April 26, 1966 D. McINTYRE 3,247,646

CASE FLAP OPENING MACHINE

Filed June 4, 1963 3 Sheets-Sheet 1

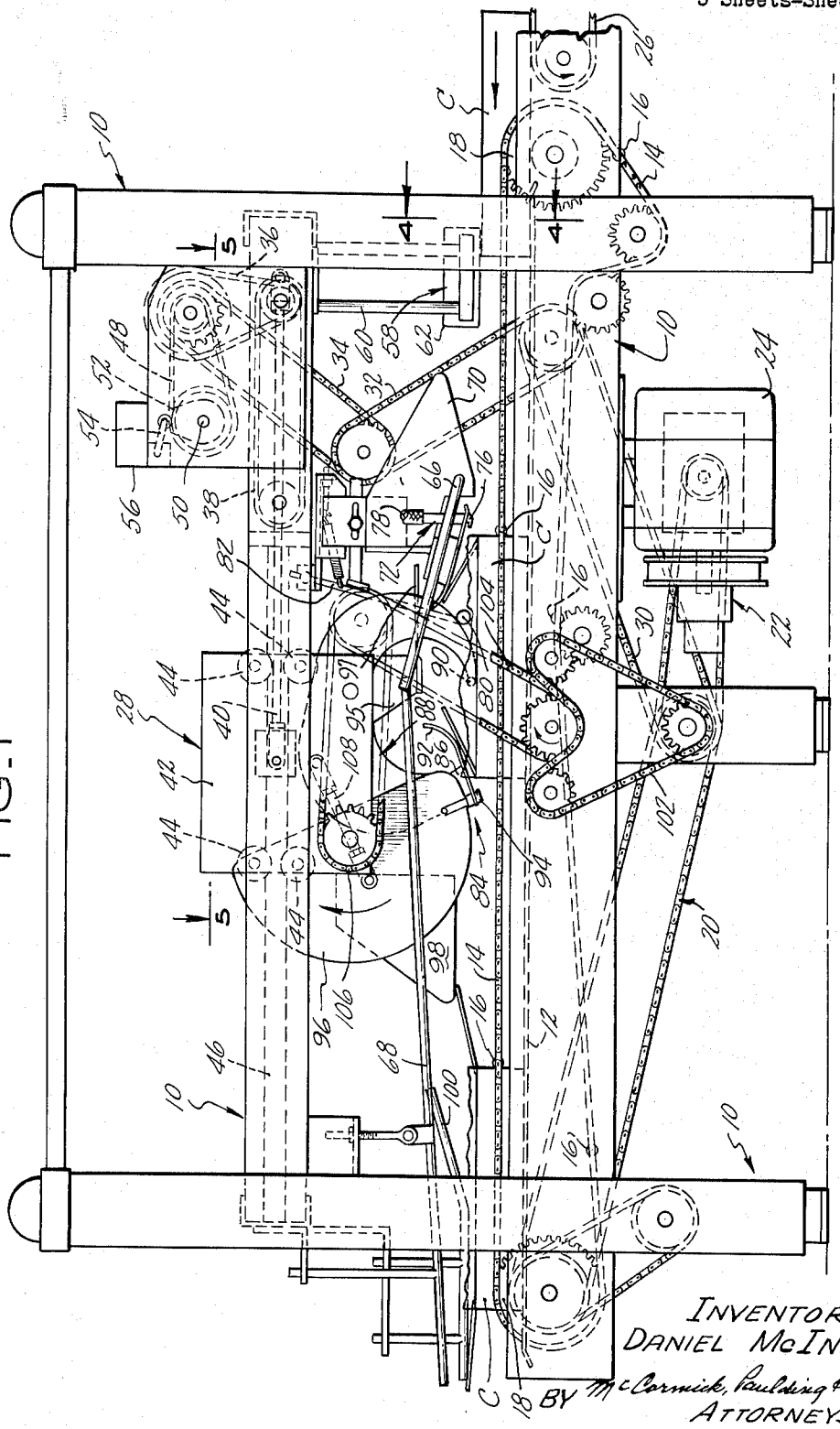


FIG. 1

INVENTOR
DANIEL McINTYRE
BY McCormick, Paulding & Huber
ATTORNEYS

