Aug. 23, 1966 J. G. H. OLLIER ETAL 3,267,639

APPARATUS FOR MAKING CLOSED BOXES

Filed Oct. 17, 1962 2 Sheets-Sheet 1

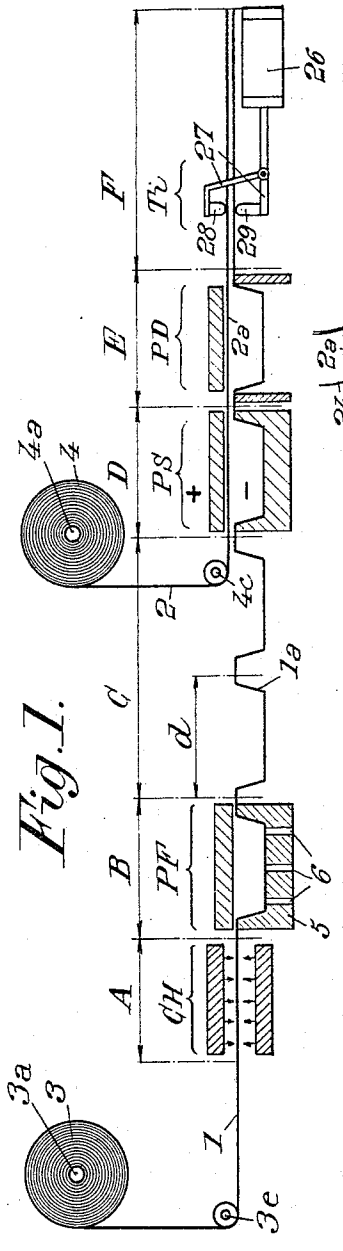


Fig. 1.

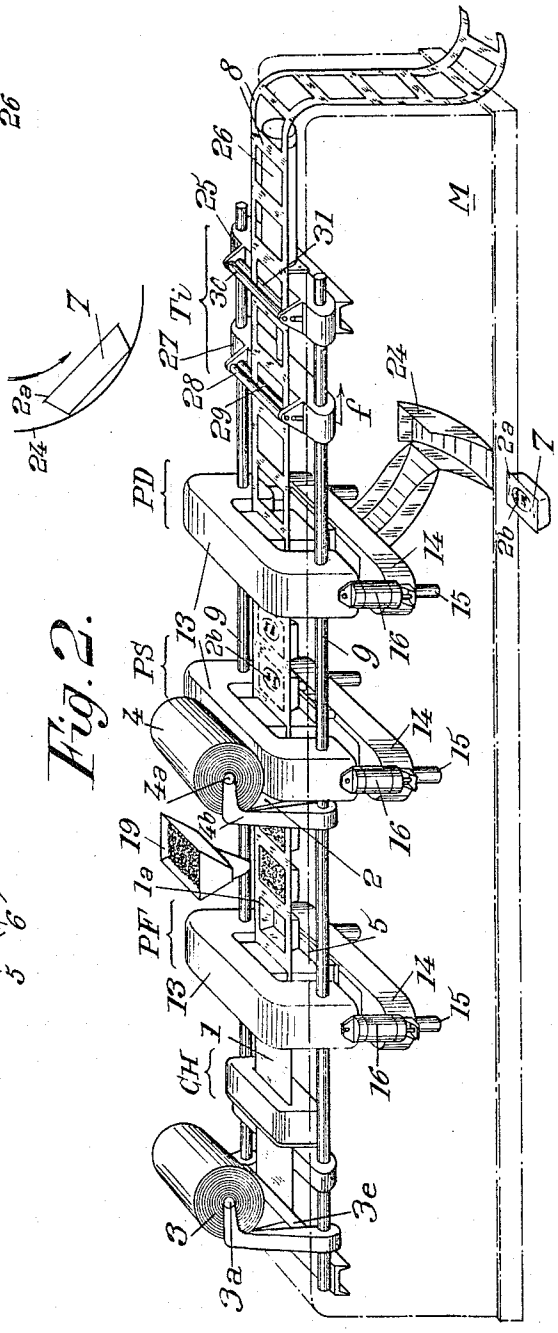


Fig. 2.

