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METHOD AND APPARATUS FOR FORMING CONTAINERS

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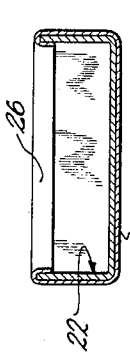

FIG. 1.

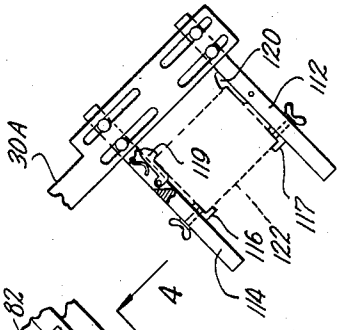

FIG. 5.

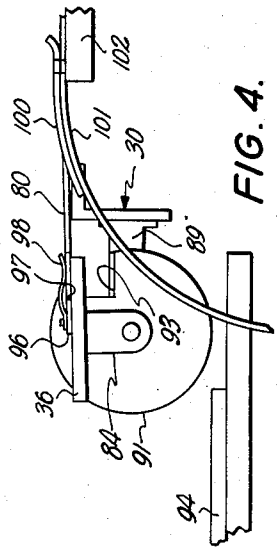

FIG. 4.

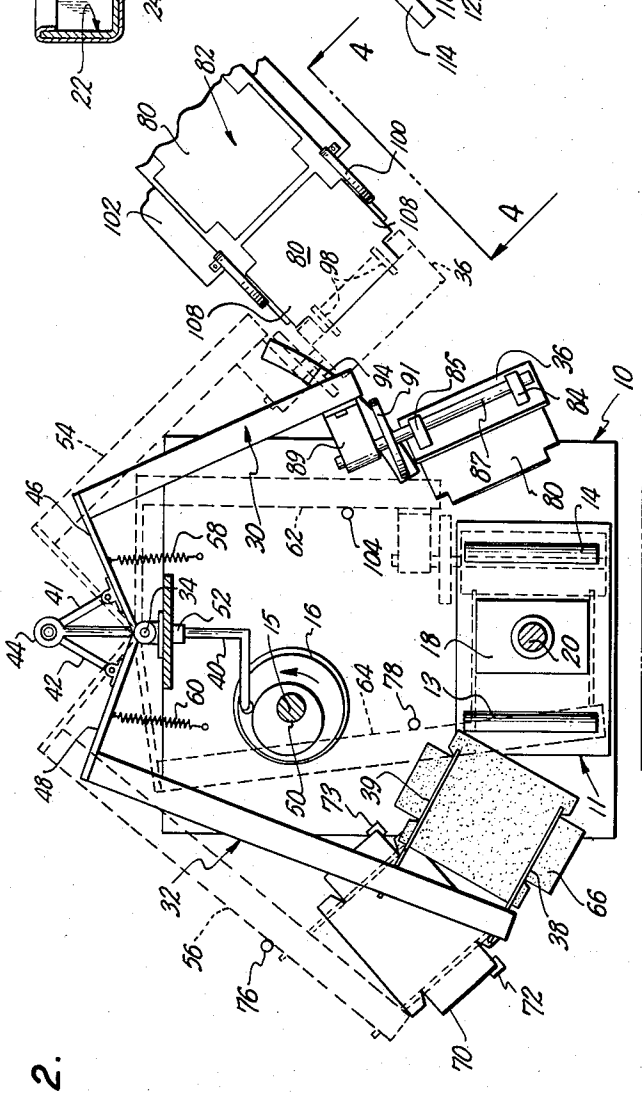

FIG. 2.

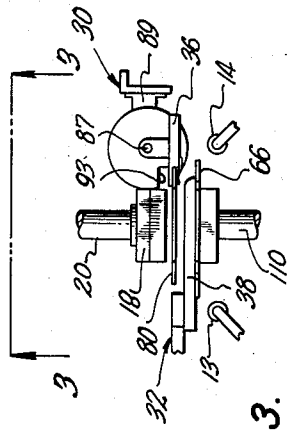

FIG. 3.