April 26, 1966 D. McINTYRE 3,247,646

CASE FLAP OPENING MACHINE

Filed June 4, 1963 3 Sheets-Sheet 2

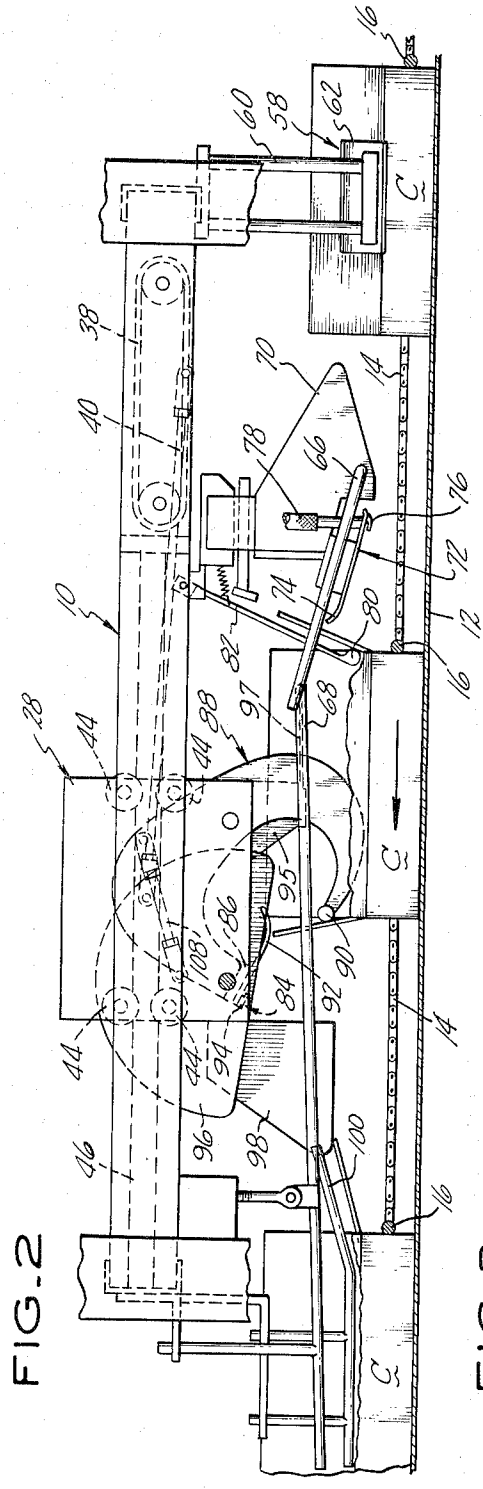


FIG. 2

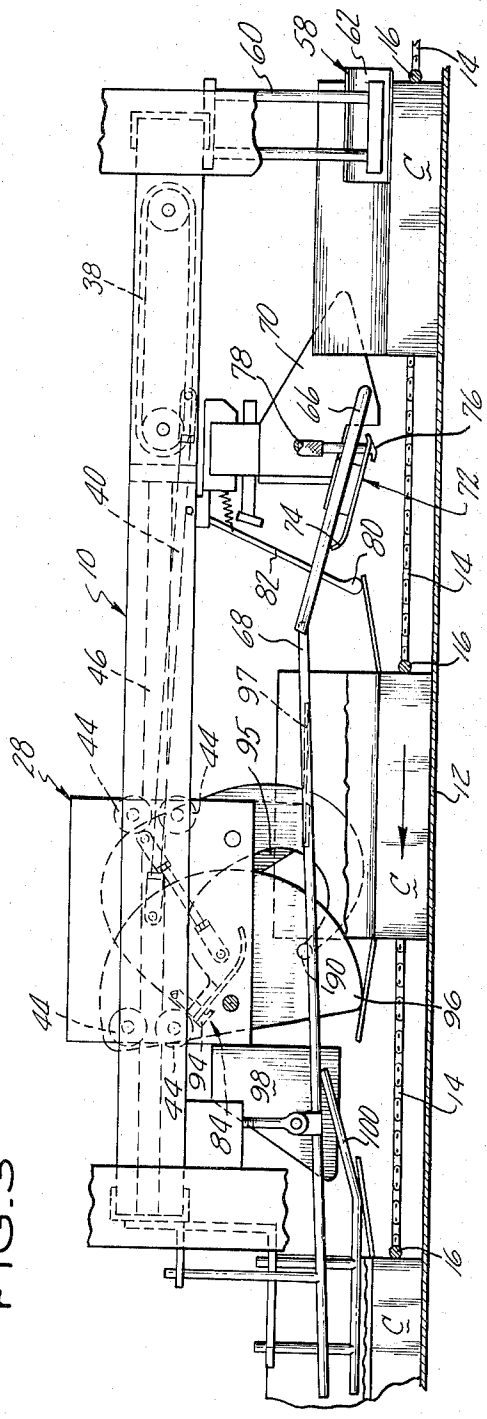


FIG. 3

April 26, 1966 D. McINTYRE 3,247,646

