Sept. 13, 1966 C. M. BEACHUM 3,272,502

APPARATUS FOR MANIPULATION OF THIN SHEET STOCK

Original Filed May 20, 1963 4 Sheets-Sheet 1

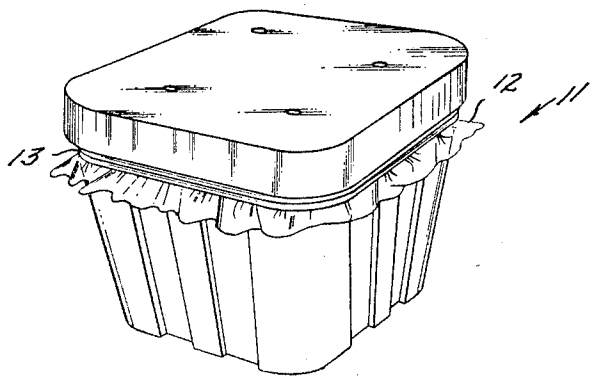
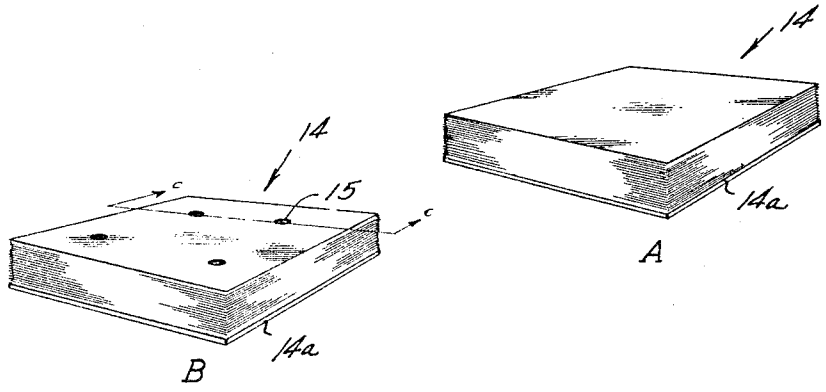


FIG. 1



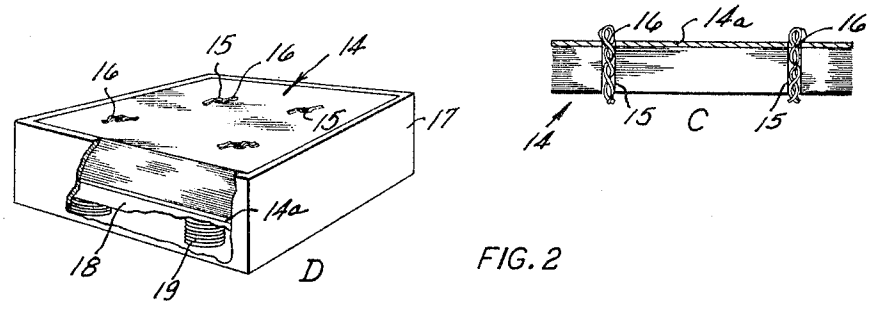
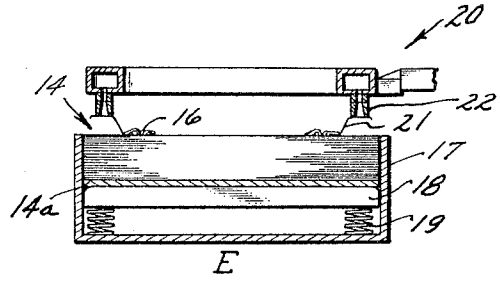