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METHOD AND APPARATUS FOR FORMING CONTAINERS

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7 Claims. (Cl. 93—43)

The invention relates to method and apparatus for forming containers such as boxes and more particularly to such boxes having an inner box form and an outer wrapping.

Included in the broad category of boxes described are candy boxes, ring boxes, garment boxes, etc. Conventionally, both the top and the bottom halves of these boxes have a box-like cardboard form or frame of suitable weight for the intended use. The form is covered exteriorly by an ornamental wrap, which may also function to secure the box corners and reinforce the box.

Conventionally the paper box industry employs a wrapping machine for combining the shaped components of the box. A "Diana" wrapping machine such as made by the High Production Machine Company is representative of the conventional wrapper. This machine and others like it receive previously combined and oriented box form blank and the paper wrap blank, plus any additional box components, and impel them by means of a plunger through a series of manipulating elements that form the paper wrap about the box.

The inner box form to be combined with the paper wrap may be presented to the wrapping machine in two forms. Firstly, it may be a "stayed" box, which is a container already shaped into a volume by applied corner tapes which maintain the box-like shape and add rigidity. Secondly, the inner box form may be combined with the paper wrap as an unstayed box blank whose substantially flat form has been altered by hand into a rough volume whose corners are not secured. In either instance the conventional procedure has been to combine properly the box form, the paper wrap, and such additional components as may be desired prior to the presentation of those components to the wrapper. The additional components may be extension cards for making extension edge boxes, top pads for padded box covers, or inner dividers. Normally such combining has been done by hand, even to the partial forming of the flat inner form into a quasi-box. Today's technology and economy penalize procedures dependent wholly or in part on hand assembly. Such assembly is also detrimental from the two standpoints of speed and precision.

I have invented an improved process and apparatus to implement the process which eliminates the hand forming and hand assembly of the components of containers made from bendable materials (such as a paper wrapped box) and accomplishes this assembly precisely and economically.

The process manufactures wrapped containers having an inner form, an outer wrap, and additional components which may vary with the intended use. They are assembled by the progression of the inner form, the wrap and additional components under the urging of a wrapping machine plunger through a series of manipulating elements. The improvement comprises the orienting of the inner form with respect to the plunger, the orienting of the wrap blank with respect to the plunger, and the orienting of additional components with respect to the plunger so that the progression of the plunger impels the inner form into proper combination with the wrap blank and the additional components.

Preferably the process includes the steps of transposing the inner form and the wrap blank from respective supply sources that are carefully oriented with respect to the wrapper plunger. Such additional components as may be desired are similarly disposed and transposed. Thereby the means for transposing the blanks can be simply adjusted properly to deliver the blanks in precise orientation with respect to the path of the plunger.

Many different supply sources may be utilized with the process of the invention. The inner form blanks, for instance, may be transposed from an intermittent conveyor having photo-electric means for locating the blank with respect to the plunger. Or the supply source may be a vertical stack with the orientation of the topmost blanks precisely maintained. It is possible to utilize the output of the blank forming device to properly position the blanks for transposition to the path of the wrapper plunger. Similar supply sources may be used for supplying the outer wrap or other additional container components.

The process requires apparatus for the transposition of the blanks that operates synchronously with the wrapper plunger. The manipulating elements of the conventional wrapper have their motion controlled by rotating cams driven from a single power shaft. These cams afford simple and economical means for synchronization of the blank transposing means with the manipulating movements of the wrapper. Therefore, the apparatus of the invention comprises separate means synchronized with the motion of the plunger for transposing each container component from a supply source to the path of the plunger. Each means operates so that each blank is not only oriented with respect to the path of the plunger but also oriented with respect to other components so that proper combination of the components may be implemented by the wrapping machine plunger. Preferably, the separate means for transposing the components from their respective supply sources comprise levers pivotable in a horizontal plane and actuated by suitable cams attached to the cam driver of the wrapper. The levers are preferably vertically placed with respect to each other so that the inner box form blank is contacted by the plunger before the plunger reaches the position of the paper wrap blank.