CASE FLAP OPENING MACHINE

Filed June 4, 1963 3 Sheets-Sheet 3

FIG. 4

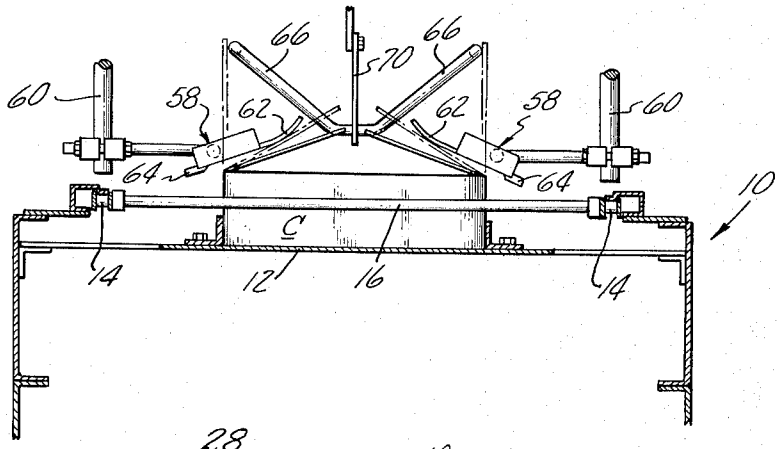


FIG. 5

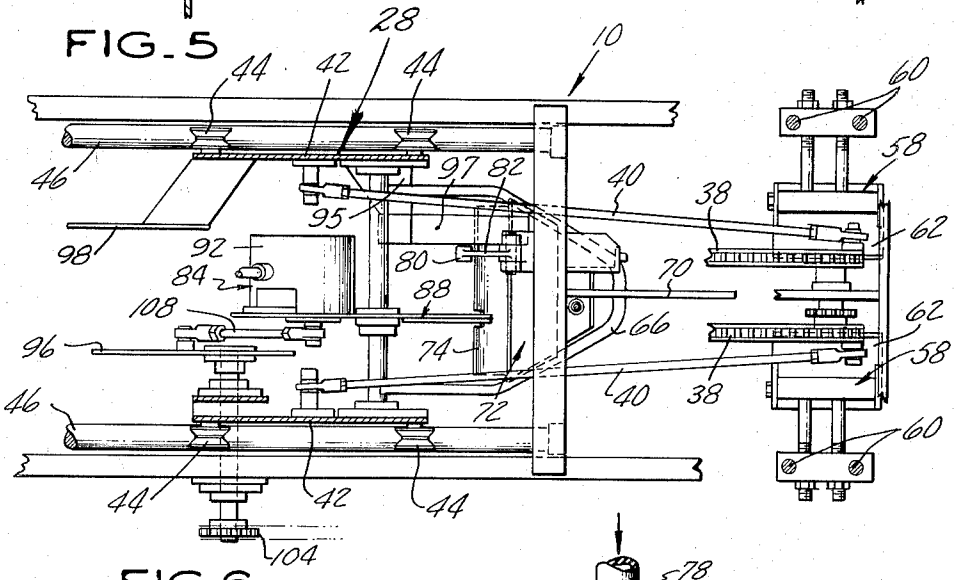
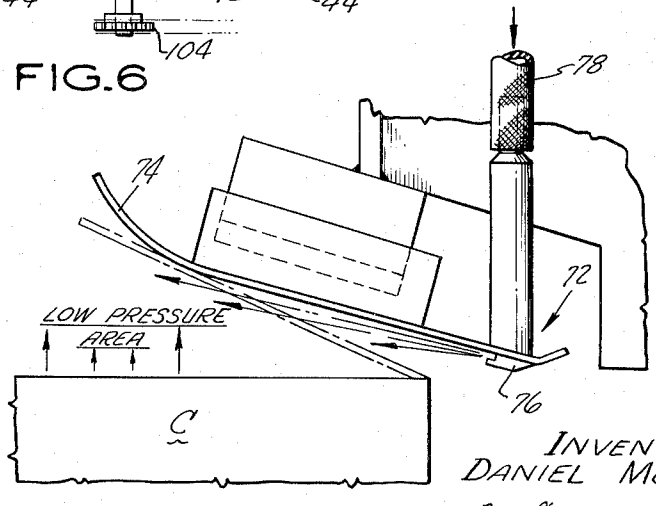