FIG. 2



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APPARATUS FOR MANIPULATION OF THIN SHEET STOCK

Original Filed May 20, 1963 4 Sheets-Sheet 2

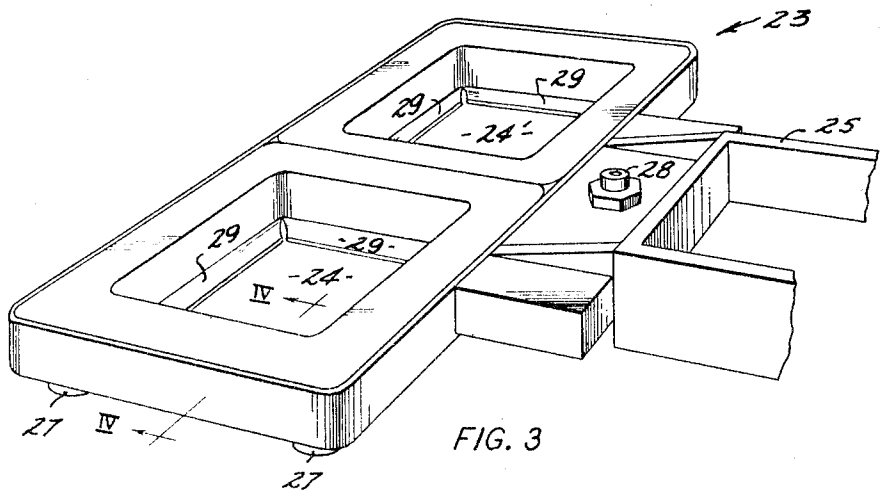


FIG. 3

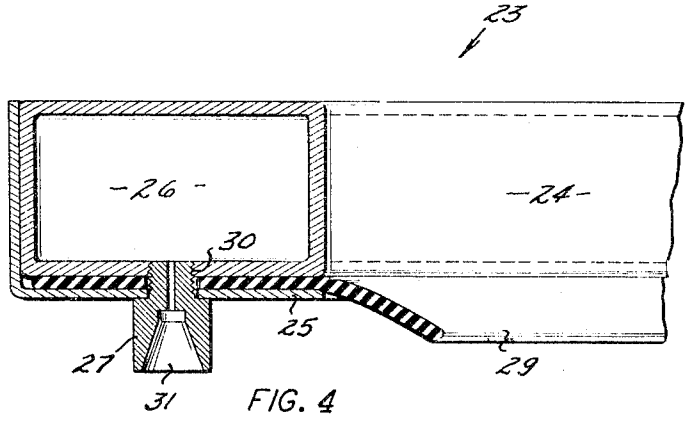


FIG. 4

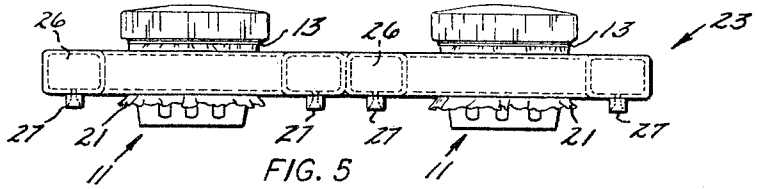


FIG. 5

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Original Filed May 20, 1963 4 Sheets-Sheet 3