Aug. 23, 1966 J. G. H. OLLIER ETAL 3,267,639

APPARATUS FOR MAKING CLOSED BOXES

Filed Oct. 17, 1962 2 Sheets-Sheet 2

Fig. 4.

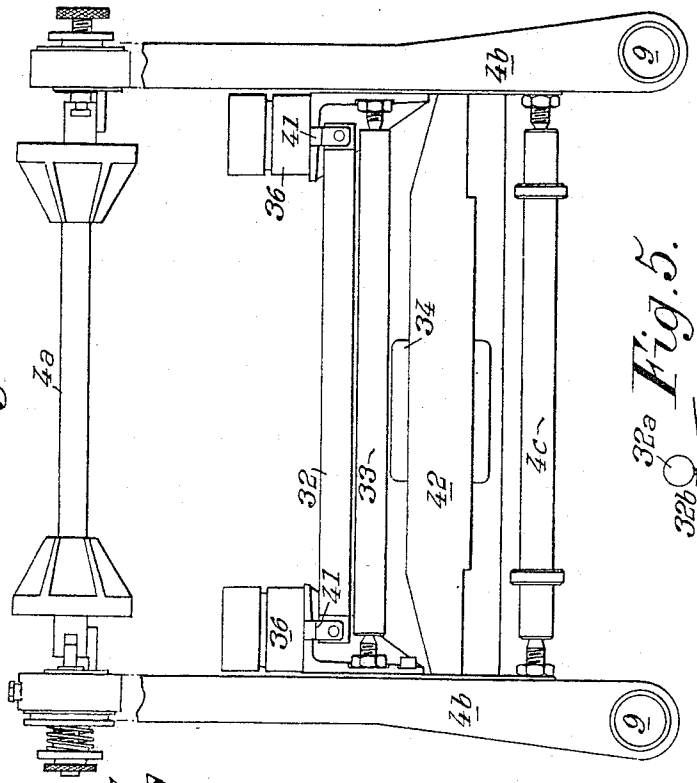


Fig. 5.



Fig. 3.

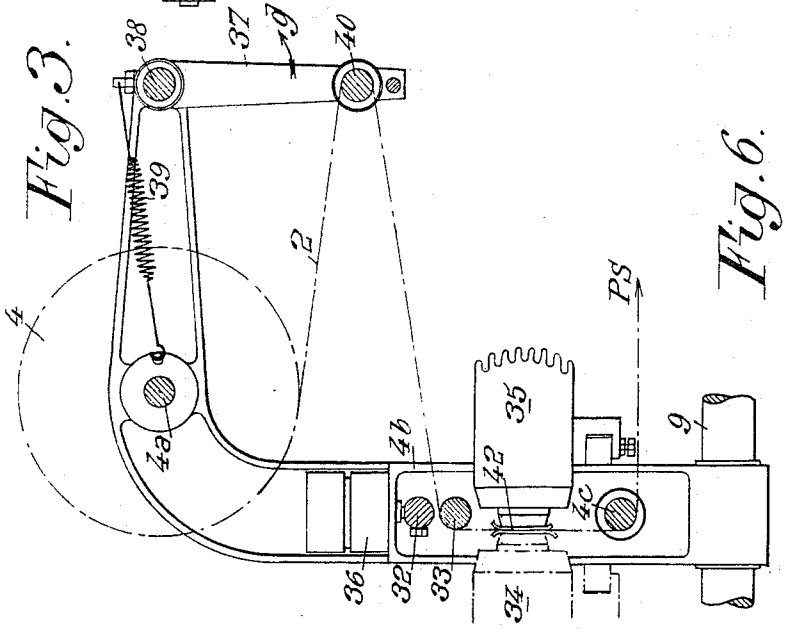
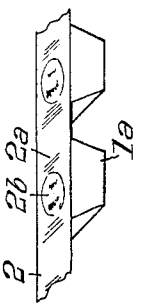


Fig. 6.