FIG. 6



INVENTOR
DANIEL McINTYRE
BY McCormick, Paulding & Huber
ATTORNEYS

United States Patent Office 3,247,646
Patented Apr. 26, 1966

3,247,646

CASE FLAP OPENING MACHINE

Daniel McIntyre, Portland, Conn., assignor to Emhart Corporation, Bloomfield, Conn.

Filed June 4, 1963, Ser. No. 285,303
11 Claims. (Cl. 53—382)

This invention relates to a case opening machine and, more particularly, to a machine for opening the four top flaps of a case that may be empty or that may have containers in it which are to be removed and filled. The machine of this invention serves a purpose similar to the two-flap machine of Patent 3,081,589.

It is the general object of the invention to provide a machine that will operate in a substantially foolproof manner and at high speed to open the top flaps of a succession of paperboard cases of the type having four flaps, i.e., side flaps that are folded inwardly to closed position over inwardly folded end flaps at the top of the case.

It is a feature of the present invention to provide a machine which includes a conveyor for moving the cases endwise and preferably in spaced apart relationship and to provide means supported along the conveyor to open the side flaps and the rear end flap of each case passing therealong and to also provide a reciprocating carriage over the conveyor to move along a portion of the conveyor with each passing case and to open the front flap of each such case. Thus, there is provided in accordance with this invention a machine for opening the top flaps of cases being moved along a conveyor that will not require the cases to be stopped for the purpose of opening the flaps thereof.

It is a further feature of the present invention to provide airfoil means for initially raising all of the case flaps from their closed position. More specifically, airfoil-shaped plates are supported along the conveyor so as to be adjacent to the side flaps of passing cases, and means are provided for directing an air stream across these plates to create a low pressure area therebelow that will cause the side flaps to rise. A similar plate is arranged for similar operation with respect to the rear end flap, and a generally similar airfoil plate is carried on the aforementioned carriage to initially raise the front end flap. Independent means are provided to engage and spread each flap outwardly after it has risen.

The drawings show a preferred embodiment of the invention and such embodiment will be described, but it will be understood that various changes may be made from the construction disclosed, and that the drawings and description are not to be construed as defining or limiting the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

Of the drawings:

FIG. 1 is a front elevational view of a case flap opening machine constructed in accordance with the present invention;

FIG. 2 is a similar view of the top portion of the machine with parts removed to prevent obscurity and showing one phase of the flap opening operation;

FIG. 3 is a view similar to FIG. 2 showing a further phase of flap opening;

FIG. 4 is a transverse sectional view taken near the right-hand end of FIGS. 2 and 3 and looking toward the left so as to provide an end view of the side flap opening elements with parts removed to avoid obscurity;

FIG. 5 is a top plan view taken near the right-hand end of the machine in FIG. 1 with some parts removed; and

FIG. 6 is an enlarged view of the airfoil structure used to raise the rear end flap of each passing case.

As shown in FIG. 1, the machine of this invention comprises a frame structure indicated generally by the reference number **10** that supports a longitudinally extending plate **12** over which the cases C, C are moved to have their flaps opened. The case conveyor comprises an endless chain **14** that extends longitudinally along each side of the plate **12**. A series of spaced apart flight bars **16**, **16** are connected between the chains **14**, **14** to engage the rear end of the series of cases C, C which are thus moved over the plate **12** in equally spaced apart endwise movement. The conveyor chains **14**, **14** are entrained over end sprockets **18**, **18** mounted on suitable shafts, the front sprocket shaft being driven by means of a chain and sprocket connection indicated generally at **20** with a speed reducing unit **22** that is connected with the drive motor **24** for the machine. A feed conveyor **26** introduces the closed cases to the machine so that they can be moved along in succession by the conveyor that has been described.

