Feb. 3, 1959 J. E. NELSON 2,871,772

MACHINE AND METHOD FOR SPOT TREATING FOLDABLE SHEETS

Filed Oct. 3, 1955 3 Sheets-Sheet 1

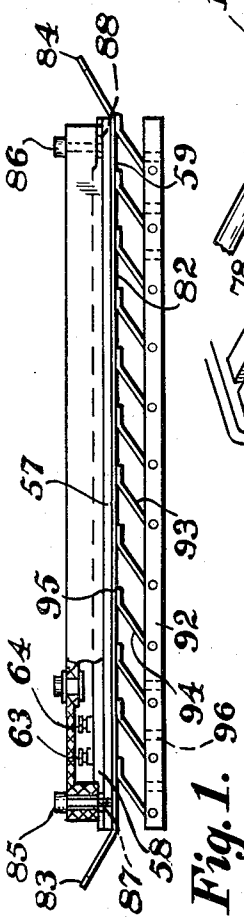


Fig. 1.

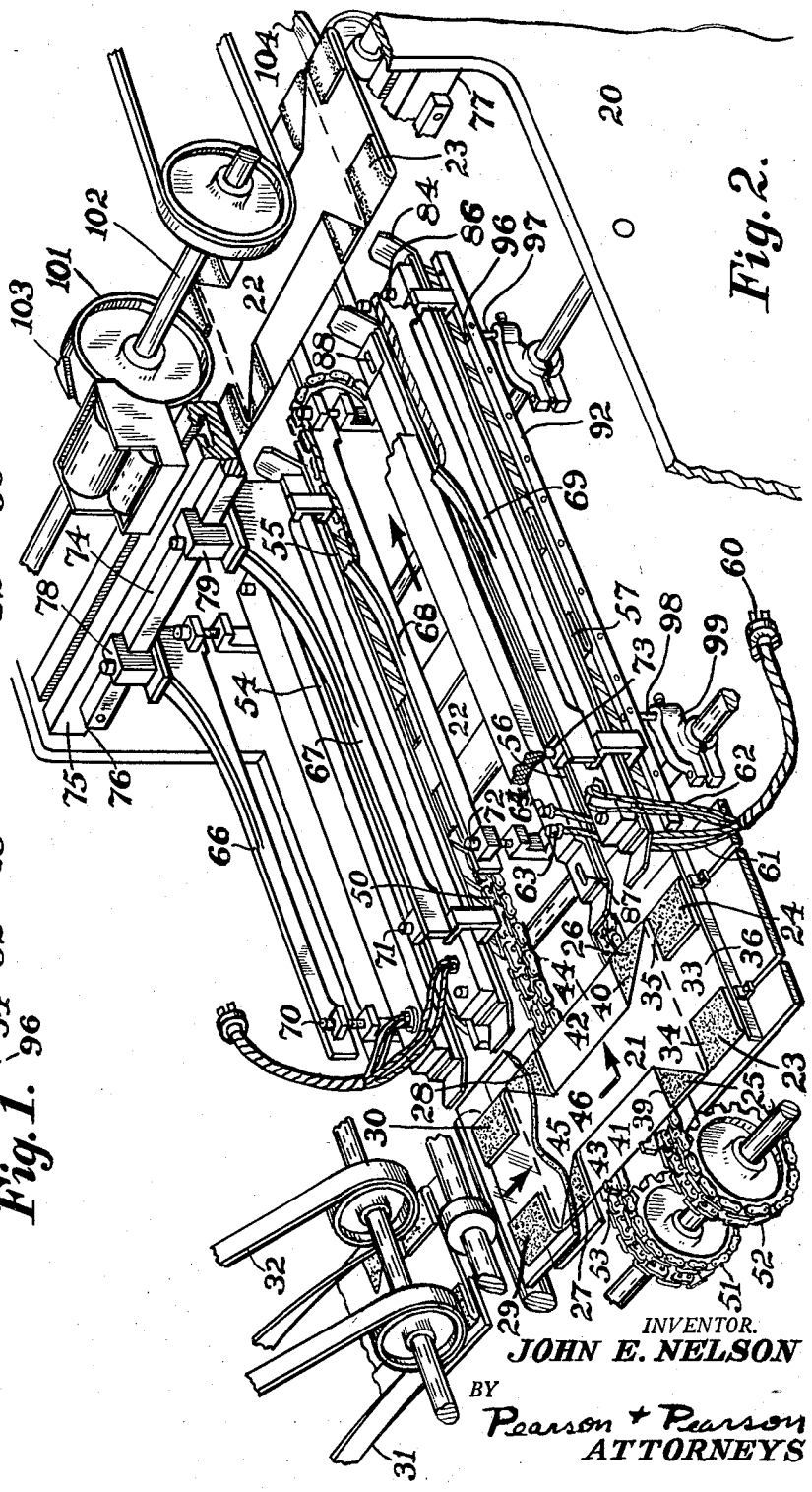


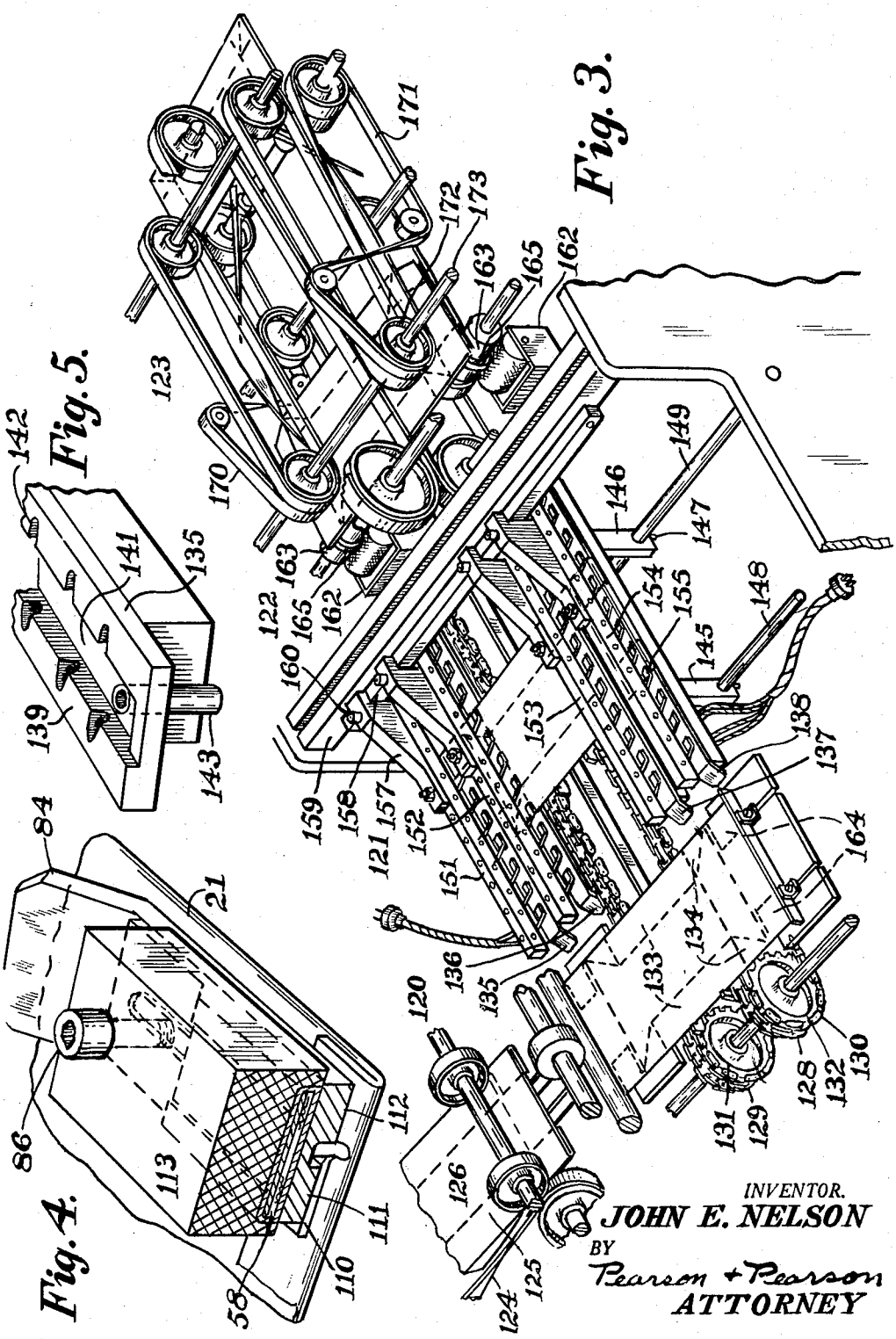
Fig. 2.