Many different means of transferring the blanks from the supply source to the levers may be used. The paper wrap blanks are preferably supplied so that the previously glued surface is uppermost at the point of supply. The lever may pick up the paper wrap by adhesion to the glued surface or by vacuumatic attachment. Spring clips may also be utilized, but the flimsy nature of the conventional paper wrap suggests preference for the first mentioned methods. However, spring clips and like grippers are practical and preferable for picking up the stiffer inner box form.

While the process and apparatus of the invention afford the most improvement in the assembly of unstayed boxes, simple alteration of the pick up means on the lever transposing the inner box form to the path of the plunger enables stayed boxes to be assembled with equal facility.

Special containers, such as loose wrap boxes, extension edge and padded top boxes are all handled with equal facility by the process and apparatus.

These and other advantages of the inventive process and apparatus are more fully disclosed in the following detailed description and drawing, in which:

Fig. 1 is a sectional elevation of a typical box fabricated by the process of the invention;

Fig. 2 is a diagrammatic plan view of the apparatus

of the invention shown in conjunction with a schematically represented wrapping machine;

Fig. 3 is a fragmentary elevational view of the paper wrap and box form blank in position to be impelled through the manipulating elements of the wrapping machine;

Fig. 4 is a fragmentary elevational view taken along line 4—4 of Fig. 2 and illustrating the preferred means of transferring the box form blank from a supply source to the lever; and

Fig. 5 illustrates an alternate embodiment of the means for effecting the transfer from a supply source to the lever, particularly adapted to use with stayed boxes.

Fig. 2 illustrates a wrapper or wrapping machine indidicated generally by the rectangular outline 10. The conventional components of such a wrapper are diagrammatically illustrated as a manipulating unit 11 having manipulating elements such as the rollers 13 and 14, a cam drive shaft 15 having a cam drum 16 and a plunger 18. Cam drive shaft 15 and plunger shaft 20 both extend vertically. The vertical motion of the plunger is controlled by rotation of the cam drive shaft 15 through mechanical linkage, not shown. Similarly rollers 13 and 14 and other like manipulative elements have their motion controlled by the cam drum 16.

The aforementioned machine components are conventional for a wrapper for fabricating wrapped paper boxes. Such a box is illustrated in Fig. 1. The box has a box-like inner form 22 which may be of a relatively stiff material such as cardboard. This inner box form is covered by an outer wrap 24 which is usually turned inwardly to form a lip 26 which adheres to the upper inner surface of the inner box form. The process and apparatus of the invention are particularly advantageous for the fabrication of such a box. Referring again to Fig. 2, a box blank lever arm 30 and a paper wrap blank lever arm 32 are pivoted from a mutual hinge 34. Lever arm 30 is generally L-shaped as viewed in plan, and supports at its end remote from the hinge a clip board 36 adapted to receive inner box form blanks.

Lever arm 32 is also substantially L-shaped and mounts a pair of spaced parallel blades 38, 39 at its end remote from the hinge. Hinge 34 is supported from the wrapper adjacent cam drive shaft 15. The cam actuated push rod 40 extends rearwardly from the machine and across the hinge line of the lever arms. Tie rods 41, 42 are pivotally attached to the outward end 44 of the push rod and to the respective short stems 46, 48 of lever arms 30 and 32. The push rod is actuated by rotation of a special cam 50 added to the cam drive shaft 15 of the wrapper. As the cam rotates, push rod 40 slides in and out in a sleeve 52 supported by the wrapper. Outward motion of the push rod engendered by the configuration of the special cam causes simultaneous outward motion of pickup arms 30 and 32. The extreme positions of these lever arms are represented by dotted lines 54, 56 respectively. Extension springs 58, 60 fastened to the respective short stems 46, 48 of the lever arms draw the lever arms inwardly as rotation of cam 50 permits. Thus, each lever arm is swung through an arc whose outer extreme is indicated respectively by dotted positions 54, 56 and to inner positions respectively indicated by dotted positions 62, 64. These latter positions are those in which the paper wrap and inner form blank are oriented with respect to the wrapper plunger so that the paper wrap and box blank may be combined and impelled through the manipulative elements of the wrapper by the plunger.

