices work relatively satisfactorily on cartons of which the flaps have been prebroken, but often when the prior art devices are utilized to open nonprebroken leading flaps, the front panel of the case will become creased, or the flap opener will penetrate the flap without opening it. These and other problems encountered with prior art flap openers are solved by means of our presently described novel flap opener.

SUMMARY OF THE INVENTION

The object of the present invention is to provide an efficient, smooth operating and reliable leading flap opener for a carton which is able to open a flap that may be level with, above, or below, the edges of the panels of the carton, and which does not penetrate the flap or crease a panel of the carton, even if the flap is not prebroken.

In accordance with the present invention an apparatus for opening a flap of a carton which is folded inwardly at the edge of a panel of the carton is provided by a flap opener which is disposed on flap opener holding means, such as the leading end of a shaft. The holding means are disposed adjacent and spaced from conveying means which convey cartons in an endwise fashion between the holding means and the conveying means to a predetermined location. At that time the holding means such as a shaft with the flap opener on the leading end thereof translates from its rest position towards the flap to be opened. As it translates, the shaft also rotates, thereby rotating the flap opener and causing the flap opener to move through a helical-like path as it engages and opens the flap. In this manner the flap opener lifts the flap up, as well as pushes it open. This action prevents the flap opener from causing the panel of the carton to which the flap is hinged to crease, and it also prevents the flap opener from penetrating the flap itself. The carton is preferably stationary during the flap opening procedure, but it is also possible to open the flap while the carton is in motion.

In accordance with a further aspect of the present invention, the flap opener is pivotably disposed on the shaft and urged to pivot by biasing means so that as the flap opener moves away from its rest position, the leading tip of the flap opener drops down as the flap opener pivots so that the tip of the flap opener is below the edge of the flap to be opened, even if the edge of the flap is below the upper edges of the panels of the carton, for example.

In accordance with another aspect of the present invention, the leading face of the flap opener is scooped to provide a camming action on the edge of the flap to be opened so that the flap opener can lift the flap as well as push it to its full open position.

The foregoing and other objects, features and advantages of the present invention will become more apparent in light of the following detailed description of a preferred embodiment thereof as illustrated in the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a partial plan view of a flap opening machine for cartons showing an embodiment of the flap opener apparatus according to the present invention.

FIG. **2** is a partial side elevation of the flap opening machine shown in FIG. **1.**

FIG. **3** is an enlarged view of the flap opener according to one embodiment of the present invention.

FIGS. **4** through **9** are partial views illustrating the sequential operation of the flap opener in accordance with the present invention, with the flap opener shown at rest in FIG. **4** and preceding through FIGS. **5, 6, 7** and **8** to FIG. **9** where the flap is shown fully open.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the figures, wherein like numerals refer to like components, in FIGS. **1** and **2** there is shown one embodiment of an apparatus for opening a carton flap in accordance with the present invention. A flap opener **2** is mounted in a rotatable head **4** on a shaft **6.** The details of the flap opener head assembly **4** are shown best in FIG. **3.** Means for translating the shaft **6,** and thus the head assembly **4,** can be provided by any of various means known in the art, such as an air motor **7** comprising a cylinder **8** having a piston rod **10** connected to the head assembly **4.** The air cylinder operates to move the piston (not shown) and piston rod **10** back and forth to translate the head assembly **4** and thus the shaft **6.** The shaft **6** is disposed with in a tube **12** which has a cam slot **14** cut therein. The shaft **6** has a cam follower pin **16** disposed therein adapted to follow the cam slot **14** in the tube **12** as the shaft **6** translates back and forth. As the shaft **6** translates back and forth within the tube **12,** the shaft **6** will be caused to rotate therein by virtue of the fact that the pin **16** attached to the shaft **6** follows the cam slot **14.** This motion of the shaft **6** causes the head assembly **4** to rotate also because it is fixed to the leading end of the shaft **6.** This can be seen best in FIG. **3** where ball bearing assembly **18** allows the head **4** to rotate within the support **20.** As will be obvious to one skilled in the art, this motion of the head assembly **4,** i.e., rotation and translation, causes the flap opener **2** to move with a helical-like, or corkscrew, motion. The face **3** of the flap opener **2** may be scoop-shaped, or camshaped, so that the flap **36** is lifted as the flap opener **2** initially engages

the flap **36.** These features provide advantages in opening the flap of a carton as will be explained hereinafter.

