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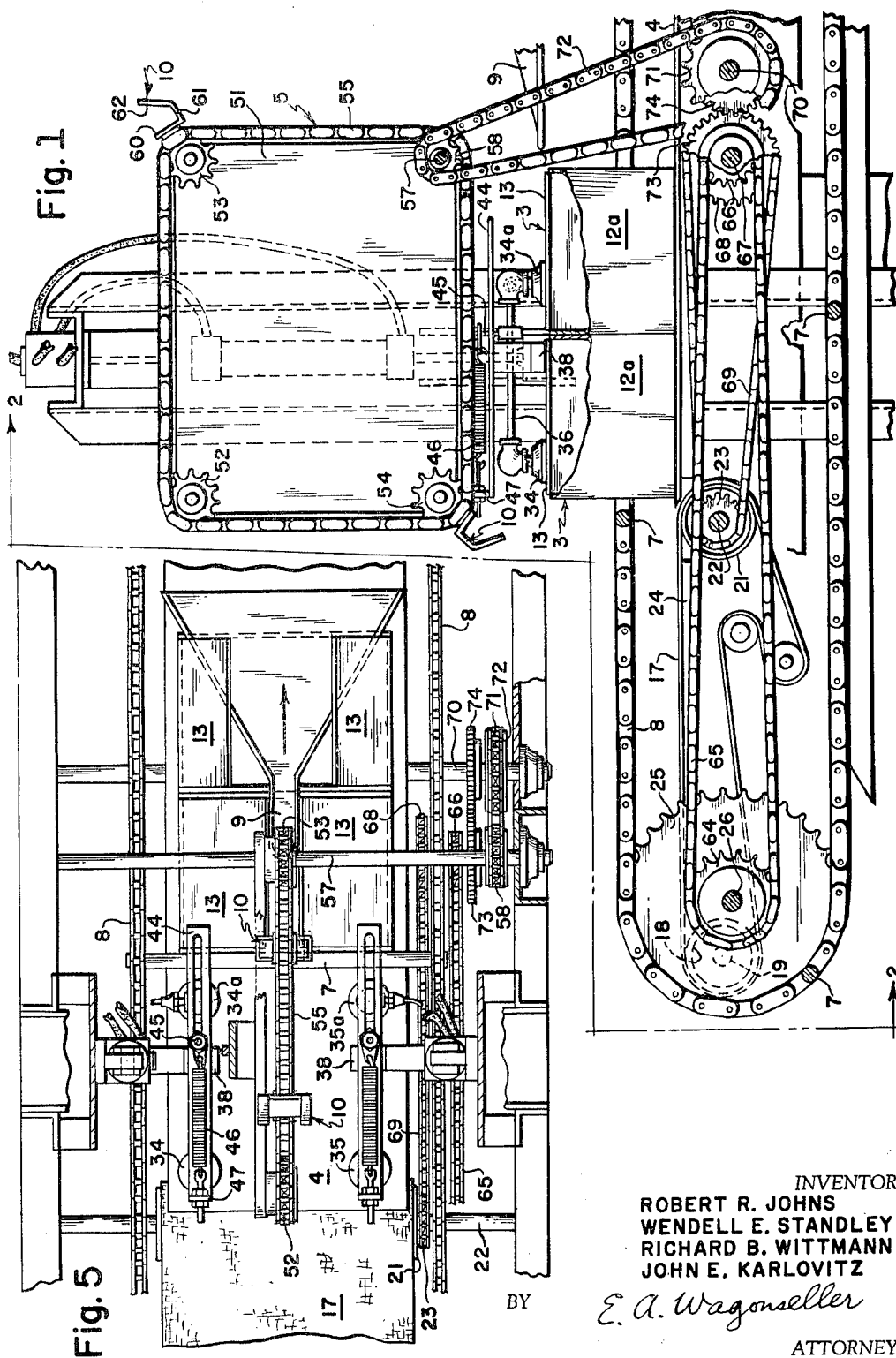
R. R. JOHNS ETAL