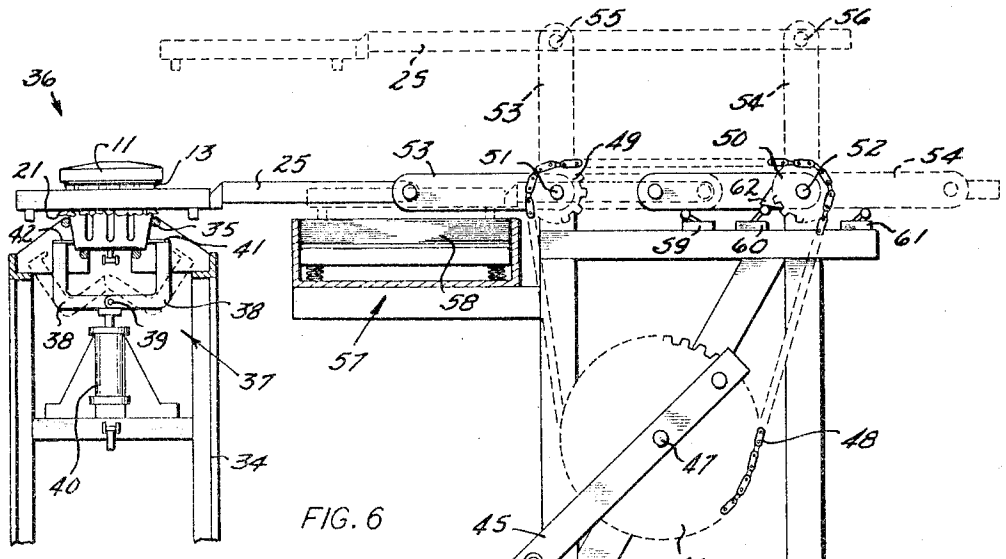


FIG. 6

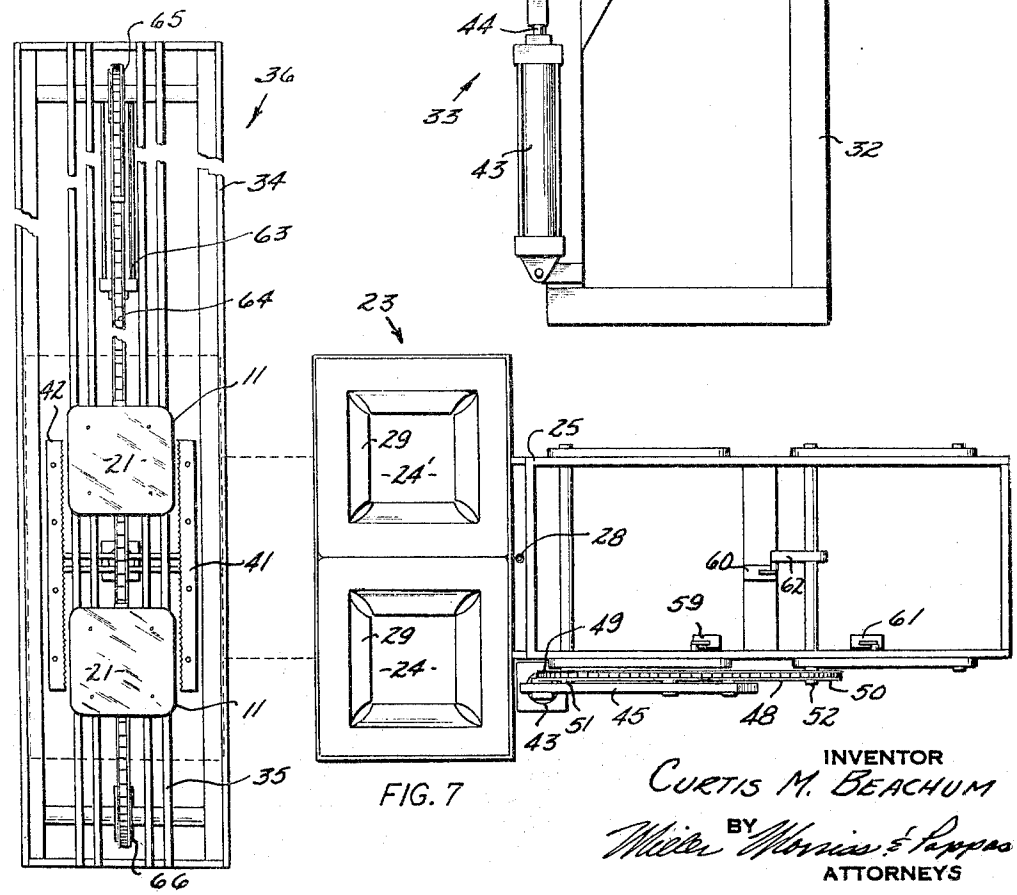


FIG. 7

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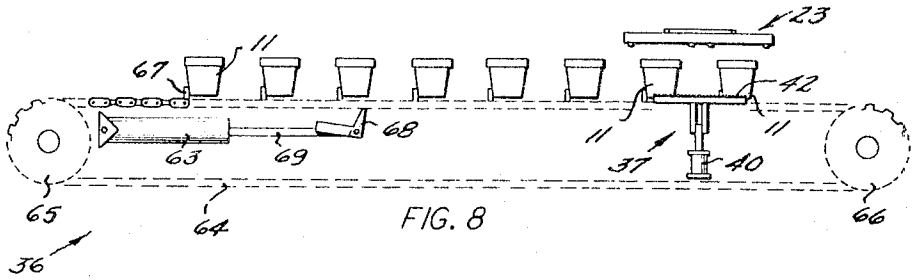