The cartons **22** are moved by means of a conveyor **24** between two outside guide rails **26** (one of which is not shown). An infeed line brake **28,** well-known in the art, is provided to hold a line of cartons at the inlet of the flap opening portion of the machine. The line brake **28** may be operated by an air motor **29** in a manner well-known to those skilled in the art. A retractable carton stop **30** may be provided to stop each carton in a predetermined location. The carton stop **30** may be operated by an air motor **31** or by any means known in the art. It will be realized by those skilled in the art that the machine may be symmetrical about its centerline. Hence only a portion of the machine is shown in FIG. **1.** For example, only one outside guide rail **26,** one infeed line brake **28** and one carton stop **30** are shown. However, there may be another one of each on the opposite side of the machine shown in FIG. **1.** A first switch **32** is provided to actuate the air motor **7** for translating and rotating the flap opener as the carton **22** reaches the carton stop **30.** A second switch **34** is provided, preferably operatively connected to the air motor **7,** for returning the flap opener to its original position after the flap opener has opened the leading flap **36** of the carton **22.** The trailing flap **38** of the carton **22** is shown being held open by flap guide **40.** Of course, a machine would need apparatus for opening the trailing flap **38** and the side flaps **39** in actual operation. However, the openers for those particular flaps form no part of our invention per se, and many types of trailing flap and side flap openers known in the art could be utilized. See U.S. Pat. Nos. 1,471,924 and 3,247,646 for examples of some of the many types of trailing flap and side flap openers suitable for use.

The operation of apparatus according to our invention is as follows. The carton stop **30** is in position to stop a carton **22** in a predetermined location. The line brake **28** is released by the air motor **29,** thereby freeing the carton held thereby to move on the conveyor **24** to the station in which carton **22** is shown, the carton being stopped by carton stop **30.** At that time the carton **22** also contacts the first switch **32** which energizes a solenoid for example, thereby causing the air motor **7** to operate the flap opener apparatus. The operation of the flap opener can be seen best in FIGS. **4** through **9.** FIG. **4** shown the flap opener **2** at the moment the switch **32** is activated (i.e., the flap opener is at rest). The lower trailing portion **44** of the flap opener **2** rests against the stop **46.** As the shaft **6** moves forward, moving the head assembly **4** with it, the flap opener **2** moves away from its rest position and the portion **44** moves away from stop **46,** as shown in FIG. **5.** The flap opener **2** is then caused to rotate about pivot **48** by spring **50** (shown in FIG. **3**). This motion allows the leading tip **52** of the flap opener **2** to drop down to a point below the flap **36,** even if the edge **54** of the flap **36** is below the edge **56** of the side panel **58,** for example. Provisions may also be included in the flap opener **2** for regulating the distance which the flap opener tip **52** drops as the trailing portion **44** moves away from the stop **46.** A set screw **65** is shown in FIG. **3** which may be adjusted in a threaded bore in the flap opener **2** to contact the wall **66** at any desired drop of the tip **52.** As the flap opener **2** progresses forwardly, it is rotated by the shaft **6** which is also rotating by virtue of the pin **16** therein following the cam slot **14** in the tube **12** as described heretofore. The rotation of the flap opener **2** can be seen in FIGS. **6-9** at which point the flap opener **2** has opened the flap **36** to its full open position. The flap opener **2** is kept in the position shown in FIG. **9** until the next carton **42** (shown in FIGS. **1** and **2**) pushes the carton **22** forward so that the flap **36** will be held open by the flap guide **60** as the carton goes to the next station in the packing process (not shown). When the flap opener **2** reaches its forward most position (FIG. **9**), the air motor **7** activates the second switch **34.** The second switch **34** energizes a solenoid which operates air motor **31** and causes the carton stop **30** to be retracted and the line brake **28** to be applied to the next succeeding carton. The lead carton, carton **22** moves to the next station (not shown) on conveyor **24.** When the trailing edge **62** of the carton **22** moves off the first switch **32** thereby opening the switch, the line brake **28** holding the next succeeding carton **42** is released by air cylinder **29,** the carton stop **30** is moved into carton stopping position, and the shaft **6** with the flap opening head **4** thereon is returned to its starting position by air motor **7.** The cycle will repeat when the leading edge of the next succeeding carton **42** contacts the first switch **32.**

As the flap opener **2** engages the flap **36,** it will be obvious to those skilled in the art that the flap opener **2** lifts the flap **36,** first by virtue of the cam-shaped surface **3,** and then with the tip **52,** as it pushes the flap **36** over into it full open position. This can be clearly seen in FIGS. **4–9** wherein the sequence of operation is shown. This is an advantageous manner in which to open the flap because it solves the problem encountered by some flap openers known in the art of creasing the leading end panel of the carton and the problem of penetration of the flap by some flap openers known in the art. While the flap opener according to the present invention has been shown in the preferred embodiment as opening the upper leading flap of a stationary carton, it will be appreciated by those skilled in the art that it could be adapted to open other flaps of a stationary carton, such as, but not limited to, the leading bottom flap, or either of the upper or lower trailing flaps, as well as to open the leading flap of a moving carton. That is, the flap could be opened while the carton is in motion merely by having the flap opener operate at a higher speed than the speed of the carton moving along the conveyor. Therefore, it should be understood by those skilled in the art that various changes and omissions in the form and detail thereof may be made therein without departing from the spirit and scope of the invention, which is to be limited only as set forth in the following claims.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. Apparatus for opening a flap of a carton which is folded inwardly at the edge of a panel of the carton, comprising:

means for conveying cartons endwise;

means for stopping each carton at a predetermined location;

flap opener holding means disposed adjacent and spaced from said conveying means a distance sufficient to allow a carton between said conveying means and said flap opener holding means;

a flap opener disposed on said flap opener holding means;

means for rotating said flap opener and translating said flap opener from a rest position towards a flap to be opened such that said flap opener moves in a helical-like path to engage and open the flap; and

means for returning said flap opener to the rest position.