Paper wrap blanks such as the wrap 66 illustrated in Figs. 2 and 3 supported by blades 38, 39 are drawn from a supply stack 70. The supply stack is precisely oriented with respect to the motion of lever arm 32 by locating means such as corner guides 72, 73 (see Fig. 2). The paper wrap supply source may constitute a precisely located stack of paper wrap blanks stacked so that the topmost blank may be adhesive coated between oscillations of the lever arm. The adhesive may be a pressure sensitive type so that contact with the bottom edge of blades 38 and 39 adheres the paper wrap to the blades. Proper orientation of the paper wrap when it is swung by the lever beneath the wrapper plunger is, of course, dependent upon precise transfer of the paper wrap from the supply source or stack to the blades. Therefore, the outer swing of the lever arm is limited by a stop 76. The inner extreme of travel for lever arm 32 is set by a second stop 78. Basically the motion arc of the lever arm is controlled by the cam actuated push rod 40 with fine adjustment being possible through re-positioning of the pivoted mounting of tie rod 42 at short stem 48. However, precise operation dictates the use of limit stops to eliminate any possibility of unprecise operation.

Figs. 2 and 4 illustrate also the pickup means by which transfer from a supply source to lever arm 30 is achieved. Lever arm 30 transposes inner box form blanks such as blank 80 of Fig. 2 from a supply source 82 to proper orientation with respect to the wrapper plunger. While many suitable methods can perform this transposition, I have found that spaced clips can perform the transfer smoothly and accurately. Therefore, the illustrative embodiment of the apparatus of the invention utilizes the aforementioned clip board 36 which is rigidly mounted by supports 84, 85 to a stub shaft 87. The shaft extends parallel to the lever arm and is supported therefrom by a journal 89. The fit between the shaft 87 and journal 89 should be a friction fit so that under the normal load of the clip board and the box form blank the shaft will not turn within the journal.

Intermediate of the stub shaft journal 89 and the clip board a drive disk 91 is fixed rigidly to stub shaft 87. The drive disk has a peripheral notch 93 which locates clip board 36 correctly by contact with registry stops (not shown) located at either extreme of lever arm travel. Drive disk 91 contacts an arcuate friction strip 94 which is conveniently supported from the wrapper beneath the drive disk so that the arcuate motion of the lever arm carries the drive disk along the friction strip.

The clip board has an adjustable registry strip 96 having a surface 97 against which an edge of box form blank 80 is registered. A pair of formed spring clips 98 are fixed to the registry strip so that they extend beyond the surface 97. The clips secure the box blank removably to the board.

As lever arm 30 swings through its arc under the impetus of the push rod 40, contact of the drive disk with friction strip 94 rotates the disk approximately 180° and consequently turns the clip board 36 with respect to the center line of stub shaft 87. When the lever arm 30 is in the position indicated by dotted line 62, the clip board depends below shaft 87 so that the box form blank extends horizontally beneath the wrapper plunger. Conversely, movement of lever arm 30 from the position indicated by lines 62 to the position indicated by lines 54 causes the drive disk to rotate the clip board to a position above shaft 87 so that the box blank, when picked up from its supply source, extends horizontally in an opposite direction.

Although supply stacks may be successfully utilized as a source of box components, it is preferable to supply the box form blanks conveyorwise. The conveyor need not be a special one and in the illustrative drawing the blanks are impelled into transfer position directly from the punch press forming the blanks. Their progress under the impetus of the punch press delivery system is intermittent so that the transfer from the discharge stream of the press to the lever arm may be effected when the blank is stationary. The operation of the punch press is synchronized with the operation of the wrapper machine.

As soon as both the blank and the supply roll trim emerge from the punch press, the trim may be utilized to suspend the blank in position while the transfer is made. For instance in Fig. 4, curved guides **100** direct the trim portion **101** of the box blank cardboard roll downwardly beyond the support bed of the press so that the partially separated box blank **80** projects in a substantially horizontal plane from the punch press support platform **102**. Thus, motion of the lever arm **30** carries the clip board to the protruding box blank and the spring clips slide over the blank and surface **97** registers against the edge of the box blank. The inward motion of the lever arm then carries the completely detached box blank away from the punch press discharge stream and into proper orientation with the wrapper plunger.