FIG. 8

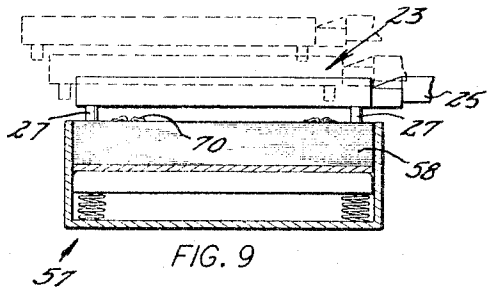


FIG. 9

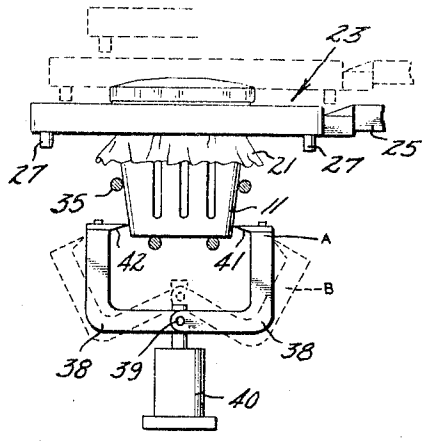


FIG. 11

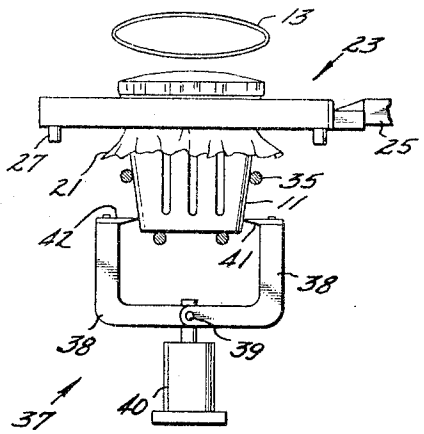


FIG. 10

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3,272,502

APPARATUS FOR MANIPULATION OF THIN SHEET STOCK

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Original application May 20, 1963, Ser. No. 281,427. Divided and this application Mar. 1, 1965, Ser. No. 440,057

2 Claims. (Cl. 271—62)

This is a division of application Serial Number 281,427 filed on May 20, 1963, now Patent No. 3,222,058.

The present invention comprises a process for the handling of film-like materials such as cellophane cover sheets and the like; a process for applying such sheet film materials to cover a box or carton; and an apparatus which utilizes the process for repetitive covering of berry boxes and the like.

Considerable difficulty has been encountered in the mechanical and even manual handling of thin sheet material such as cellophanes, vinyl and acetate films and the like, whether transparent or opaque and whether perforate or imperforate in form. The difficulty is related to the fact that it is almost impossible to distinguish the existence of plural sheets in a pad or stack of such stock. In part this is due to the thin character of the sheet material. The sheets possess an unusual affinity for each other due, in part, to a surface tension, related to smoothness of finish, and related also to the chemical relationship between adjacent sheets. In some instances the existence of an electrostatic charge in the sheet material contributes to the difficulty in handling and more specifically in separating one sheet from the next adjacent. In some film sheet material the limpness of the sheet adds difficulty to the pick-up problem. The present invention is addressed to a solution to this problem resulting in an extension of the use of such thin sheet material and in more economical usage since wastage by plural sheets is avoided. The present invention extends beyond the process of sheet handling to a process for manipulation of thin sheet stock in situations where thin sheet stock must be removed from a stack and relocated in register relation to another object, as for example a box or carton. Extending further, the invention embodies a machine wherein the process of the invention is practiced and which wholly avoids manual application of sheet stock as covers for cartons, boxes, and the like, and in particular berry boxes.

Thin transparent film material is well known to the packaging field and enriches the appearance of contents of the materials wrapped in it. For example a package of cigarettes in its transparent overwrap appears much more vivid and colorful than when the overwrap is removed. This is also true where produce or vegetables are wrapped in this manner. Tomatoes, so wrapped, may be visually inspected and the wrap enhances the appearance of the produce. This is particularly true of berries since the wrap over the top of quart and pint berry boxes gives the purchaser an appetizing and enticing view of the fresh contents. Collaterally the cover serves to prevent spillage. Certainly, more of such film sheets would be used except for the mechanical problems involved in handling the material without too much waste.

In produce covers, particularly, the present invention has tremendous application since the produce must be ventilated and the presence of vent holes through the covers is taken for granted. Additional small openings through the sheet stock does not detract from the use of such cover sheets and the process as taught herein requires additional minor perforations.

The process involves a frictional engagement with all sheets in the stack of sheets. Thus, the stack of sheets is pierced and a frictional member is inserted through the pierced opening so as to pass transversely through all of the sheets in the stack. The frictional member thus applies a radial frictional force to all sheets tending to maintain them in their stacked relationship. The resistance thus imposed is in excess of the summation of forces tending to cause sheet affinity, and, by means of vacuum or suction applied to the uppermost sheet a single sheet is lifted from the stack. The balance of the stack of stock remains in position for consecutive dispensation.