It will also be seen in FIG. 1 that the upper portion of the frame **10** supports a carriage indicated generally by the reference number **28** over the case conveyor. This carriage is reciprocated in timed relationship with movement of the conveyor so that it will move along with each case C passing through the machine over a portion of the longitudinal extent of the conveyor. The means for reciprocating the carriage **28** in timed relationship with movement of the conveyor chains **14**, **14** comprises a series of chain and sprocket units **30**, **32**, **34**, and **36** which serve to connect the drive motor **24** with a pair of longitudinally extending endless chains **38**, **38** which are entrained over sprockets suitably supported in a fixed position over the conveyor in the upper part of the frame structure **10**. The endless chains **38**, **38** are also shown in FIG. 5, and it will be observed that connecting rods **40**, **40** extend between these chains and suitable connections on the respective longitudinal side plates **42**, **42** of the carriage **28**. Thus, as the endless chains **38**, **38** move about their end sprockets, the carriage **28** is reciprocated. Such movement of the carriage is accommodated by means of pulley-like rollers **44**, **44** on each side plate **42** of the carriage, the rollers **44**, **44** being arranged to ride on a pair of longitudinally extending rods **46**, **46** which are supported by the frame structure **10**.

An additional chain and sprocket unit **48** (FIG. 1) in the upper part of the frame structure serves to drive a cam shaft **50** that is supported transversely and which has a series of cams, such as the cam **52** thereon. These cams engage valve actuators, such as the actuator **54**, to operate a series of valves within a housing **56**, and these valves control the flow of air streams at a plurality of airfoil units that raise the case flaps as will be described hereinafter.

As viewed in FIGS. 1–3 of the drawings, the cases C, C move from right to left and as each case enters the right-hand end of the machine its flaps are closed. The side flaps of each case are opened first as the case passes along the conveyor by a pair of airfoil units **58**, **58** which are vertically and pivotally adjustably mounted on rods **60**, **60** depending from the upper part of the frame structure **10**.

The airfoil units **58**, **58** each includes an airfoil-shaped plate **62** that is supported at an angular position and in spaced relationship over the closed side flaps of a case passing therealong. Each such unit also includes a jet **64** connectible as by a hose (not shown) through valving in the housing **56** with a source of air under pressure. The jet **64** directs a stream of air across the underside of the associated plate **62** so as to create a low pressure area therebelow that will cause a side flap to rise as a case moves past.

As will be seen from FIGS. 2 and 3, the raised side flaps

of each case passing along the conveyor will be engaged by a plow **66** at about the time they lose association with the airfoil units **58, 58**. The plow **66** serves to spread the side flaps outwardly and to hold them in an elevated position as shown in FIG. 4 until they can be engaged by additional plow means **68** (FIGS. 2 and 3) beneath the reciprocating carriage **28**. A rudder-shaped plate **70** is adjustably supported by the frame in a vertical longitudinal plane to hold each case down as its side flaps are being spread by the plow **66**.

As each case C passes below the plow **66**, its rear end flap passes below an airfoil unit **72** which is shown in enlarged scale at FIG. 6. The airfoil unit **72** is rigidly supported in adjustable positions by the frame **10** and, like the airfoil units **58, 58**, it includes an airfoil-shaped plate **74** and a jet **76**. The jet **76** is connectible as by a hose **78** through a valve in the housing **56** to a source of pressurized air, and the jet is arranged to direct an air stream across the bottom side of the plate **74** as indicated by the arrows in FIG. 6. This air stream creates a low pressure area below the plate **74**, causing the rear end flap of each passing case to rise. It will be understood, of course, that the valving controlling flow to the various airfoil units is not continuously open. That is, the cams on the cam shaft **50** are arranged to open these valves in timed relationship to movement of the cases so that air flows and the airfoils are effective only when a case is in position with respect to the various airfoils to be operated upon.