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Feb. 3, 1959 J. E. NELSON 2,871,772

MACHINE AND METHOD FOR SPOT TREATING FOLDABLE SHEETS

Filed Oct. 3, 1955 3 Sheets-Sheet 2



Feb. 3, 1959 J. E. NELSON 2,871,772

MACHINE AND METHOD FOR SPOT TREATING FOLDABLE SHEETS

Filed Oct. 3, 1955 3 Sheets-Sheet 3

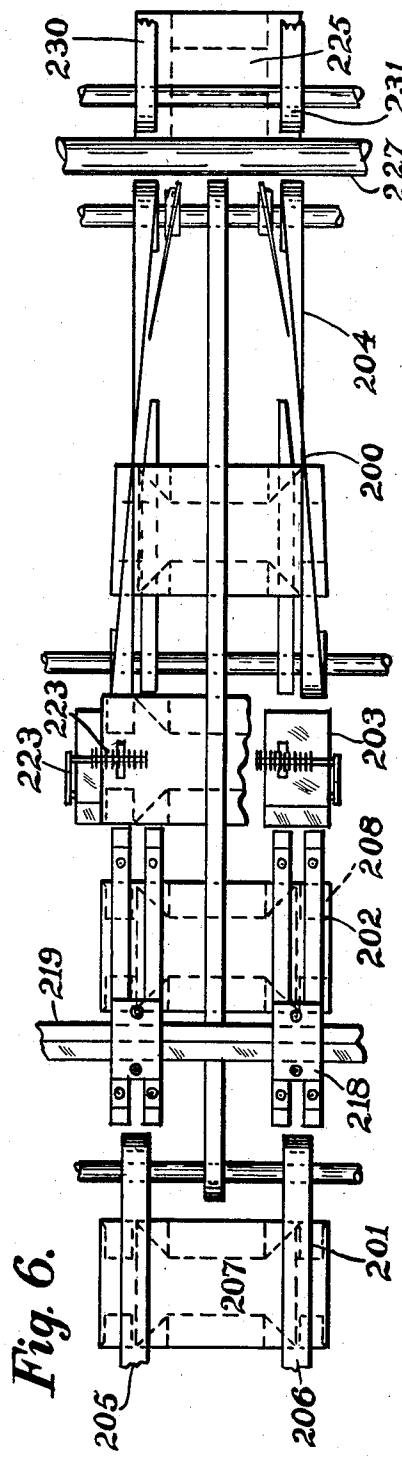


Fig. 6.

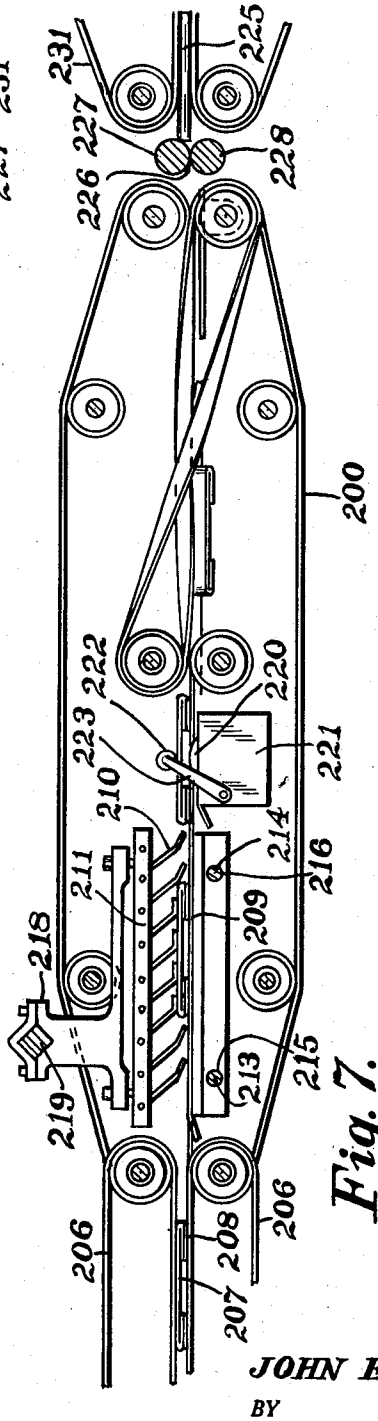


Fig. 7.

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MACHINE AND METHOD FOR SPOT TREATING FOLDABLE SHEETS

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Application October 3, 1955, Serial No. 538,043

1 Claim. (Cl. 93—36)

This invention relates to an improved method and apparatus for spot treating of certain areas of foldable blanks of sheet material as the blanks are continuously advancing along a path in timed or untimed relation.