The process thus extends to include manipulation of the sheet by variant mechanical means. Conceivably, once a means for presentation is provided, variants in frictional lifts as well as vacuum lift is amenable to usages as the specific manipulation is contemplated.

The invention extends as well to a particular machine or apparatus for applying covers to berry boxes and which utilizes the processes of the present invention in a most novel and ingenious manner and adaptable to automated packaging of produce requiring transparent or thin film sheet covering.

Accordingly one of the objects of the present invention is to provide a simple process for separation of adjacent sheets of thin film-like stock.

Another principal object is to teach a simple frictional engagement applying a frictional force to all sheets of film material in a stack so that the friction exceeds all of the factors of affinity as between adjacent sheets, thereby providing a method for dispensation of thin sheet stock.

Another object is to teach a simple method for manipulation of thin sheet stock wherein one sheet is handled at a time.

Still another object is to teach an apparatus and dispenser for practicing the processes as above set forth in the dispensation of covers for produce cartons and the like wherein the construction is simple and the repetitive accuracy of the device is assured.

Other objects will be more completely appreciated to those skilled in the arts of handling thin sheet stock as the description proceeds in reference to the drawings.

In the drawings:

FIGURE 1 is a perspective view of a produce carton to which a transparent cover has been applied in accord with the present invention and retained in position by an elastic peripheral band.

FIGURE 2 is a sequence composite of perspective views indicating: A the stack of sheet material, B the application of pierced openings through the stack of sheet material, C the insertion of frictional elements through the pierced openings (transverse section taken on line C—C of B), D the stack of thin sheet stock loaded into a suitable dispenser and with frictional elements which are clipped and in place, E a full cross section showing the stock in a receptacle or dispenser in register with a pick-up element lifting a single sheet of film material from the stack.

FIGURE 3 is a perspective view of a frame or pick-off head indicating a double construction with vacuum feed provisions.

FIGURE 4 is a partial cross section elevation view taken through the frame shown in FIGURE 3 and indicating the vacuum cup inserts connecting through the hollow frame and indicating the internally peripheral resilient lip utilized to tension and stretch sheet stock.

FIGURE 5 is a front elevation view of the double frame shown in FIGURE 3 in full lowered position over a pair of produce cartons and indicating the attachment of the elastic retaining bands about the cartons prior to lifting of the frames.

FIGURE 6 is a partially cut away side elevation view of a machine in accord with the present invention and

employing the frame shown in FIGURES 3 and 5 to registrably pick-up, manipulate, and apply thin sheet material covers in accord with the present invention.

FIGURE 7 is a top plan view of the structure shown in FIGURE 6 and indicating two cartons in registering position on the conveyor adjacent the frames.

FIGURE 8 is a partial front elevation view in somewhat schematic form indicating conveyor movement and registry of a pair of boxes in respect to the sheet manipulating frame.

FIGURE 9 is a schematic side elevation view indicating the motion of the frame toward and away from the dispenser receptacle containing the thin sheet stock.

FIGURE 10 is a side elevation schematic view indicating the registering positioning of the sheet manipulating frame having applied the thin sheet cover and pausing for attachment of elastic retainer ring or band. The carton gripping structure is shown in the gripping position.

FIGURE 11 is a side elevation schematic view as in FIGURE 10 and indicates, schematically, the movement toward and away from the carton to which the cover is being applied or has been applied and indicates the grip and release positions of the carbon gripper means.

General description

The process of the present invention insofar as the handling of a single sheet of thin stock material is concerned, comprises the insertion of a frictional member through a stack of such stock so that radial pressure from a tensioning element provides a countering force against the accumulation of factors causing affinity as between adjacent sheets. The frictional means may be rigid as for example a small tack or nail with or without surface upset and driven through the stock of material. The frictional means may also be a resilient or non-rigid element as for example an elastic band threaded through the opening pierced through the stack of stock. Slightly oversized non-rigid rods or pins, wherein radial engagement occurs with the sheet material, have also worked satisfactorily when inserted in the transverse openings.

The process of the present invention insofar as it relates to sheet manipulation utilizes the sheet preparation as set forth herein and extends to apply a lift force overcoming the affinity of sheets of adjacent material to adhere to each other and subsequently stripping the sheet from the frictional engagement means. This, as will be seen, is preferably accomplished by a vacuum lift.