After a rear end flap on a passing case has been caused to rise slightly, its leading edge is engaged by the weighted or hooked end **80** of a rod **82** (FIGS. 1–3) that is suspended from the upper portion of the frame **10** in the path of movement of the cases. This rod is pivotally connected to the frame and spring biased toward the right as viewed in FIGS. 1–3 so that its end **80** will be sure to engage the edge of a raised rear case flap. Then, as a case continues to pass along the conveyor, the rod will raise and spread outwardly the rear flap.

As shown in FIG. 1, at about the same time that the rear flap is being raised by the airfoil unit **72**, the front flap of a passing case is raised by an airfoil unit **84** on one end **86** of a crescent-shaped member **88** that is rotatably supported on the carriage **28**. The crescent-shaped member **88** is oscillated, as will be described, so that its airfoil unit **84** on said one end will initially raise the front end flap of a passing case and so that its other end **90** which is hook-shaped will then engage the underside of the front flap and spread it outwardly. This occurs as the carriage **28** moves along a portion of the conveyor with each passing case. Like the other airfoil units, the unit **84** is connected with suitable control valving and has a plate **92** and a jet **94**. The oscillation and operation of the crescent-shaped member **88** with respect to the front flap will be understood by comparing FIGS. 1 to 3.

A parti-circular or half disc-shaped member **96** is also rotatably supported on the carriage **28** for the purpose of holding the front and rear flaps in an outwardly spread condition until the associated case leaves operational association with the carriage. As shown in FIGS. 1–3, the disc **96** is rotated so that its convex edge will engage and roll over the front and rear case flaps holding them in an outwardly spread position during movement of the carriage **28** in a left-hand direction. A bracket **95**, having a rearwardly extending blade **97**, is mounted on the carriage **28** to help retain the spread condition of the rear flap of each case moving with the carriage. Then, as the carriage starts to move toward the right, a rudder-shaped blade **98** on its left-hand end passes over the spread front and rear flaps of the case with which the carriage was just associated to retain the flaps in spread condition until they pass under a rigidly affixed plow **100** which continues to maintain the spread condition of the flaps as each passing case moves out of the left-hand end of the machine toward a case packing machine or the like.

The drive for the crescent-shaped member **88** and for the parti-circular member **96** comprises the chain and sprocket units **102, 104**, and **106** which connect the drive motor **24** with a shaft to which the parti-circular member **96** is connected for rotation. The said parti-circular member **96** rotates throughout 360° in timed relationship to movement of the cases through the machine, and it is connected to the crescent-shaped member **88** by a crank arm **108** that causes the crescent-shaped member to oscillate as the parti-circular member rotates. This oscillation is, of course, in timed relationship throughout to movement of the cases through the machine so that the front flap of each case passing through the machine will be opened as described. Further, the air stream for the front flap raising airfoil unit **84** is controlled by the previously mentioned valving to be operable in timed relationship to case movement.

In a brief summary of the operation of the case flap opening machine that has been described, it can be said that a driven conveyor is provided for moving the cases in spaced apart end-to-end relationship through the machine. Airfoil means **58, 58** are supported along the conveyor to raise and spread the side flaps of each passing case in association with the plow **66**. Then, the passing case moves beneath the airfoil unit **72** which raises the rear end flap which is spread on upwardly and outwardly by the arm **82**. Then, the carriage **28** which is supported over the conveyor to move along a portion of the conveyor with each passing case takes over the flap opening operation by means of its oscillatable crescent-shaped member **88**. One end of the crescent-shaped member serves to raise the front flap of an associated case and the other end serves to spread it outwardly. Then, the parti-circular member **96** takes over the operation by having its convex edge engage the spread front and rear flaps to retain them in such position until the case leaves association with the carriage. Means are provided in the path of movement of the cases to retain the spread condition of all of the flaps as the cases move on toward a case packing machine or the like.

The invention claimed is:

1. A machine for opening cases having end flaps that are folded inwardly at the top thereof, said machine comprising a driven conveyor for moving the cases endwise, means supported along the conveyor to raise and spread the rear end flap of each passing case, a carriage supported over said conveyor, means for reciprocating said carriage so that it travels along a portion of the conveyor with each case, a generally crescent-shaped member rotatably supported on the carriage on an axis transverse to the conveyor, a parti-circular member rotatably supported on the carriage on an axis transverse to the conveyor, means for moving said members in timed relationship to carriage movement so that an end of the crescent-shaped member will spread the front end flap of each case and so that the convex edge of the parti-circular member will then hold both end flaps in spread condition, and means supported along the conveyor for retaining the flaps of each case spread after association with said carriage.