Such spot treating may be for the purpose of applying spots of adhesive coating to the flaps or tabs of a paper box blank without coating the remainder of the blank. Such spot treating may also be for the purpose of removing spots of coating from certain areas of coated box blanks in order that adhesive may be applied to the treated areas for forming an adhesively secured box from each blank. Heretofore in both spot coating and spot decoating it has been customary to use timed feeding mechanism and a patterned applicator member but in this invention the feed may be untimed and the applicator member smooth and unpatterned. This is accomplished by first folding the panels, flaps or tabs of the sheets into overfolded position and then slidably engaging the overfolded members with a smooth coating or decoating member. Thus the sheets are spot treated only where desired while they flow along a path at high speed.

I am aware that it has previously been proposed, in the field of wax coated paper box blanks, to apply the wax coating initially only in the desired areas of a flat blank by the use of patterned wax coating rolls. It has also been proposed to first apply a pattern of oil repelling material to a flat blank, then to coat with wax and then to squeeze the wax from the oil repelling areas. Similarly, it has been proposed to first coat the flat blanks with wax and then to remove wax from the adhesive flaps by passing the blank under rotating rolls having heated pattern elements, or to halt the flat blank and lower a pattern of heating elements thereon. All of the various expedients, heretofore proposed, however, have the disadvantages that at high speed, the registration of the patterns is difficult to maintain, the surface of the heated elements may become covered with wax and an extremely fine adjustment of the parts must be achieved. In the type device wherein the blanks are stopped in their path for the removal of wax, the production rate is comparatively low and the heated elements also become covered with wax since the area thereof is equal to the area of the flap being dewaxed. If a longitudinally dewaxed continuous strip only is required from a continuous flat web, it has been proposed to use a heated disc in rolling contact with the web as in U. S.. patent to Potdevin, No. 2,115,283 of April 26, 1938. However, such a disc is not practical for use in dewaxing the flaps of a paper box blank because blanks do not have a continuous strip to be dewaxed and the disc would remove wax not only from the flaps but also from portions of the body of the blank.

The principal object of this invention is to provide an apparatus and method for treating predetermined surface areas of paper box blanks while the blanks are continuously advancing at high speed and without requiring any registration of the blanks or causing undesired portions of the blanks to be treated.

Another object of the invention is to provide an untimed apparatus and method for dissipating the coating on selected areas of continuously advancing coated box blanks which exposes each said area to a much larger area of a heated element whereby a single area of the element does not unduly accumulate the removed coating.

A further object of the invention is to provide an apparatus and method for dewaxing paper box blanks in which the dewaxing of the adhesive flaps occurs after the initial under folding of the adhesive flaps and just before said flaps are coated with adhesive.

Still another object of the invention is to provide novel electrically heated bars, positioned above the path of each overfolded adhesive flap on a partly folded blank, each bar being arranged to dissipate the coating on a flap, resiliently pressed thereagainst, but not to dissipate the coating on any other part of the blank travelling along the path.

A still further object of the invention is to provide electrically heated bars above the path of a plurality of box blanks advancing from a folding zone to an adhesive zone in a box making machine and to provide resilient fingers pressing upwardly on the blanks from below their path to combine a yielding pressure with the heating effect of the bars.

Other objects and advantages of the method and apparatus of the invention will be apparent from the accompanying description of the drawing, claim and from the drawing in which a preferred embodiment of the apparatus of the invention is illustrated.

In the drawing,

Fig. 1 is a side elevation of one of the elongated heating bars of the invention, together with a row of resilient fingers below the same, to yieldingly push a blank into contact with the bar when the blank is therebetween, and

Fig. 2 is an isometric view of a fragment of a typical right angular paper box making machine in the zone between the flap folding zone and the adhesive coating zone with the apparatus of this invention shown in a typical installation.

Fig. 3 is a view similar to Fig. 2 of a box folding machine in which the blanks are advanced and folded upside down and the dewaxing heating bars of this invention are under, rather than above the blanks.

Fig. 4 is a fragmentary perspective view in section of a stepped heating bar according to this invention, and

Fig. 5 is a fragmentary perspective view in section of a heating bar as used in the inverted folding machine of Fig. 3.

Fig. 6 is a diagrammatic plan view of a straight line folder and gluer having spot treating apparatus in accordance with this invention and arranged to fold, dewax and glue box blanks in upside down condition and in untimed relation.

Fig. 7 is a diagrammatic side elevation of the device shown in Fig. 6.