In Fig. 3 the orientation of the paper wrap and the inner box form blank with respect to both the wrapper plunger and each other is apparent. In the figure both lever arms have reached the limit of their inner motion, arm **32** being stopped in registry by stop pin **78** and a stop pin **104** (see Fig. 2) performing the same function for lever arm **30**. Further rotation of shaft **87** has been precluded by the limited length of friction strip **94**. This leaves clip board **36** in the desired orientation, i.e. inner box form blank **80** being held horizontally beneath the wrapper plunger. The arms **30** and **32** are located vertically with respect to each other so that blank **80** is oriented above paper wrap **66** and as a consequence is the first to be contacted by plunger **18**. Plunger **18** has a rectangular shape substantially identical to the inner dimensions of the box to be formed. Blades **38** and **39** are spaced so that the outer dimension of the plunger spans the space between. As the plunger descends, box blank **80** is impelled into contact with the upper surface of blades **38, 39**. The further progression of the plunger between the blades folds up end flaps **108** of the box blank. Therefore, the blades perform the twin functions of transporting a paper wrap and being the first manipulating element of the box forming process. At the moment of contact of box blank **80** with the coated surface of paper wrap **66** a conventional lower plunger **110** moves into place to support the paper wrap against the thrust of the plunger **18**. Redesign of the lower plunger cycle may be necessary to adapt particular wrapping machines for proper synchronous performance of this function. Positive contact is thus assured between the box blank and the paper wrap. The two plungers then progress downwardly together carrying the now combined box components through a series of manipulative elements such as rollers **13** and **14** whose motions are controlled by their linkage (not shown) to cam roller **16**.

The process of the invention in essence makes the combining of the paper wrap and the box blank components a part of the wrapping stroke of the wrapper plunger, eliminating the costly step of combining these box components prior to the presentation to the wrapper. The apparatus of the invention implements this process in a precise and speedy manner.

The process is flexible enough to encompass the assembly of both stayed and unstayed box forms. The illustrative apparatus is adapted for assembling containers having two components. The process and apparatus are equally suited to the manufacture of containers having several parts. The number of lever arms may be increased so that many components are oriented with respect to the plunger for proper assembly with each other. Although the apparatus illustrated in Figs. 2 and 4 is most advantageous in the assembly of unstayed boxes, stayed boxes may be accommodated by the simple substitution of the transfer means illustrated in Fig. 5, for that of Figs. 2 and 4.

In Fig. 5 a lever arm **30** has parallel supports **112, 114** extending horizontally and perpendicularly therefrom. A pair of horizontally adjustable corner locators **116, 117** are supported near the ends of the support arms remote from the lever arm. A pair of spring loaded receiving dogs **119, 120** are pivotably mounted to the support arms near the lever arm. The dogs are pivoted so that motion of the lever arm against a stayed box presses the dogs inwardly into recesses in the support arms allowing the lever arm to progress until the corner locators register against the forward edge of the stayed box. When the lever arm reaches this position, the spring loaded dogs are impelled about the opposite corners of the stayed box indicated by dotted lines **122** and grip the box with sufficient force to enable the lever arm to transpose it from the supply source to proper orientation beneath the wrapper plunger.

Since the only restraint on the box is against its vertical sides, the downward motion of the plunger can readily impel the stayed box from the grip of the dogs and corner locators.

Those skilled in the art will appreciate the many forms other than those illustrated by the detailed specification that the concept of the invention encompasses. The applicant therefore regards the following claims as the true measure of the scope of his invention, both as to process and apparatus.

I claim:

1. In a process for manufacturing boxes having an inner box form and an outer wrap by the progression of the inner box form and the adhesive coated outer wrap through a series of manipulating elements of a wrapping machine under the urging of a first plunger of the machine operating against an opposed yielding second plunger, the improvement comprising picking up an adhesive coated wrap blank from a supply source, orienting the wrap blank for wrapping beneath the first plunger of the wrapping machine, picking up an inner box form blank from a supply source, orienting the box form blank for wrapping beneath the first plunger and vertically spaced from the outer wrap blank, forming the box form blank in part into a box shape by passing the box form through forming elements, and then bringing the partly formed box form blank into contact with the coated wrap blank by the further progression of the first plunger of the wrapping machine, the coated wrap blank being supported at the instant of contact by the opposed yielding second plunger.