United States Patent Office 3,267,639 Patented August 23, 1966

3,267,639

APPARATUS FOR MAKING CLOSED BOXES

Jacques Gaspard Honoré Ollier, 17 Rue General Henrion Bertier, Neuilly-sur-Seine, France; Georges Frédéric Grosshans, 53 bis Rue de Boulainvilliers, Paris, France; and Robert Gaston Masson, 6 Blvd. de Courbevoie, Neuilly-sur-Seine, France

Filed Oct. 17, 1962, Ser. No. 231,230
1 Claim. (Cl. 53—51)

This invention relates to apparatus for making closed boxes from two strips of material of which a first strip is formed with a longitudinally extending series of open-topped boxes of equal length which are equally spaced longitudinally of the strip, while a second flat strip is provided with a longitudinally extending series of identification markings respectively for positioning in predetermined relationship relative to the boxes of the first strip, the longitudinal spacing being successive markings on the second strip being different from the longitudinal spacing of successive boxes on the first strip.

A known form of apparatus for making closed boxes employs two strips of the same or different material, successive sections of one strip being shaped to form open-topped boxes while successive sections of the other strip form the covers. An open-topped box of the first strip is filled with the product to be stored therein, and is then placed in register with a section of the other strip and sealed thereto to form a closed box.

If an identification label is required on the cover of each box these labels may be printed on, or attached to, the respective sections of the second strip before that strip is placed in the apparatus. A difficulty which then arises is that the longitudinal spacing between successive labels may not be equal to the longitudinal spacing between successive boxes of the first strip, in which case the labels will not appear in their correct position relative to the edges of the covers of the boxes. In fact, if the spacing between labels is continuously less than, or greater than, the longitudinal spacing of the boxes of the first strip a stage will be reached when part of a label appears on one box and the remainder on the succeeding box.

This difficulty can be overcome by stopping the apparatus as soon as the displacement of labels become appreciable, cutting out a small transverse section of the strip bearing the labels, and pulling the remainder of that strip to its correct position relative to the other strip. However, repeated stoppages of this kind reduce the output from the apparatus and also require the presence of an operator, with consequent increases in the cost of producing each box.

It is an object of the present invention to provide an improved apparatus for making closed boxes which includes means for ensuring that the two parts of the box are substantially in register before being joined together to form the box.

Accordingly the present invention consists in an apparatus for making closed boxes from two strips of material of which a first strip is formed with a longitudinally extending series of open-topped boxes of equal length which are equally spaced longitudinally of the strip while a second flat strip is provided with a longitudinally extending series of identification markings respectively for positioning in predetermined relationship relative to the boxes of the first strip, the longitudinal spacing between successive markings on the second strip being different from the longitudinal spacing of successive boxes on the first strip, and a longitudinally extending series of detectable means being provided on the second strip, the longitudinal spacing between successive detectable means being a function of the longitudinal spacing between successive markings,

wherein there are provided conveying means for advancing the strips along respective paths through the apparatus, the two strips lying alongside one another over a part of their paths, detecting means disposed alongside the path of the second strip and arranged to detect the passage of each detectable means, the detecting means providing a difference signal representative of the difference between the longitudinal spacing of two successive detectable means and the longitudinal spacing of successive open-topped boxes on the first strip, control means operable in response to the difference signal to cause an alteration in the position of an identification marking on the second strip relative to an open-topped box on the first strip, whereby the marking is positioned in the said predetermined relationship relative to the said open-topped box within the said part of their travel, and means for joining the part of the second strip bearing the marking to the open-topped box to form a closed box while they are in the predetermined relationship.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:

FIGURES 1 and 2 are diagrammatic and perspective views, respectively, of an apparatus for making closed boxes;

FIGURES 3 and 4 are side and elevations, respectively, of part of an apparatus for making closed boxes according to the invention;

FIGURE 5 shows part of a further apparatus according to the invention;

FIGURE 6 shows two strips after they have been joined to form closed boxes on an apparatus according to the invention.

The apparatus illustrated in FIGURES 1 and 2 of the drawings is adapted for making a series of closed boxes from two strips of an extensible plastic material such as polyvinyl chloride, polystyrene or low density polyethylene.

At one end of the apparatus there is provided a spindle 3*a* upon which is wound a reel 3 of a first strip 1 of the material and at an intermediate point along the length of the apparatus is a further spindle 4*a* carrying a reel 4 of a second strip 2 of the material. The strip 1 is used to provide the bases and side walls of the boxes and the strip 2 the covers, the latter having labels 2*b* printed thereon at locations spaced apart along its length.

