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METHOD OF AND APPARATUS FOR WRAPPING BOXES

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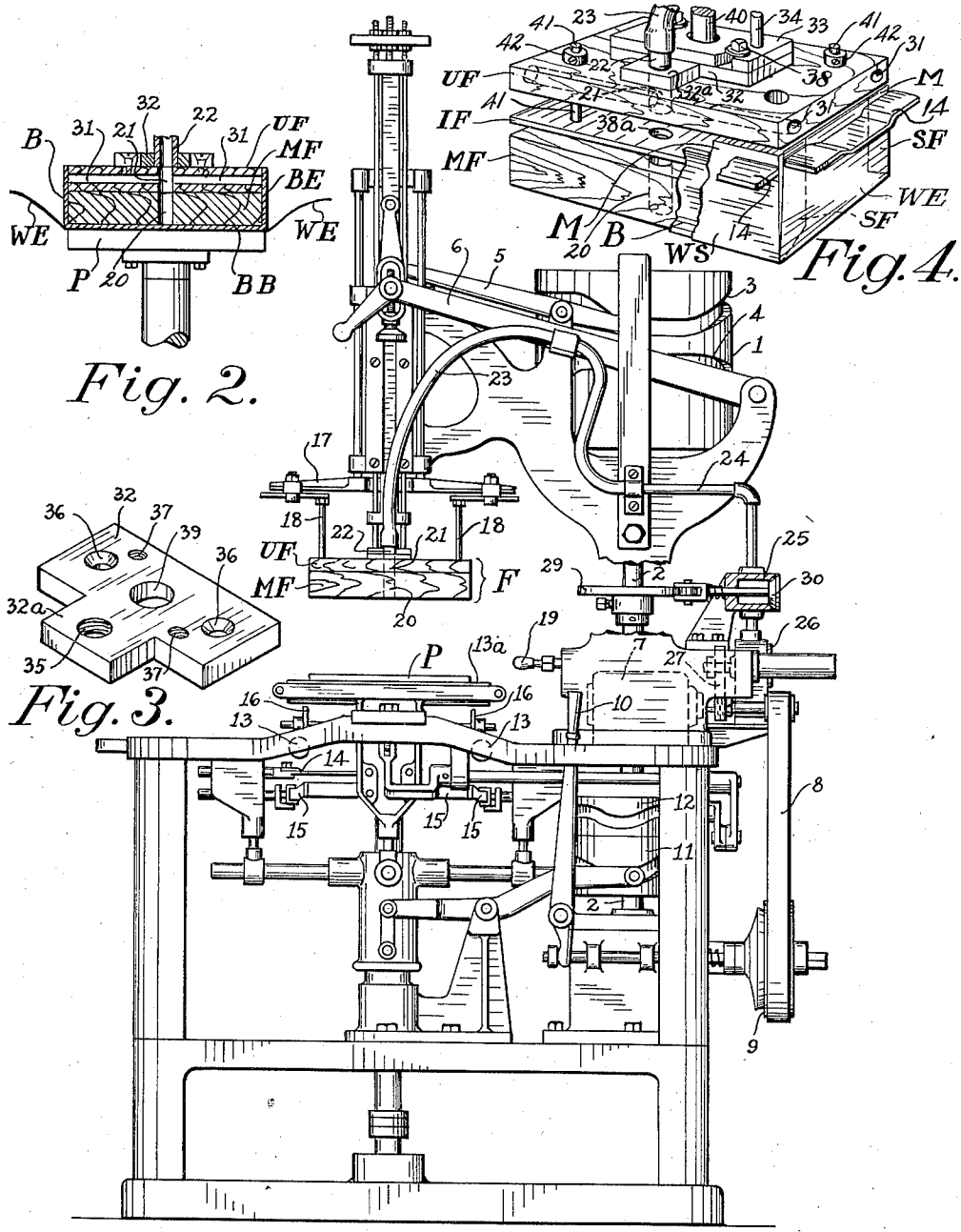


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

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METHOD OF AND APPARATUS FOR WRAPPING BOXES

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14 Claims. (Cl. 93—54.2)

My invention relates to methods of and apparatus for covering previously formed or stayed boxes, containers or the like, by applying thereto a wrapper, label, or equivalent, or for forming a box from a box blank by applying sheet material, as a tabbed or untabbed wrapper, or tabs solely, previously partially applied or adherent to the box blank; and more particularly to box-wrapping machines of the type having form-block structure for transporting a box or box blank adjacent sheet-applying tools.