2. Apparatus for opening a flap of a carton which is folded inwardly at the edge of a panel of the carton, comprising:

means for conveying cartons endwise;

means for stopping each carton at a predetermined location;

shaft means disposed adjacent and spaced from said conveying means a distance sufficient to allow a carton between said conveying means and said shaft means;

a flap opener disposed on the leading end of said shaft means;

means for rotating said shaft means and translating said shaft means from a rest position towards a flap to be opened such that said flap opener moves in a helical-like path to engage and open the flap; and

means for returning said shaft means to the rest position.

3. Apparatus for opening a flap as defined in claim **2** wherein said flap opener is pivotably disposed on the leading end of said shaft means and further comprising biasing means operatively connected to said flap opener for urging said flap opener to pivot as said shaft means moves from the rest position such that the leading tip of said flap opener drops down to a point below the edge of the flap to be opened.

4. Apparatus for opening a flap as defined in claim **1**, wherein the leading face of said flap opener is cam-shaped such that said face acts to lift the flap as said flap opener engages the flap.

5. Apparatus for opening a flap of a carton which is folded inwardly at the top edge of the leading end panel of the carton, comprising:

means for conveying cartons endwise;

means for stopping each carton at a predetermined location;

flap opener holding means disposed above and spaced from said conveying means a sufficient distance to allow a carton therebetween;

a flap opener disposed on said flap opener holding means;

means for rotating said flap opener and means for translating said flap opener from a rest position towards the flap to be opened such that said flap opener moves in a helical-like path to engage and open the flap; and

means for returning said flap opener to the rest position.

6. Apparatus for opening a flap of a carton which is folded inwardly at the top edge of the leading end panel of the carton, comprising:

means for conveying cartons endwise;

means for stopping each carton at a predetermined location;

shaft means disposed above and spaced from said conveying means a sufficient distance to allow a carton therebetween;

a flap opener disposed on the leading end of said shaft means;

means for rotating said shaft means and means for translating said shaft means from a rest position towards the flap to be opened such that said flap opener moves in a helical-like path to engage and open the flap; and

means for returning said shaft means to the rest position.

7. Apparatus for opening a flap as defined in claim **6** wherein said flap opener is pivotably disposed on the leading end of said shaft means and further comprising biasing means operatively connected to said flap opener for urging said flap opener to pivot as said shaft means moves from the rest position such that the leading tip of said flap opener drops down to a point below the edge of the flap to be opened.

8. Apparatus for opening a flap as defined in claim **5** wherein the leading face of said flap opener is cam-shaped such that it acts to lift the flap as the flap opener engages the flap.

9. Apparatus for opening a flap of a moving carton which is folded inwardly at the edge of a panel of the carton comprising:

means for conveying cartons endwise;

flap opener holding means disposed adjacent and spaced from said conveying means a distance sufficient to allow a carton between said conveying means and said flap opener holding means;

a flap opener disposed on said flap opener holding means;

means for rotating said flap opener and means for translating said flap opener from a rest position at a speed greater than that at which said carton is being conveyed towards a flap to be opened such that said flap opener moves in a helical like path to engage and open the flap; and

means for returning said flap opener to the rest position.

10. Apparatus for opening a flap of a moving carton which is folded inwardly at the edge of a panel of the carton comprising:

means for conveying cartons endwise;

shaft means disposed adjacent and spaced from said conveying means a distance sufficient to allow a carton between said conveying means and said shaft means;

a flap opener disposed on the leading end of said shaft means;

means for rotating said shaft means and means for translating said shaft means from a rest position at a speed greater than that at which said carton is being conveyed towards a flap to be opened such that said flap opener moves in a helical-like path to engage and open the flap; and

means for returning said shaft means to the rest position.

11. Apparatus for opening a flap, as defined in claim **10** wherein said flap is pivotably disposed on the leading end of said shaft means and further comprising biasing means operatively connected to said flap opener for urging said flap opener to pivot as said shaft means moves away from the rest position such that the leading tip of said flap opener drops down to a point below the edge of the flap to be opened.

12. Apparatus for opening a flap as defined in claim **9** wherein the leading face of said flap opener is cam-shaped such that it acts to lift the flap as the flap opener engages the flap.

13. Apparatus for opening a flap of a carton which is folded inwardly at the edge of an end panel of the carton, comprising:

means for supporting a carton in a desired location;

flap opener holding means disposed adjacent and spaced from said supporting means;

a flap opener disposed on said flap opener holding means;

means for translating said flap opener and for rotating said flap opener so that said flap opener goes through a helical path; and

means for returning said flap opener to the rest position.

14. Apparatus for opening a flap of a carton which is folded inwardly at the edge of an end panel of the carton, comprising:

means for supporting a carton in a desired location;

shaft means disposed adjacent and spaced from said supporting means;

a flap opener disposed on the leading end of said shaft means;

means for translating said shaft means and for rotating said shaft means so that said flap opener goes through a helical path; and

means for returning said shaft means to the rest position.

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