3,224,166

COVER OPENER FOR ABUTTED CASES

Filed Oct. 11, 1962

4 Sheets-Sheet 1



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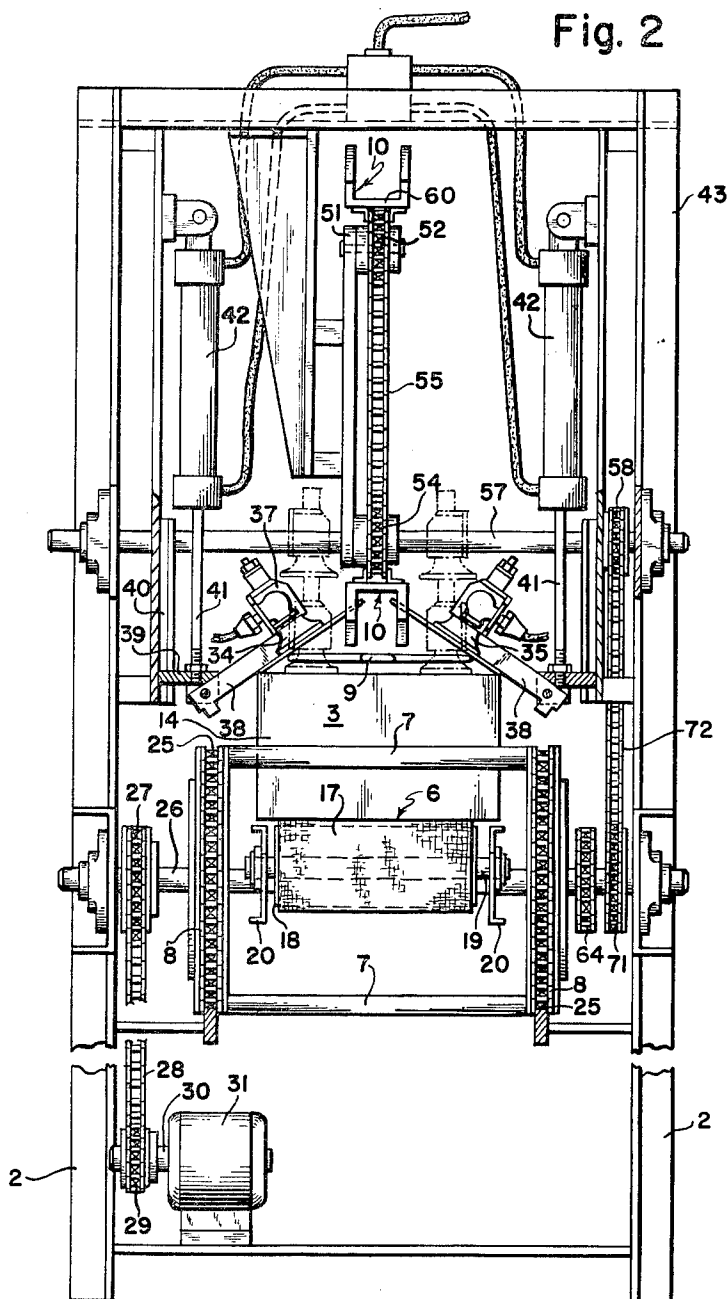
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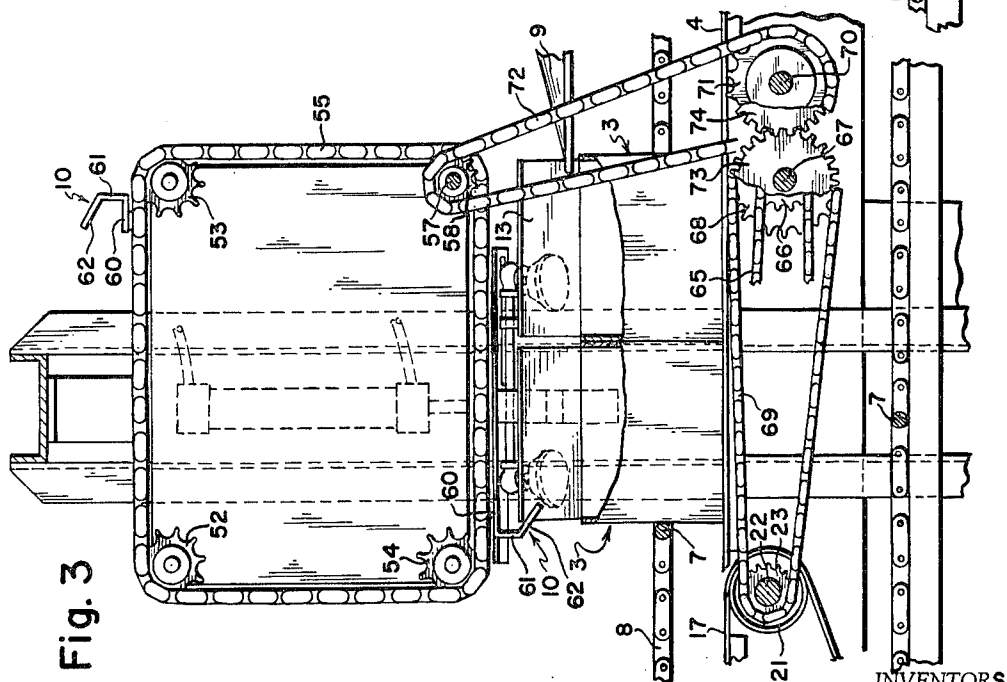