The apparatus of the present invention comprises a movable frame which defines at least one opening therethrough and which frame is locatable in register over a particular carton, box or product to be covered. The opening defined by the frame generally conforms to the plan configuration of the item to be covered. Means are provided on the machine for accomplishing this registry and then dropping the frame over the produce or carton to be covered. In addition the means imparting movement to the frame also locates the frame registrably over a magazine or dispenser which is stocked with thin sheet material in stacked relation in accord with the previously indicated process. The frame is arranged to descend into registry with the dispenser and pick-up means such as vacuum cups depending from the frame acts upon the uppermost sheet. The frame then is drawn away from the dispenser carrying a single sheet of thin stock and covering the opening defined by the frame. The balance of the sheet stock is frictionally restrained during the pickup so as to avoid lift of plural sheets. The restraint is provided by the friction element passing transversely through the complete stack of thin stock sheets and radially applying a localized drag to each sheet in resistance to the vacuum applied to the uppermost sheet by the frame vacuum elements. The apparatus returns the loaded frame to registry over the produce to be covered and then drops over the produce. In this action wiper elements smooth the thin stock tautly over the produce end, if desired, pause after the stripping action of the wipers have removed the stock from the vacuum elements so that a restraining band, for example an elastic band, can be dropped over the thin stock cover where it laps over the edges of a carton, for example. Then the apparatus recycles to reload the frames. During the deposition of the cover on the boxes or produce, a conveyor gripper locks the box at its base against withdrawal upon elevation of the frame. The apparatus at heart thus provides a movable frame providing one or more peripherally defined openings and each of the openings is further defined by resilient wiper or stretcher flaps. Each of the frame elements are also provided with vacuum pick up elements arranged or located outboard from the openings defined by the frames. Stop or lock provisions orient the frame to registry with the produce and with the dispensing means.

Specific description

Referring to the drawings and particularly to FIGURE 1, the end result sought by the process and apparatus of the present invention is illustrated as a berry carton **11** over which a transparent thin sheet cover **12** has been positioned and secured in place by means of a restraining band **13** which is an elastic band. While illustrated as a rectangular carton, the carton **11** may be oval or round (cylindrical) in plan view and with appropriate registering equipment could even be of irregular plan configuration. Heretofore such a covering was accomplished manually with considerable loss of time in packaging. While filling was accomplished rapidly the time required to apply the covers was expensive and laborious. The major difficulty surrounded the separation of thin sheet stock such as cellophane or transparent vinyl material or the like.

By reference to FIGURE 2 the process of the present invention is best revealed in the sequence sketches A–E inclusive. At A a stack of thin sheet stock **14** is shown as cut to size and as it is obtained preliminary to the practice of the process. It includes a spacer sheet **14***a* of cardboard or the like which is of assistance in maintaining orientation. At B the stock **14** has been transversely pierced by one or more holes **15** which are preferably symmetrically arranged in regard to the stock size and spaced substantially inwardly from the margin of the stock **14**. At C, the stock **14**, containing the pierced openings **15** is seen to have received transverse frictional elements **16** axially inserted through the openings **15** so that they radially apply force which impinges on all of the sheets in the stock **14**. These frictional elements **16** may be serrated elongate pins or as shown they may comprise elastic bands. If the elements **16** are rigid they must have a diameter slightly in excess of the diameter of drilled or punched openings **15**. If resilient material is used the material of the frictional elements **16** should be stretched so that upon release a radial impingement with the sheet stock occurs along the entire length of the opening **15**. At D the stack of stock **14**, prepared in accord with sketches A–C, inclusive is loaded into a dispenser **17** after the ends of the frictional elements **16** have been clipped off, as shown. The dispenser **17** is preferably in a horizontal open position having bottom and sides as the orientation in FIGURE 2, D, reveals, and the follower form of base plate **18** is preferably spring loaded as by springs **19** to provide a spring loaded false bottom so that a constant level of stock is maintained. The reason for the constant level is appreciated by reference to FIGURE 2, E, where a frame element **20** is positioned in register with the dispenser receptacle **17** and, without manual intervention, the frame **20** is lifting off a single sheet **21** of thin stock from the stack **14** for delivery to a remote station. The cushion springs **19** provide the resilient carriage of the false bottom or base

plate 18. Thus it is seen that the process of the present invention is established by the unique restraint of stock by peripheral or radial frictional engagement so that only a single sheet of stock is lifted from the dispenser or receptacle on each contact cycle. The dispenser 17 assures repetitive preparation of the receiving elevation for accuracy of schematic frame 20 in engagement with uppermost single sheet 21. As seen, the schematically shown vacuum elements 22 provide grip on the sheet 21 removing it from dispenser 17.