From the spindle 3*a* the path of the strip 1 extends vertically downwards to a guide roller 3*e* and then horizontally through successive zones A, B, C, D, E and F of the apparatus. The path of the strip 2 extends vertically downwards to a guide roller 4*c*, disposed at the beginning of zone D, and thence extends through zones D, E and F, immediately above the path of strip 1. The strips are moved along these paths by predetermined distances at periodic intervals by means of a conveying device T*i* disposed in zone F, the detailed construction of this device being described hereinafter.

In its passage through the apparatus a section of the strip 1 first passes through a heating device CH in zone A, which softens the section, and thence to a moulding device PF in zone B. The lower part of the latter device consists of a mould 5 of a shape corresponding to that required for the base and side walls of the boxes and formed with apertures 6 whereby its interior can be subjected to a reduced pressure. Under the influence of this reduced pressure a central part of a softened section of the strip 1 is deformed to the shape of the mould 5, forming an open-topped box of the form designated 1*a* in FIGURES 1 and 2. In succeeding zone C, this box is filled with the product to be stored therein by means of a dispenser 19.

The section of strip 1 next enters zone D of the ap-

paratus where it is disposed immediately beneath a labelled section of the strip 2 from reel 4 and within a welding device PS. In this zone the peripheral parts of the two strips are joined together by the welding device PS to form a closed box 7.

For separating the closed box 7 from the remainder of the composite strip thus formed from strips 1 and 2 there is provided a cutting and ejecting device PD in zone E, the box 7 being ejected from the apparatus by means of a chute 24 and the perforated, composite strip 8 passing on to zone F wherein the conveying device T*i* is mounted.

The moulding device PF, welding device PS, and cutting and ejecting device PD each includes a gantry 13, comprising a horizontal member which extends transversely over the path of the strip 1 and two vertical members disposed on opposite sides, respectively, of the path of this strip. The vertical members of each gantry 13 are clamped to respective horizontal bars 9 which extend through the apparatus and are disposed parallel with, and on opposite sides of, the path of strip 1. Each device also includes a base member 14 which is movable in a vertical direction relative to its gantry 13 by means of a jack 16. Guides 15 are provided for confining movement of the base members 14 to the vertical direction.

The conveying device T*i* in zone F includes a cross bracket 25 which is rigidly attached at opposite ends thereof to the bars 9 and carries a jack 26. Mounted on the end of the jack remote from the bracket 25 is a further bracket 27 which is slidably mounted on the bars 9 and carries two clamping jaws 28 and 29 disposed above and below, respectively, the path of the composite strip 8. The jack 26 is provided with a driving means whereby the bracket 27 can be moved backwards and forwards along the length of the bars 9, the jaws 28 and 29 clamping the composite strip and drawing it forwards by a predetermined distance *d* when the movable part of the jack moves in a forward sense, and releasing the strip so as to effect no movement thereof on its return.

The cross bracket 25 also carries guide rollers 30 and 31 for guiding the composite strip 8 out of the apparatus.

In order that the labels 2*b* printed on the strip 2 are correctly positioned on the boxes 7 it is essential that the longitudinal spacing *p* (not shown) between successive startings of labels should be equal to the distance *d* by which the composite strip 8, and hence the strip 1, is advanced during each forward movement of the jack 26. Unfortunately, as stated above, correct spacing of the labels cannot be ensured even with careful printing, and eventually a stage may be reached where a label appears partly on one box and partly on the succeeding box.

To overcome this difficulty succeeding startings of labels 2*b* on the strip 2 are spaced apart by a distance *p* which may vary due to errors in printing but which is arranged to be smaller than the distance *d* by which the composite strip 8 and strip 1 are advanced at each forward movement of the conveying device T*i*. In addition, each section of the strip 2 is provided with a detectable mark, which may simply be the start or finish of the label on that section or may be an additional mark such as a strip of opaque material. For use with strips 2 of this form the apparatus illustrated in FIGURES 1 and 2 of the drawings is modified by the inclusion of the parts illustrated in FIGURES 3 and 4.