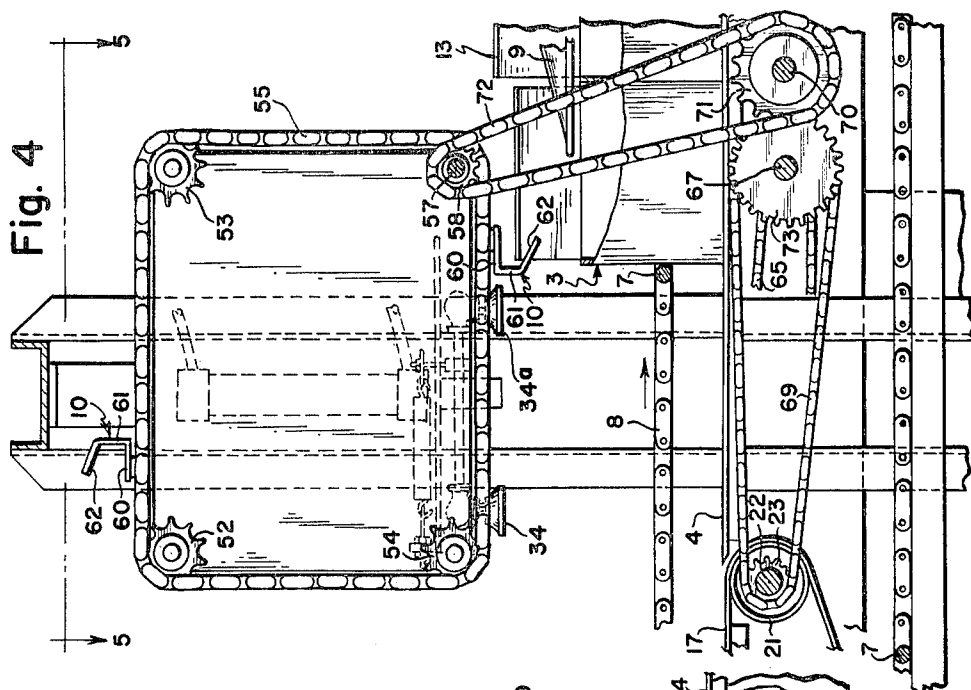
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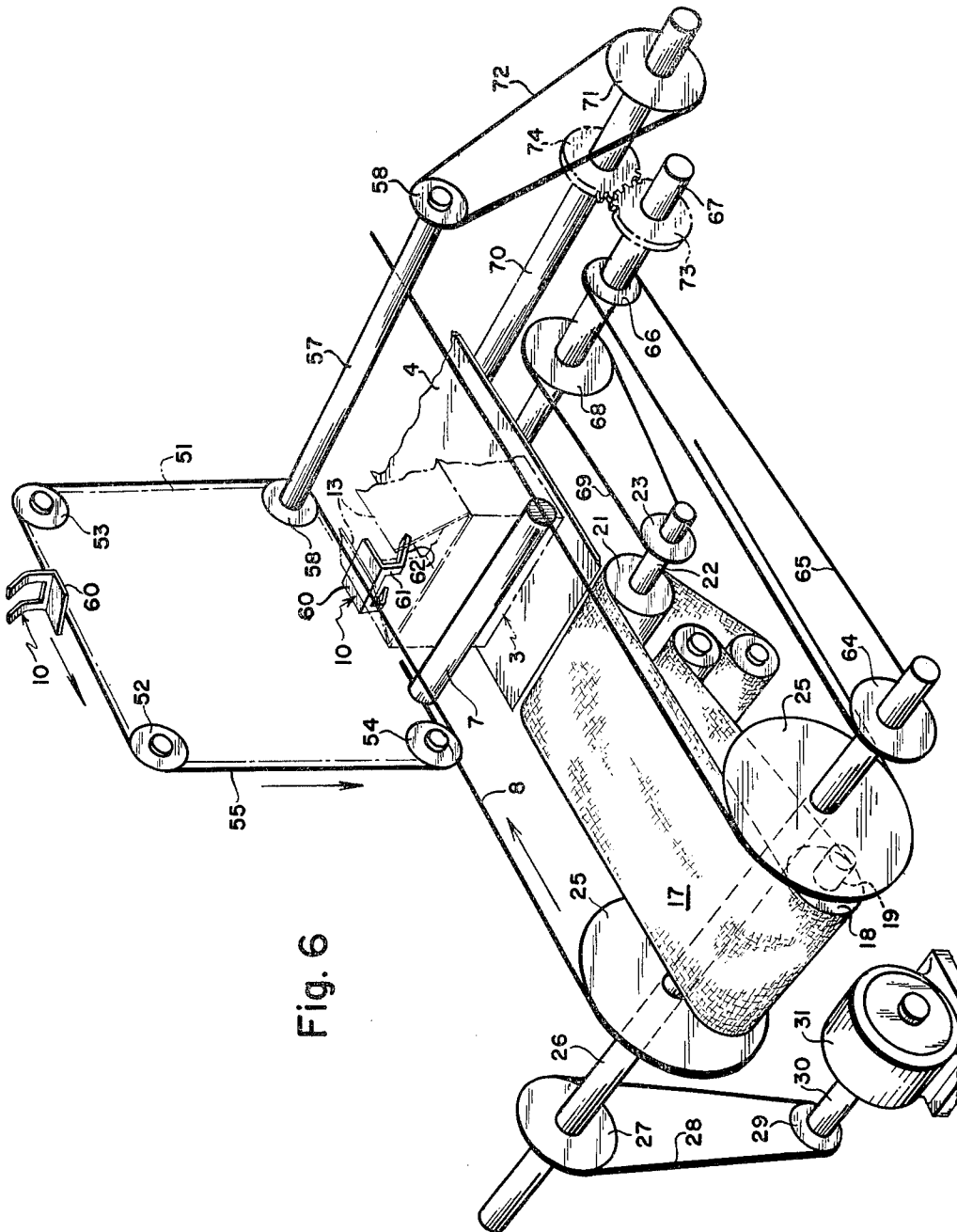
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4 Sheets-Sheet 4