In FIGURE 3 a preferred embodiment of a frame or pick-off head 23 is shown in two cavity form, defining a pair of spaced adjacent openings 24 and 24'. The frame 23 is secured to a carriage means 25 and the frame 23 is conveniently provided with a hollow interior 26 (FIGURE 4) so that the hollow interior 26 provides a vacuum manifold serving the plural vacuum lift feet 27 which depend from the frame 23 in a symmetrical manner about the openings 24 and 24'. The vacuum feet 27 may be of rubber, brass, or other material as well known in the art. The vacuum connection 28 provides an access means for connecting a vacuum source (not shown) to the hollow frames 23. The frames 23 are peripherally definitive of the openings 24 and 24' and wiper or stretcher strips 29 are secured to the inner peripheral portion of the frame 23 so that they extend into the respective openings 24 and 24'. These strips or wipers 29 are resilient and as will be seen assist in stretching thin stock smoothly over produce containers as the containers move relatively upward through the openings 24 and 24'. For ease of fabrication the strips or wipers 29 may be secured in the manner of gaskets to the frame 23 and sandwiched between carriage elements 25 and frame 23.

By reference to FIGURE 4 the vacuum feet 27 are seen as cups or inserts threaded into openings 30 communicating the hollow interior 26 of the frame 23 with the conical openings 31. FIGURE 4 also shows the gasket-like attachment of the resilient strips or wipers 29 which extend coplanarly into the openings 24 and 24'.

FIGURE 5 indicates the registry of the frame 23 over a pair of cartons 11 in spaced apart adjacent relationship. The frame 23 is fully lowered and it can be seen that in this position the cartons 11 project through the openings 24 and 24' and stock sheets 21 have been stripped away from the vacuum feet 27.

As the description has proceeded it will be appreciated that the frame 23 must be shuttled or reciprocated between contact registry with the sheet dispenser 17 and contact delivery register over the carton 11 at the carton stations. By reference to FIGURES 6 and 7 an extremely simple and effective apparatus is shown which neatly and repetitively accomplished the desired cycling. The apparatus comprises a base 32 which supports the drive mechanism 33 which oscillates the carriage 25 and the frames 23. A conveyor base 34 provides a support for a conveyor path defined by carton support elements 35 which path is transverse of the path of the frames 23. Hence the conveyor 36 moves cartons 11 into spaced apart registry position for application of the thin sheet stock 21 by action of the frames 23. The conveyor 36 is provided with a carton lock or gripper 37 comprising a pair of rocker arms 38 operable by movement of cylinder 40. This action opens and closes clamp bars 41 and 42 on the base of the cartons 11, thus fixing them or restraining them from lifting away from the conveyor 36 as the frames 23 move away from the registry position over the cartons 11. Compressor for drive of all cylinders and vacuum producing means are not shown in the drawings but will be understood to provide necessary drive power.

Secured to the base 32 is a power cylinder 43. The piston 44 of the cylinder 43 is pivotally secured to a crank arm 45. The crank arm 45 is secured to and extends from a sprocket wheel 46 rotatable on bearing 47.