2. A machine for opening cases having end flaps that are folded inwardly at the top thereof, said machines comprising a driven conveyor for moving the cases in spaced apart end-to-end relationship, means supported along the conveyor to raise and spread the rear end flap of each passing case, a carriage supported over said conveyor, means for reciprocating said carriage so that it travels along a portion of the conveyor with each case, a generally crescent-shaped member supported on said carriage with its ends facing downwardly and for oscillation on an axis transverse to the conveyor, a parti-circular member supported on said carriage for rotation on an axis transverse to the conveyor, means for respectively

oscillating and rotating said members in timed relationship to carriage movement so that one end of the crescent-shaped member will raise the front end flap of each case and the other end will engage and spread it, and so that the convex edge of the parti-circular member will then hold both end flaps in spread condition, and means supported along the conveyor for retaining the flaps of each case spread after association with said carriage.

3. A machine for opening cases as set forth in claim 2 wherein an airfoil shaped plate is supported on said one end of the crescent-shaped member, and means are provided to direct an air stream across the plate to create a low pressure area below the plate to cause the front end flap of each associated case to rise.

4. A machine for opening cases as set forth in claim 2 wherein the means for raising and spreading the rear end flap of each case comprises an airfoil shaped plate supported over the conveyor, means for directing an air stream across the plate to create a low pressure area therebelow that will cause each rear flap to rise, and means suspended over the conveyor to engage and spread each risen flap as the cases pass.

5. A machine for opening cases as set forth in claim 4 wherein an airfoil shaped plate is supported on said one end of the crescent-shaped member, and means are provided to direct an air stream across the plate to create a low pressure area therebelow to cause the front end flap of each associated case to rise.

6. A machine for opening cases as set forth in claim 5 wherein means is provided to control both of said air streams for operation thereof in timed relationship to carriage reciprocation.

7. A machine for opening cases having side flaps closed over end flaps at the top thereof, said machine comprising a driven conveyor for moving the cases in spaced apart end-to-end relationship, means supported along the conveyor to raise and spread the side flaps of each passing case, means supported along the conveyor to raise and spread the rear end flap of each passing case, a carriage supported over said conveyor, means for reciprocating said carriage so that it travels along a portion of the conveyor with each case, a generally crescent-shaped member supported on said carriage with its ends facing downwardly and for oscillation on an axis transverse to

the conveyor, a parti-circular member supported on said carriage for rotation on an axis transverse to the conveyor, means for respectively oscillating and rotating said members in timed relationship to carriage movement so that one end of the crescent-shaped member will raise the front end flap of each case and the other end will engage and spread it, and so that the convex edge of the parti-circular member will then hold both end flaps in spread condition, and means for retaining all of the said flaps of each case spread after association with said carriage.

8. A machine for opening cases as set forth in claim 7 wherein an airfoil shaped plate is supported on said one end of the crescent-shaped member, and means are provided to direct an air stream across the plate to create a low pressure area below the plate to cause the front end flap of each associated case to rise.

9. A machine for opening cases as set forth in claim 7 wherein the means for raising and spreading the rear end flap of each case comprises an airfoil shaped plate supported over the conveyor, means for directing an air stream across the plate to create a low pressure area therebelow that will cause each rear flap to rise and means suspended over the conveyor to engage and spread each risen flap as the cases pass.

10. A machine for opening cases as set forth in claim 9 wherein an airfoil shaped plate is supported on said one end of the crescent-shaped member, and means are provided to direct an air stream across the plate to create a low pressure area therebelow to cause the front end flap of each associated case to rise.

11. A machine for opening cases as set forth in claim 10 wherein means is provided to control both of said air streams for operation thereof in timed relationship to carriage reciprocation.

References Cited by the Examiner

UNITED STATES PATENTS

2,890,560	6/1959	Nigrelli et al.	53—382
2,918,773	12/1959	Krupp et al.	53—382

TRAVIS S. McGEHEE, *Primary Examiner.*