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3,224,166

COVER OPENER FOR ABUTTED CASES

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6 Claims. (Cl. 53—382)

The present invention relates to mechanism for opening hinged cover flaps on open top, corrugated or fibre cases, and more particularly to mechanism adapted for interchangeable use for swinging open the hinged cover flaps of individual cases of usual or standard size and for similarly opening the flaps on smaller sized cases arranged in tandem; the flaps on such smaller sized cases being swung open as a single unit.

The principal object of the invention is to provide an effective form of continuously operating cover flap opener capable of swinging cover flaps to open position on two or more cases arranged in a row as such cases are being advanced on a conveying means.

A further object of the invention is to improve the operation of existing forms of cover flap openers of the general type adapted to treat a series of advancing cases which have side-hinged flaps constructed to swing laterally outward of the direction of case travel, the flaps of successive cases being initially lifted and swung through a small angle as the cases are advanced, and each flap being subsequently swung to outwardly extending position by plow means.

A still further object of the invention is to enable a cover flap opening mechanism of the type above described to swing open the side-hinged cover flaps of two advancing cases, arranged in tandem, by initial flap engaging devices capable of advancing a limited distance with the cases to enable the flaps on the leading case to be engaged by plow means for continuing the opening operation, and at the same time engaging or controlling the flaps on the trailing case to assure that such flaps are held raised until the trailing case has reached the plow means.

Additional and more specific objects and advantages of the invention will become apparent as the description proceeds.