In accordance with my invention, whenever in that part of its cycle during which the form block is accessible there is placed thereon a box structure for wrapping and/or staying, there is immediately applied a force which holds the box structure to the form block; more particularly, suction is exerted through the form block to hold the box or blank thereon, avoiding need for the operator to continue holding the box or blank after manually applying it to the form block; more specifically, the bottom of the form block is provided with one or more suction ports closed by a box or box blank when disposed on the form block, and preferably, for unstayed box blanks, the sides or ends of the form block are also provided with ports through which suction is exerted to hold the corresponding panels of the blank.

Further in accordance with my invention, the suction is controlled, as by a valve, to cut off the suction during part of the machine cycle when suction is not necessary or desirable, and to provide suction through the form block for substantially all of that part of the cycle during which the form block is accessible to receive a box or box blank.

My invention further resides in the features of construction, combination and arrangement hereinafter described and claimed.

For an understanding of my invention and for illustration of a preferred form thereof, reference is to be had to the accompanying drawing in which:

Figure 1 is a front elevational view, with parts in section and parts omitted, of a box-wrapping machine;

Fig. 2 is a detail view on enlarged scale and in section of form-block structure shown in Fig. 1;

Fig. 3 in perspective discloses an attachment plate for the form-block structure of Fig. 2;

Fig. 4 is a perspective view of a modification of the wrapping machine form-block structure.

Referring to Fig. 1, the wrapping machine is generally of the type shown in Federwitz Patent No. 2,044,606 and more particularly the type shown in Rider et al. Patent No. 2,074,561.

The main cam 1 on shaft 2, which makes one revolution for each cycle of the machine, is provided with cam grooves 3 and 4 which effect oscillation of the levers 5 and 6 to effect reciprocation of the form-block structure F to and from the position shown in Fig. 1. The shaft 2 is driven by motor 7 through the belt 8 and clutch 9 which is controlled by the manually-operable lever 10.

The cams 11 and 12 on shaft 2 control the operation of the various sheet-applying tools; specifically, the cam 11 controls, in known manner, the rolls 13, 13a for applying the side and end walls of a wrapper to a box, the marginal turn-in tools 14, and the presser blocks 15. The cam 12 controls the operation of the corner-lap tools 16.

The operator, to make a wrapped box, places upon the form-block structure F an assembly comprising a stayed box, or a box blank, to which is adherent a partially applied wrapper. The form block F, under the control of cam 1, descends, meeting the platen P, which is spring-biased to the position shown in Fig. 1, to clamp the assembly between the form block F and the platen.

As the form-block structure continues its descent, the wrapping tools in usual and known manner first apply the side panels WS of the wrapper to the box B or box blank, then the corner-lap tools 16 turn the corner laps SF of the wrapper side panels into engagement with the box end walls; the wrapper end panels WE are then wiped into engagement with the box ends by the end rolls 13. Preferably all of the sheet-applying operations thus far described are effected during continued movement of the form-block structure as more clearly described in the aforesaid Rider et al. patent.

Before the form-block structure arrives at a position adjacent the marginal turn-in tools 14, the movement of the upper component UF of the form block is arrested under the control of the groove 3 of the main cam 1, the lower component MF of the form block continuing its downward movement until its upper edge is substantially in alignment with the turn-in tools 14. While the form block is stationary, the tools 14 are moved inwardly under the control of cam 11 to turn in the marginal portions M of the wrapper, and substantially concurrently the presser blocks 15 are moved inwardly to exert a light pressure against the vertical walls of the box. The upper form UF is then permitted, under the control of

cam 3, to fall so that when tools 14 are withdrawn, the form-block component UF drops to turn the marginal portions M of the wrapper into engagement with the inside of the box. The presser blocks 15 are then moved in to exert hard pressure, thus to insure intimate adhesive engagement of the turned-in margins of the wrapper with the inside of the box.

The tools are then withdrawn, and the form-block structure F, under the control of the main cam 1, is moved upwardly toward its original position, Fig. 1. When, during this movement, the form block and completed box reach the upper limit of movement of the plunger P, the movement of the stripper yoke 17 carrying the stripper rods 18 is temporarily arrested so that, as the form block F continues its upward movement, the stripper rods, which extend through the form block, separate the completed box from the form block. When the form block and the stripper rods 18 have cleared the upper edge of the completed box, the ejector 19 is automatically operated forcibly to remove the completed box from the path of the form block.