The latter figures show the strip 2 of thermoplastic material for forming the covers of boxes which is in the form of the reel 4 wound on the spindle 4*a* and is provided with labels at locations spaced apart by a distance *p* and strips of opaque material near the respective labels. The ends of the spindle are mounted on respective horizontal arms 38 each of which is carried by an upright member 4*b* mounted on a bar 9. Pivoted at the forward end of each arm 38 is a movable arm 37 which is urged in a counter-clockwise direction, as seen in FIGURE 3 of the drawings, by a compression spring 39 connected between an upper end of the arm 37 and an intermediate point along the length of arm 38. A freely rotatable roller 40 is carried by the lower ends of the movable arms 37.

Also mounted on each of the upright members 4*b* are respective jacks 36, each having a piston and piston rod 41 which are arranged to be movable in a vertical direction. Opposite ends of a movable roller 32 are connected to the lower ends of the respective pistons 41 and a stationary roller 33 is mounted on the arms 4*b* immediately below this movable roller. As in the apparatus illustrated in FIGURES 1 and 2, a roller 4*c* is provided at the bottom ends of the upright members 4*b*. The rollers 40, 32, 33 and 4*c* are all made of rubber.

The path of the strip 2 extends forwardly from the reel 4 to the roller 40, rearwardly to rollers 32 and 33, between these rollers, vertically downwards to roller 4*c*, and from there to zone D of the apparatus.

In the vertical part of this path, between the rollers 33 and 4*c*, the strip passes between a pair of transparent guide plates 42, each of which extends between the upright members 4*b*. A lamp 35 is mounted on one side of the path to provide a beam of light through the plates 42 and the part of the strip 2 therebetween. For detecting the light after it emerges from the plates and strip a photoelectric cell 34 is provided on the side of the strip remote from the lamp 35.

In operation of the apparatus the conveying device T*i* moves the composite strip 8, and hence the strips 1 and 2, in a forward direction at periodic intervals of time. No restraining means is provided for the composite strip 8 or the strip 1 and accordingly these strips are advanced through a distance *d* during each movement of the jack 26 in a forward direction, a section on strip 1 being subjected to the various operations described above in the intervals between successive movements.

Prior to each movement of the conveying device T*i* in the forward direction one of the opaque strips on strip 2 is disposed between the plates 42, this position having been reached at the end of the preceding forward movement. Under the action of the conveying device the strip 2 is then advanced, together with the composite strip 8 to which it is attached, and a new section of the strip begins to enter the welding device PS in zone D.

Movement of the strip 2 continues until the strip has moved through a distance *p* and the succeeding opaque strip has entered the space between the guide plates 42 and cut off the light from the lamp 35 to the photoelectric cell 34. As soon as this happens the current through the cell decreases, and this is arranged to actuate a relay device, not shown in the drawings, which controls the operation of the jacks 36. The jacks effect downwards movement of the roller 32 so as to clamp the strip 2 between rollers 32 and 33 and prevent movement of any part of the strip between these rollers and the reel 4.

The relay device is arranged to remain in its operative position until the device T*i* has moved the composite strip 8 and strip 1 through a total distance *d*, which corresponds to the movement of the succeeding open-topped box 1*a* into the welding device PS. During this time the part of the strip 2 between the rollers 32 and 33 and the composite strip 8 is stretched by an amount equal to *d*—*p*, the difference between the spacing between successive boxes on strip 1 and the spacing between successive labels on the strip 2. This is sufficient to ensure that corresponding sections of the strips 1 and 2 are substantially in register as they come to rest in the welding device PS and subsequent operation of the latter device produces a box whose label is disposed substantially at the center of its cover. Two boxes formed in this manner, and before separation from the strips 1 and 2 in the zone E of the apparatus, are shown in FIGURE 6.

After the welding of the strips 1 and 2 in the welding device PS the relay device causes the jacks 36 to move

the roller **32** vertically upwards, thereby releasing the strip **2** in readiness for the next forward movement of the conveying device T*i*.

In a second embodiment of the invention which is suitable for making boxes from thermoplastic material or metal strips, a device for producing a line of perforations extending transversely across the strip **2** is provided to the right of the roller **4***c* as viewed in FIGURE 3. After the roller **32** has moved downwards to clamp the rearward part of the strip **2** further movement of the strip **8** and the forward part of strip **2** causes the latter to be torn along the line of the perforations, and at the end of this movement a section of strip **2** has moved into a position in the welding device PS where its label **2***b* is disposed substantially over the center of the corresponding section of the strip **1**. The gap in strip **2** caused by the tear lies over the space between the rearward end of the receptacle **1***a* in the device PS and the succeeding receptacle.