In the drawings:

FIGURE 1 is a side elevational view of the receiving end portion of a machine made according to the present invention, showing a pair of abutted cases in position at the flap raising station with the vacuum cups lowered onto the cover flaps of both cases and ready to swing the flaps upward, and also showing the holding device for the trailing case flaps as such device is being moved into operative position;

FIGURE 2 is an end view, partly in section, taken along line 2—2 of FIGURE 1, looking in the direction of the arrows, certain parts being omitted, showing the vacuum cups in grasping relation to the cover flaps and with the vacuum cup arms swung upward as the mid-portions of the arms swing on the hinge lines of the flaps;

FIGURE 3 is a fragmentary side elevational view, similar to FIGURE 1, but showing the abutted cases in a more advanced position, and showing the holding device for engaging and supporting the flaps on the trailing case in raised position after such device has been brought into flap engaging position;

FIGURE 4 is a view similar to FIGURES 1 and 3, showing the vacuum cup arms in their raised position and with the flap engaging device holding the flaps on the trailing case raised while such flaps are brought into operative relation to the plow for swinging them fully open;

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FIGURE 5 is a plan view, partly in section, taken along lines 5—5 of FIGURE 4; and

FIGURE 6 is a diagrammatic perspective view illustrating the drive.

The invention, as herein disclosed, is designed to be incorporated with existing forms of cover flap opening machines which operate in the general manner of the machines disclosed in the patent to B. J. Nigrelli et al., No. 2,997,833, and in the pending application of B. J. Nigrelli et al., Serial No. 199,944, filed June 4, 1962. By the addition to such machines of the mechanism herein disclosed, they may readily be adapted to handle different forms of cases. For example, when machines such as disclosed in the above referred to patent and pending application are designed to handle the side-hinged cover flaps of cases holding twenty-four cans, the addition of the improvement herein disclosed will adapt the machines to handle the end-hinged flaps on two twelve-can cases when such cases are in side-by-side arrangement, whereby jointly they have approximately the same horizontal dimensions as a single case holding twenty-four cans.

A common form of twelve-can case is proportioned to hold the cans in four rows of three cans each and such case is provided with a pair of cover flaps each having a dimension along its hinge line which corresponds to three times the can diameter. These flaps meet centrally of the long dimension of the case and are hinged on the narrower walls. In this type of case construction, the juxtaposed flaps on two such twelve-can cases, arranged side-by-side, present an opening problem substantially the same as that of opening the side-hinged cover flaps of a case holding twenty-four cans.

In the operation of the machine of the present invention, two twelve-can cases are advanced in abutted relation on a conveyor past vacuum cup flap openers, arranged first to swing the oppositely hinged flaps upward through a small angle and hold them briefly as such angle as the abutted cases advance, the leading case will move into cover engaging relation with a cover swinging plow member after which the vacuum cups are deactivated. The cover flaps on the trailing case, which will not have advanced sufficiently to contact the plow, are held in their partially raised position, as they advance by means of a traveling holder designed to move forwardly as the case advances. This traveling holder continues to retain the cover flaps of the trailing case partially raised until the case advances far enough for the cover flaps to be engaged by the plow.

Referring more particularly to the drawings, the machine is supported on suitable horizontal and vertical frame members, indicated at 1 and 2. The cases, indicated at 3, 3, are delivered in groups of two onto a dead plate 4 at the flap raising station, indicated as a whole at 5, by a short conveyor 6. After the flaps of both cases have been swung upward through a small angle by the flap lifting devices, a push rod 7 on conveyor chains 8, 8 advances the abutted cases toward a plow member 9. The flap swinging devices at the station 5 are designed to move forward to a limited extent and this enables the raised flaps on the leading case to be brought into engaging relation with the plow member. The flaps on the trailing case are controlled by a flap holding member having flap engaging or holding elements 10, 10. One of the holding elements will move into engaging relation with the flaps on the trailing case and maintain such flaps raised after the flap lifting devices have been disengaged from the flaps and will continue to hold the flaps raised until the case moves a sufficient distance to enable its flaps to be engaged by the plow member 9. After the flaps on the trailing case, as well as those on the leading case, are under control of the plow, the flaps

may be swung to their fully opened, or horizontal, position and the cases are thus conditioned either to be loaded or unloaded as circumstances require.