With the construction as thus far described, which is exemplary of wrapping machines of widely known and used type, the operator, after a completed box has been ejected from the machine, may place another assembly on the form block during a period which begins after ejectment of the completed box and terminates when the descending form block reaches a position beyond which an assembly can no longer be slipped beneath the form block due to obstruction by the platen P and/or the sheet-applying tools. After placing an assembly upon the form block, the operator had to continue to hold it there until the descending form block met the plate P as above described. The need for the operator to hold the assembly on the form block for a substantial part of each cycle of the machine substantially reduced the time left available to prepare another assembly.

Since, in practical operation, a machine of this type is operated at speeds substantially in excess of twenty cycles per minute, it is desirable that the operator, after placing an assembly on the form-block structure, be at once free to prepare the next assembly.

In my preferred arrangement for accomplishing this result, the upper and lower form-block components are provided with passages 20 and 21 which are in communication when the components are together. The passage 20 in the lower component MF terminates in its lower face, forming a suction port which is closed when a box is placed on the form block F, (Fig. 2). The passage 21 in the upper component UF is in communication with the fitting 22 which receives one end of a flexible hose 23 whose other end is connected to pipe 24 extending from the bleeder valve 25 connected to the suction side of pump 26 continuously driven as by chain 27 from the motor 1. The cam 29 on shaft 2 of the wrapping machine controls the position of the movable element 30 of the bleeder valve, and is preferably of such contour that the valve is closed for substantially all of that part of each cycle of the machine during which the form block F is accessible to receive a box and wrapper assembly.

With my improvement, the operator may place an assembly upon the form block at any time during that part of the cycle during which the form block is accessible and as soon as she has placed an assembly on the block she may immediately release her hold thereon, since the suction is immediately effective.

The suction, under the control of the cam 29, is exerted to hold the assembly on the form block at least until the descending form block meets the platen P; the suction may then be discontinued if desired, particularly when the box has been previously stayed, and, in any event, the suction should preferably be discontinued before the stripping operation above described.

For making stayed, or wrapped boxes, from unstayed box blanks, the upper form block UF is preferably provided with additional passages 31 which are in communication with the principal passage 21, and which extend to and terminate in ports in the vertical faces of the form block (Figs. 2 and 4). The suction through these ports holds the end panels BE of the unstayed blank against the form block at least until the corner flaps SF of the wrapper or tabs have been applied; the suction may then, if desired, be discontinued under the control of the cam 29.

Since machines of this type are used to make boxes of many various sizes, it is desirable the addition of the improvement shall add as little as possible to the mechanical operations involved in changing from one size of form block to another. As more clearly appears in Figs. 3 and 4, the plate 32 for attaching the upper form component UF to the plate 33 permanently attached to the lower ends of the reciprocating rods 34, is of the usual construction except for the extension 32a which is provided with a hole 35 in registry with the passage 21 of the upper form UF and threaded, or otherwise suitably machined, to receive the suction connection 22. With this construction the only additional operation required in the substitution of one form block for another is the sliding on and off of the hose connection 23.

The countersunk holes 36 receive the screws for holding plate 32 to its form block; holes 37 are threaded to receive the bolts 38 for attaching the block to the plate 33 of the box-wrapping machine, and hole 39 is to permit passage of the rod 40 which is connected at its lower end to the form-block component MF.

Particularly in making shallow boxes, the form-block structure F is often of the type shown in Fig. 4, having, in addition to the upper and lower components UF and MF of Figs. 1 and 2, an intermediate thin block or plate IF suspended as by pins 41 which extend through the upper form block UF and are provided with stops or collars 42 which are so adjusted that when the upper form block is arrested for operation of the turn-in tools 14, the upper surface of the intermediate plate IF is, as shown in Fig. 4, slightly lower than the upper edge of the box and slightly lower than the turn-in tools 14. To provide for communication between the passage 20 in the form-block component MF and the suction passage 21 in the upper form UF, there is provided a passage or hole 38a in the intermediate plate IF.

While I have illustrated and described a preferred arrangement, it is to be understood that my invention is not limited thereto, but is coextensive in scope with the appended claims.

What I claim is:

1. A box-wrapping machine comprising sheet-applying tools, form-block structure for transporting an assembly comprising box structure and partially applied sheet material adjacent said tools and moved to and from a region substantially remote from said tools to permit manual

application of an assembly to said form-block structure, and means for holding said assembly to said form-block structure whenever applied thereto in said region comprising one or more ports in one or more faces of said form-block structure, and means for applying suction through said ports.

2. A box-wrapping machine comprising sheet-applying tools, reciprocating form-block structure which for part of its cycle is accessible to receive an assembly comprising box structure and partially applied sheet material, and for another part of its cycle is adjacent said tools and inaccessible, said form-block structure having one or more ports in one or more faces thereof, a source of suction in communication with said ports, and means timed to interrupt application of suction through said ports when said form-block structure has passed from the region of its accessibility.