The welding electrodes of the device PS are made wider than the width of the gap in strip **2** so that both the rearward and forward edges of the tear are welded to the strip **1**, thus ensuring that the rearward part of strip **2** is drawn forward at the next movement of composite strip **8**.

A third embodiment of the invention is suitable for use with a strip of non-extensible material, such as a metal strip. In this apparatus the photoelectric cell **34** is disposed on the same side of the strip **2** as the lamp **35**, so as to detect light reflected from the strip, or alternatively, it may be disposed on the opposite side and the detectable means may consist of cut-out portions of the strip. A roller **32***a* having a ridge **32***b* along its length, as illustrated in FIGURE 5 of the drawings, is used in place of the roller **32** of FIGURES 3 and 4, and the labels **2***b* on the strip **2** are spaced apart by a distance P which is greater than the distance *d* through which the strips **8** and **1** are advanced at each forward movement of the conveying device T*i*.

During the initial part of this forward movement the ridge **32***b* of the roller **32***a* is pressed against the strip **2** so as to form a deformation which extends transversely across the strip, the size of this deformation being such as to reduce the effective spacing between successive labels to an amount less than *d*.

The deformation in the strip **2** passes through the plates **42** and around the roller **4***c* before an identification mark on the strip causes the photoelectric cell **34** and relay device to operate the jacks **36** and cause downward movement of the roller **32**. When this movement does take place, and the rearward part of the strip is clamped between rollers **32** and **33**, further movement of the conveying device T*i* causing enlargement of the sections of strip **2** entering the welding device PS by reducing the size of its deformation. This enlargement is arranged to be such that a section of strip **2** is substantially in register with the corresponding section of strip **1** by the time the two come to rest and welding is effected.

What we claim is:

Apparatus for making packages from two strips of material, of which a first strip is deformed to produce a longitudinally extending series of open-topped boxes of equal length which are equally spaced longitudinally of the first strip while a second flat strip is provided on the one hand with a longitudinally extending series of identification markings for positioning in a predetermined relationship on the boxes of said first strip, the longitudinal spacing between the beginning of successive markings on the second strip being systematically smaller than the longitudinal spacing between the beginning of successive boxes on the first strip, and on the other hand with a longitudinally extending series of detectable means, the longitudinal spacing between successive detectable means being substantially equal to the longitudinal spacing between the beginning of successive markings, said apparatus comprising conveying means for advancing step-by-step each of said strips along respective paths through the apparatus, said two strips lying alongside one another over a part of their paths, detecting means disposed alongside the path of said second strip and arranged to detect the passage of each detectable means, said detecting means providing a signal each time a detectable means passes the detecting means, means for heat-sealing the part of said second strip bearing said marking to the open-topped box to form a package while they are in said predetermined relationship, during a standstill of said conveying means between two steps thereof, and clamping means operable in response to said signal to retain in a stationary position the portion of said second strip which is disposed rearwardly of said clamping means, while the portion of said second strip disposed forwardly of said clamping means is advanced by said conveying means, whereby said identification marking is brought into said predetermined relationship due to actual movement of said conveying means and to the longitudinal extension of said portion of said second strip disposed forwardly of said clamping means, at the heat-sealing level thereof, said clamping means including a stationary guide roller providing a guiding surface for the second strip along its path through the apparatus, a movable roller disposed on the side of the path remote from the stationary roller, and means operable in response to said signal for moving the movable roller towards the stationary roller so as to grip the second strip therebetween.

References Cited by the Examiner

UNITED STATES PATENTS

2,127,028	8/1938	Hayssen	53—51
2,162,230	6/1939	Salfisberg	53—51
2,546,059	3/1951	Cloud	53—51 XR
2,956,484	10/1960	Subklew.	
3,126,431	3/1964	Harder et al.	53—51 XR

FRANK E. BAILEY, *Primary Examiner.*

A. E. FOURNIER, R. L. FARRIS, *Assistant Examiners.*