The cases 3, 3 for which the present machine is adapted, are of elongated rectangular shape. The end walls 12, 12a carry hinged flaps 13, 13a on their upper edges, and the side walls 14, 14 are without flaps, as herein shown. The type of case illustrated may contain twelve cans or bottles arranged in four rows of three cans each. Two cases, placed with their long sides in contact, constitute in effect four rows of six cans each and thus the horizontal dimensions of two cases so arranged are substantially the same as a single case designed for four rows of six cans each. It is also apparent that the cover flaps on the end walls of the twelve-can cases, placed side-by-side, are comparable to the side wall flaps on the cases holding twenty-four cans. In each arrangement there are side-hinged flaps to be treated, and the difference is that, for the twelve-can cases arranged in tandem, there are two flaps on each side to be controlled instead of a single flap.

Cases to be treated are delivered in tandem to the receiving end of the machine by any desired or convenient mechanical means which will automatically feed groups of two cases in timed relation between the push rods 7, 7 on conveyor chains 8, 8. An effective feeding means for this purpose may be similar to that shown in the above mentioned pending application, except that two cases are delivered between the push rods instead of a single case.

As shown herein, the conveyor 6 comprises an endless belt 17 passing over a roll 18 at its receiving end. The roll 18 is mounted on a shaft 19 journaled in suitable bearings arranged in side frame plates 20, 20. At the discharge end the belt 17 passes over a roll 21 mounted on a driven shaft 22 which is also journaled in the side frame plates. The shaft 22 has a sprocket 23 fixed thereon and connected with drive means to be described. The driving ratio for the belt 17 is such that its speed is substantially faster than the speed of the push rods 7, 7. This conveyor may thus be termed a speed-up conveyor. In between the rolls 18 and 22 a suitable plate 24 may be secured below the belt 17 to support the belt as it carries the cases.

The main conveyor chains 8, 8 pass over individual sprockets 25, 25 fixed on a shaft 26 journaled in bearings on the vertical frame members 2, 2. This shaft carries a sprocket 27 over which a sprocket chain 28 passes. Chain 28 also passes around sprocket 29 on the shaft 30 of a motor 31 which drives the machine. If desired, the driving motor may be associated with the mechanism at the discharge end of the conveyor, as shown in the pending application referred to above.

While the drawings illustrate only a single flap raising station, namely, a station for raising the side-hinged case flaps, it is to be understood that the herein disclosed mechanism may be incorporated in a machine which has a second flap raising station to raise additional, underlying flaps carried on the leading and trailing walls of a case and swingable at right angles to the side-hinged flaps. Such an additional flap raising station is disclosed in the above identified application. To simplify the present disclosure, only the portions of the main conveyor comprising the receiving end and the part for carrying cases past the plow member 9 are illustrated.

The push rods 7, 7 are spaced from each other a distance which may vary from approximately two to two and one-half times the dimension of the two abutted cases taken in the direction of travel, and when a mechanical feeder is employed, it is so designed or adjusted as to deliver a pair of cases just ahead of an oncoming push rod. This operation is disclosed in the above identified application, except that a single case is delivered to the main conveyor instead of two abutted cases.

By delivering a pair of cases to the speed-up conveyor just ahead of a push rod 7 moving up around the sprockets

25, 25, the conveyor will deliver the cases in abutted relation onto the dead plate 4 while the push rod 7 which is immediately in advance of such cases is propelling the preceding pair of cases off the dead plate and past the plow 9.

Any desired flap raising means for the side-hinged flaps may be employed at the flap raising station 5. In the present instance flap raising devices are employed which are substantially identical to those disclosed in the above identified patent. This mechanism comprises two sets of vacuum cups, each set having two individual cups suitably spaced and arranged to operate substantially as a single unit. Each cup is adapted to grasp and raise one cover flap. Each pair of cups is carried on the end of a pivoted arm that is held on a vertically movable frame. The frames are movable in paths located outside the planes of the case walls and the vacuum cup arms are held from swinging downwardly, but are constructed so they may swing upwardly away from the tops of the cases. By forcing the frames downwardly and at the same time activating the vacuum cups, the arms move down while maintaining their horizontal position. The vacuum cups grip the flaps and, as the frames continue their downward movement, the arms bear against the hinge lines of the flaps and begin to swing upwardly about such hinge lines as fulcrums, thus raising the flaps through a small angle, such as illustrated in FIGURE 2.