A closed chain loop 48 is in operable engagement with the sprocket wheel 46 and the loop is supported by two smaller spaced apart sprocket gears 49 and 59. The gears 49 and 50 are operative on shafts 51 and 52, respectively. The gears 49 and 50 are also operatively secured to parallel links 53 and 54, respectively. The links 53 and 54 are equal in length and are each pivotally secured in spaced relation to the carriage 25. Pivotal connections are 55 and 56, respectively, and are best seen in the phantom line position shown in FIGURE 6. As the cylinder 43 operates it moves the crank arm 45 rotating the sprocket wheel 46 and causing equal lineal movement to be translated to the gears 49 and 50 in such manner in relation of sprocket 46 to gears 49 and 50 as to oscillate the links 53 and 54 through 180 degrees of angular travel. The carriage 25 is thus maintained in a substantially parallel position and through successive horizontal planes, as shown, so as to contact register the extending frames 23 on the carton positions on the conveyor 36 at one extreme of travel, and on the receptacle or dispenser 57 wherein sheet stock 58 is presented for vacuum pick up in accord with prior description. The dispenser 57 is secured to the frame 32 as shown. The cylinder 43 is of the double acting type so that repetitive oscillations are accomplished. Limit switches 59, 60 and 61 are located on the base and are connected to suitable valve controls well known in the art to provide reversal of operation, time delay at the carton registry extreme of movement, gripper energization, and sequence control over the action of the conveyor 36. Switch 60 is controlled by the cam 62 as shown in FIGURE 7. The limit switches act in the following way on either hydraulic or pneumatic valving. Limit switch 59 reverses the action of cylinder 43 after a suitable time delay for attachment of retaining bands 13 to the cartons 11. This action has been accompanied by a locking of the gripper 37 by energization of valving to cylinder 40. As the frame 23 is lifted clear of the carton the cam 62 trips away from limit switch 60 and cylinder 40 moves to release the gripper 37. At full opposite extreme of throw, limit switch 61 is contacted energizing the conveyor cylinder 63 and moving another group of cartons 11 into spaced apart registering position for service by frames 23. In similar wise, though not shown, the vacuum line may be turned on and off at selected times in serving vacuum to the frames 23 at manifold connection 28, however it has been found unnecessary to turn the vacuum on and off since the stripping action of the wipers 29 frees the feet 27 of thin sheet stock.

In FIGURE 8 the schematic construction reveals the major portion of the construction of conveyor 36. The endless chain 64 moves on sprockets 65 at each end of the conveyor 36. Pusher extensions 67 in spaced relation on the chain 64 project upward into the bed of the conveyor 36 and establish the spacing interval of cartons 11. Movement of the chain 64 is by means of the stroke of cylinder 63 acting against limit stops and using a dog element 68 on the end of piston 69 which elevates to dog engagement on each power stroke and drops out of engagement on each return.

In FIGURE 9 the dispenser 57 is seen full of stock 58 which is prepared for use by friction inducing elements 70 as earlier described. The frame 23 has dropped so that the vacuum feet 27 are in pick up contact with the thin sheet material. In phantom line the carriage 25 and frame 23 are indicated as they approach the dispenser 57.

FIGURES 10 and 11 indicate the gripper mechanism 37 in increased detail. In FIGURE 10 the gripper arms 39 and bars 41 and 42 are closed on the carton bottom 11 and the frame 23 is at full extent of travel and delays in this position until the band 13 can be inserted over the tautly stretched thin sheet 12. In FIGURE 11 the gripper is shown in phantom line position B as it appears prior to frame registry and as it moves after removal clearance of the frame 23 so that danger of lifting of the

carton has past. In phantom line the approach and removal from registry is indicated in an elevation sense. The gripper **37** is in gripping position A while the frame **23** is in contact with the carton **11**.

In operation, the process makes possible repetitious accuracy of operation with single sheet pick up and avoids electrostatic, chemical, and mechanical adherence between adjacent sheets. The friction contact is achieved by either rigid or resilient means with the resilient means preferred.

The dispenser works nicely and, with resilient follower provisions, as described, presents the sheet material as prepared in accord with the present invention for easy pick up and at a constant reference plane elevation.

The apparatus described works smoothly and over long runs without service and without constant attention. The apparatus is relatively inexpensive to build and the preferred embodiment makes it obvious that hydraulic, pneumatic, and mechanical means could be adapted to the drive of the structure and combination of these are obvious. Drive by cam means or by solenoids can be used and are operable but not preferred.

Having thus described an operative embodiment of my processes and apparatus it will be readily appreciated by those skilled in the art that changes, improvements and modifications may be applied and such changes, improvements and modifications are intended to be included herein limited only by the scope of my hereinafter appended claims.

I claim:

1. A flexible thin sheet stock dispenser comprising:

(a) a stack of thin sheet stock pierced to provide at least one transverse opening therethrough;

(b) a receptacle shaped to support upwardly and enclose from the sides, said stack of thin, pierced sheet stock;

(c) a spring loaded, false bottom providing in said receptacle upward support of said stack of thin sheets; and

(d) at least one elongate resilient member through each of said openings in said sheet stock, said resilient member constricted by said openings against radial expansion whereby friction on each of said sheets in said stack is established at the perimeter of each of said openings.

2. The structure of claim **1** wherein a plurality of said resilient members are passed through a plurality of said openings in said sheet stock.

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