2. In a wrapping machine having a plunger for assembling containers of the type having an inner box form and an outer wrap, the improvement comprising a pivotable first lever arm synchronized with the motion of the plunger for transporting the inner box form from a supply source to a position in the path of the plunger, means associated with the first lever arm for releasably receiving the inner box form, a separately pivotable second lever arm synchronized with the motion of the plunger for transporting the outer wrap from a supply source to a position in the path of the plunger spaced from the inner box form, and means associated with the second lever arm for releasably receiving the outer wrap, the separate means associated respectively with the first and second lever arms being adapted to present the inner box form and the outer wrap in proper orientation for mutual engagement during the stroke of the plunger.

3. Apparatus in accordance with claim 2 in which the means associated with the pivotable first lever arm comprises a shaft journaled with respect to the lever arm, a drive disk fixed to the shaft, a spring clip board fixed to the shaft, spring clips on the board for releasably securing the inner box form thereto, and a friction strip adapted to rotate the drive disk by contact therewith so as to turn the shaft and the spring clip board so that the spring clips are oriented to receive an inner box form from the supply source as the lever arm pivots in one direction and oriented to present the inner box form releasably secured to the board to the path of the plunger as the lever arm pivots in the opposite direction.

4. Apparatus in accordance with claim 2 in which the

means associated with the second lever arm comprises a pair of spaced rails, a bottom surface on each rail adapted to contact the outer wrap, and a top surface on each rail, said top surfaces interacting to shape partially the inner box form as the box form and the outer wrap are mutually engaged by the progression of the first plunger.

5. In a process for manufacturing boxes having an inner box form and an outer wrap by the progression of the inner box form and the adhesive coated outer wrap through a series of manipulating elements of a wrapping machine under the urging of a first plunger of the machine operating against an opposed yielding second plunger, the improvement comprising picking up an adhesive coated wrap blank from a supply source by mechanical means, orienting the wrap blank and the mechanical means between the first and the second plungers of the wrapping machine, picking up an inner box form blank from a supply source, orienting the box form blank for wrapping adjacent the mechanical means and beneath the first plunger and vertically spaced from the outer wrap blank, passing the box form through the mechanical means holding the outer wrap blank to shape partially the inner box form blank, and then bringing the partly formed box form blank into contact with the coated wrap blank by the further progression of the first plunger of the wrapping machine, the coated wrap blank being supported at the instant of contact by the opposed yielding second plunger.

6. In a process for manufacturing boxes having an inner box form and an outer wrap by the progression of the inner box form and the adhesive coated outer wrap through a series of manipulating elements of a wrapping machine under the urging of a first plunger of the machine operating against an opposed yielding second plunger, the improvement comprising orienting the wrap blank for wrapping beneath the first plunger of the wrapping machine, orienting the box form blank for wrapping beneath the first plunger and vertically spaced from the outerwrap blank, forming the box form blank in part into a box shape by passing the box form through forming elements, and then bringing the partly formed box form blank into contact with the coated wrap blank by the further progression of the first plunger of the wrapping machine, the coated wrap blank being supported during adhering contact by the opposed yielding second plunger.

7. In a wrapping machine having a plunger for assembling containers of the type having an inner box form and an outer wrap and means for orienting the inner box form with respect to the path of the plunger the combination comprising a pivotal lever arm synchronized with the motion of the plunger and with the means for orienting the inner box form for transporting the outer wrap from a supply source to a position in the path of the plunger spaced from the inner box form, a pair of spaced rails on the lever arm, a bottom surface on each rail adapted to contact the outer wrap, and a top surface on each rail, said top surfaces interacting to shape partially the inner box form as the box form and outer wrap are mutually engaged by the progression of the plunger.

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