The vacuum cups are mounted on elements which are slidable transversely of the vacuum cup arms. Thus, while the cups are gripping the flaps, the case is advanced. Advantage is taken of this feature by advancing the case toward a plow member which will engage beneath the leading edges of the raised flaps on the leading case of the pair of abutted cases. Auxiliary flap holding means, to be described presently, are provided for holding the raised flaps on the trailing case until such flaps can be engaged by the plow member.

Referring to FIGURES 1, 2 and 5, the vacuum cups for engaging the flaps 13 on the left in the direction of advancing movement are indicated at 34 and 34a and those on the right are indicated at 35 and 35a. See FIGURE 5. The pairs of vacuum cups are supported on metal tubes 36, 36 mounted in guides 37, 37, fixed on the free ends of upwardly swingable arms 38, 38 which are pivotally carried on vertically movable frame members 39, 39. These frame members are slidable along guides 40, 40 and are raised and lowered by piston rods 41, 41 having pistons thereon operating within cylinders 42, 42 carried on upstanding sections of frame 43 fixed on the base frame. Each swingable arm 38 carries a transversely extending guide bar 44 formed with a slot in which is received a pin 45 fixed on the tube 36. A coil spring 46 has one end secured to the pin 45 and its other end anchored to a lug 47 on the guide bar 44. By this arrangement the cups, when gripping the cover flaps, may be carried forward a short distance as the case advances. When the vacuum is released from the cups they will be returned to their retracted position by the spring 46. The tubes 36 serve as conduits for connecting the cups to the vacuum source.

The construction, mounting and operation of the vacuum cup units may be identical to that disclosed in the above identified patent and pending application to which reference is made for a more detailed description.

Control of vacuum to the cups and control of fluid pressure to operate the piston and cylinder mechanism for raising and lowering the vacuum cup frames 39, 39 is timed with the travel of the push rods 7, 7 on conveyor chains 8. Such control means is fully disclosed in the above identified application. The operation is such that immediately after a pair of abutted cases comes to rest on the dead plate 4 the vacuum cup frames 39, 39 will be caused to move downward to bring the cups against the cover flaps. The cups are activated at this point in the movement, thus gripping the flaps. Continued downward movement of the frames 39 causes the arms to rock up-

ward about the cover hinges to raise the flaps. The frames are held in lowered position for a short interval. During this interval the push rod 7, which has been advancing toward the abutted cases, reaches the trailing case and moves both cases forward. The raised flaps of the leading case during this interval will reach the plow member 9.

Before the cups are deactivated, one of the holding elements 10 on the holding device for the flaps on the trailing case is brought into position to engage the flaps and keep them from swinging back toward closed position. The cups are then deactivated and the springs 46 return the cups to their original position on the arms 38.

The details of the holding member for controlling the flaps on the trailing case will now be described. A depending bracket 50, secured to the upstanding frame 43, has a frame plate 51 secured thereon to extend longitudinally and centrally of the conveyor. At the upper corners and at one lower corner of the plate 51 there are mounted idle sprockets 52, 53 and 54 over which a sprocket chain 55 passes. A driven sprocket 56 at the remaining corner of the frame is fixed on a shaft 57 journaled in the plate 51 and having its ends supported in bearings in the vertical members of frame 43. Near one end of the shaft 57 is secured a sprocket 58, the driving connections for which will be described presently.

In the present instance the chain 55 carries a pair of similarly shaped holding elements 10, 10. The construction of these holding elements may vary, but they are preferably U-shaped and have parallel, hook-shaped sections. When viewing the holding element, as shown in FIGURES 2, 3 and 4, illustrating the element in engagement with the case flaps, a horizontal plate 60 is secured, as by means of welding, to one of the links in the chain 55. On the trailing edge of the plate 60 are downwardly extending parts 61, 61 terminating in forwardly inclined parts 62, 62. The arrangement of the holding elements is preferably such that the inclined parts 61, 61 will move into contact with the respective trailing edges of the raised flaps on the trailing case.

The speed at which the chain 55 is driven is preferably the same as the speed of travel of the push rods 7 on conveyor chains 8. The primary consideration, however, is to provide means for assuring that the flaps will be supported in raised position after they have been initially lifted, such means continuing to act until the case flaps reach the plow member.