3. A box-wrapping machine comprising sheet-applying tools, reciprocating form-block structure accessible for part of its cycle to receive an assembly comprising box structure and partially applied sheet material, means in the path of said form-block structure for clamping said box structure thereagainst during operation of said tools, and means for holding said box structure to said form-block structure while accessible and before engagement with said clamping means comprising one or more ports in one or more faces of said form-block structure, and means for applying suction to said box structure through said ports.

4. A box-wrapping machine comprising sheet-applying tools, reciprocating form-block structure accessible for part of its cycle to receive an assembly comprising box structure and partially applied sheet material, means in the path of said form-block structure for clamping said box structure thereagainst during operation of said tools, means for holding said box structure to said form-block structure while accessible and before operation of said clamping means comprising one or more ports in one or more faces of said form-block structure, means for applying suction to said box structure through said ports, and means timed to effect discontinuance of suction when said clamping means is operative.

5. A composite form block for a wrapping machine comprising upper and lower blocks, a passage in said lower block terminating in a port in a face thereof, a passage in said upper block in communication with said first-named passage when said blocks are in engagement, and structure for attaching said upper block to a plunger of said wrapping machine and having a suction connection in communication with said second-named passage.

6. A composite form block for a wrapping machine comprising upper and lower blocks, a passage in said lower block terminating in a port in a face thereof, a passage in said upper block in communication with said first-named passage when said blocks are in engagement, passages in said upper block terminating in ports in vertical faces of said block and in communication with said second-named passage, and structure for attaching said upper block to a plunger of said wrapping machine and having a suction connection in communication with said second-named passage.

7. A composite form block for a wrapping machine comprising upper and lower blocks, a passage in said lower block terminating in a port in a face thereof, a passage in said upper block in communication with said first-named passage when said blocks are in engagement to receive box structure, and a connection in said upper block for application of suction through said second-named passage.

8. A composite form block for a wrapping machine comprising upper and lower blocks, a passage in said lower block terminating in a port in a face thereof, a passage in said upper block in communication with said first-named passage when said blocks are in engagement to receive box structure, passages in one of said blocks terminating in ports in vertical faces of said block and in communication with the passage in the block, and a connection in said upper block for applying suction through said second-named passage.

9. A box-wrapping machine comprising sheet-applying tools, reciprocating form-block structure comprising upper and lower blocks which are separable for operation of said tools and in engagement to receive box structure, said blocks having passages in communication with each other when said blocks are in engagement and at least one of said blocks having a port in one or more faces thereof, means for applying suction through said passages, and means timed to effect discontinuance of suction when said blocks are separated.

10. In the operation of a wrapping machine having reciprocating form-block structure accessible for a portion of its cycle for disposition of box structure thereon, the method which comprises exerting suction through said form-block structure throughout said portion of its cycle to permit an operator to place a box structure on said form-block structure at any time during said portion of said cycle and immediately thereafter to discontinue holding said box structure.

11. A machine for forming or wrapping a box, comprising sheet-applying tools, form-block structure for transporting a box structure and sheet material with respect to said tools and comprising a plurality of separable components having passages connected in series with each other when said components are in engagement with each other, one of said passages terminating in a port in a face of the form-block structure engaged by the box structure during transport with respect to said tools, and means for exerting suction through said passages and at said port during engagement of said components with each other.

12. A box-wrapping machine comprising sheet-applying tools, reciprocating form-block structure which for a substantial part of its cycle is accessible to receive an assembly comprising box structure and partially applied sheet material, and for another part of its cycle is adjacent said tools and inaccessible, and suction means immediately effective whenever in said first-mentioned part of said cycle an assembly is placed on said form-block structure to hold said assembly thereon.

13. A box-wrapping machine comprising corner-lap tools, reciprocating form-block structure for moving unstayed box-blank structure and partially applied sheet material in a path adjacent said tools, and means for holding a pair of opposite box walls against opposite sides of said form-block structure at least until operation of said corner-lap tools comprising one or more ports in said sides of said form-block struc-

ture, and means for applying suction to said pair of box walls through said ports.

14. A box-wrapping machine comprising reciprocating form-block structure for moving unstayed box-blank structure and partially applied sheet material along a path, a tool adjacent said path for folding the sheet material about a corner of the box formed by adjacent side walls of said box-blank structure, and means for holding said side walls in corner-forming position at least until operation of said tool comprising one or more ports in said form-block structure, and means for applying suction through said ports.

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