Any suitable form of driving means for the various operating parts may be employed. In the present instance, the drive for the speed-up conveyor and the flap holder mechanism is taken from the shaft 26 of the push rod conveyor. As shown in FIGURE 1, the shaft 26 has a sprocket 64 keyed thereon over which a sprocket chain 65 passes. This chain also passes around a sprocket 66, keyed on shaft 67. The shaft 67 is suitably journaled in the vertical frame members and has an additional sprocket keyed thereon, indicated at 68, this sprocket drives a chain 69, passing thereover which also passes around sprocket 23 which is keyed to the shaft 22 for the drive roll 21 of the speed-up belt 17.

For the purpose of driving the flap holder chain 55, there is provided a shaft 70, suitably journaled on the frame, which has a sprocket 71, keyed thereon, connected to sprocket 58 on shaft 57 through sprocket chain 72. Shaft 70 is driven from shaft 67 at the same speed but in the opposite direction by similar meshing spur gears 73 and 74 fixed on the respective shafts 67 and 70.

By this arrangement of driving means, the speed-up conveyor belt is driven at a speed substantially in excess of that of the push rods 7, and the chain 55 carrying the flap holder elements 10 is driven at a speed equal to that of the push rod conveyor and in the same direction. It is to be noted that the vertical portions 61 of the holders 10 are approximately vertically aligned above the push rod engaging the trailing case. See FIGURES 3 and 4.

As best shown in FIGURE 1, the speed-up conveyor belt and the dead plate 4 are preferably so arranged that the abutted cases will come to rest at the flap raising station in such position that the vacuum cup arms 38 when lowered, will contact the leading portion of the flap hinges of the trailing case. This exact relation is not essential and the arms 38 can be caused to contact the flap hinges at the juncture between the cases, or they could engage the flap hinges on the leading case.

If desired, the mechanism disclosed herein may be utilized interchangeably to open the flaps of abutted cases and of single cases, such as those holding twice the number of cans or bottles held by the individual abutted cases.

While the present description sets forth a preferred embodiment of the invention, numerous changes may be made in the construction without departing from the spirit of the invention, and it is therefore desired that the present embodiment be considered in all respects as illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

We claim:

1. In a cover flap opener designed to open side-hinged cover flaps on pairs of abutted, top-opening cases, the combination of conveying means along which the abutted cases are advanced with their cover hinge lines extending in the direction of travel, means for raising a pair of adjacent hinged cover flaps upwardly through a small angle and for retaining such flaps raised as the cases advance through a limited distance, plow means located in spaced relation to the conveying means downstream from the cover flap raising means, said plow means being disposed in operative relation to the raised cover flaps to swing the flaps to fully open position as the cases advance past such plow means, supplemental flap engaging means timed with the first mentioned flap raising means to engage and hold the flaps raised on the trailing case, means for releasing the cover flaps from the flap raising means, said releasing means being timed with the advancing movement of the cases and operative after the flaps on the leading case are in operative relation to the plow means, said supplemental flap engaging means being timed with the travel of the conveying means to retain the flaps on the trailing case raised until such case reaches flap engaging relation with the plow means.

2. In a cover flap opener designed to open side-hinged cover flaps on top opening cases, the combination of conveying means along which a case is advanced with its cover hinge line extending in the direction of travel, means for raising a hinged cover flap on a case upwardly through a small angle, plow means located in spaced relation to the conveying means downstream from the cover raising means, said plow means being disposed in operative relation to the raised cover flap to swing the flap to fully open position when the case advances past such plow means, and supplemental flap engaging means comprising an element mounted for movement above the case path, means for moving said element in timed relation with the first mentioned flap raising means to engage and hold the case flap raised as the case is conveyed until the advancing edge portion of the flap moves into engaging relation with the plow means.

3. A cover flap opener, as defined in claim 2, in which the means for raising the hinged cover flap is arranged to advance with the case a limited distance to maintain the flap raised through such distance.

4. A cover flap opener, as defined in claim 2, in which the supplemental flap engaging means comprises an endless chain supported outside the path of cases on the case conveying means and having a portion of the endless chain arranged to travel with the conveyed cases, and holding means carried by the chain movable in a path generally parallel with the case flap hinge line to engage and hold a partially raised flap.

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5. A flap opener, as defined in claim 4, in which the holding means carried by the chain has a straight portion extending at right angles to the case conveyor, and a second portion carried by the straight portion, such second portion extending at an acute angle to the case conveyor.

6. A cover flap opener, as defined in claim 2, in which the supplemental flap engaging means comprises a cover engaging element arranged to move in the same direction as the conveyed case.

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