In Fig. 2, a fragment of a right angular conveyor type box folding machine **20** is shown, although it will be obvious that the invention may be applied to many other forms of machines well known in the art. The box blanks such as **21** and **22** which for the purpose of illustration will be referred to as of paper and coated on both sides with wax or the like, do not have portions of the coating removed while in flat, unfolded condition as in prior devices. Instead, in this invention the adhesive flaps, or glue flaps, such as at **23**, **24**, **25**, **26**, **27**, **28**, **29** and **30** are first folded by suitable means well known in the art, such as the folding belts **31** and **32** or by apparatus such as shown in U. S. Patent No. 1,926,364, to Bergstein of September 23, 1941, before the coating is removed therefrom. Each adhesive flap

such as at 23 and 24 is overfolded flatwise against the portion of the blank to which it is articulated, such as the end wall panel 33, to overlie the same and to bring the surfaces 34 and 35 thereof, which are to be dewaxed and then coated with adhesive, to the outside and preferably facing upwardly. Each surface 34 or 35 is thus spaced by the thickness of the flaps 23 or 24 above the similarly coated surface 36 (the coating not being shown for clarity) of the wall panel 33. In the case of the diagonally backfolded adhesive tabs or flaps such as 25 and 26, the outside surfaces 39 and 40 thereof are spaced above the surfaces 41 and 42 of the side wall panels 43 and 44 to which they are articulated by a single thickness and above the surface 45 of the bottom panel 46 by a double thickness of the material of the blank.

A longitudinally extending blank supporting conveyor 50 is provided, which may comprise a pair of spaced apart, parallel conveyor chains 51 and 52, continuously advancing along the paper line of the machine in a well known manner. Upstanding lugs such as at 53 are provided on each conveyor chain, at spaced distances therealong, to receive a succession of individual blanks and advance the blanks on the path formed by the conveyor 50. Any suitable holddown bar or belt may be used to keep the folded flaps of each blank in downfolded position from the time of such folding to the delivery of the blanks into the dewaxing zone of the machine illustrated.

With the type blank shown, four elongated heating bars 54, 55, 56 and 57 are provided, each mounted in the dewaxing zone above the path of each pair of adhesive flaps such as 23 and 24, 25 and 26, 27 and 28 and 29 and 30. Each heating bar such as 57 is preferably of rigid heat conductive material and is removably attached below an electric resistance unit 58 for heating the flap engaging lower surface 59 of the bar at a predetermined constant temperature sufficient to dissipate coating on the folded flaps of the blanks. Preferably a single electric plug 60 is provided for each two adjacent heating units such as 58, the plug having conductors 61 and 62 and the units having terminals 63 and 64. The heating circuit is completed when the plug 60 is placed in a plug-in receptacle of a well known type not shown.

The heating units are preferably each carried by a bracket such as 66, 67, 68, 69, with a micromatic adjustment at each end such as 70, 71, 72 and 73. Each bracket is supported by a clamp such as 78, 79 on a bar 74 attached to extending frame piece 75. Frame piece 75 is supported at each opposite end 76 and 77 on machine 20. Clamps 78, 79 are provided to position the various brackets, heating units and bars transversely in accordance with various types and sizes of blank.

Preferably surface 59 is formed on a detachable strip 82 having a pair of upturned extensions such as 83 and 84 at each opposite end, thereby making the strip 82 reversible longitudinally in case of wear or accumulation of foreign matter thereon and also providing an inclined meeting face at the leading edge to force downwardly any partially upfolded flaps on the blank. Each bar such as 57 includes a pair of oppositely disposed threaded bolts 85 and 86 passing downwardly through elongated slots 87 and 88 in the heating unit such as 58 and threaded into the bar. It is thus possible to easily substitute a narrower or wider bar for the bars being used to accommodate flaps of greater or lesser width, it being preferable that the bar be exactly the same width as the maximum width of the surface of a flap to be dewaxed.

Preferably also, at least two of the heating bar brackets also support, below the path of the blanks along the paper line, a longitudinally extending member such as 92, carrying a row of upstanding resilient fingers such as 93. Each finger such as 93 is of thin spring metal and leans or inclines rearwardly in the direction of travel of the blanks as at 94, with its free terminal end as at 95 extending rearwardly parallel to the path of the blanks. The fingers 93 thus apply yielding resilient upward pressure on the underside of a blank, passing thereabove on the conveyor 50, to press the blank against the heated underfaces 59 of the heating bars. A plurality of identical holes 96 are provided in each member 92 to receive a pair of supporting rods 97 and 98 of brackets such as 99 to permit longitudinal adjustment of the fingers. After the folded box blanks such as 21 have been advanced along conveyor 50 to cause the exposed outer surfaces of the overfolded adhesive flaps to slideably contact the heated underfaces 59 of the heating bars they are ready for glueing or coating with other types of adhesive. A plurality of adhesive coating rolls such as 101 may be positioned above the paper line immediately in rear of the rearward extensions 84 of heating bars 54, 55, 56 and 57, or by the use of suitable flap holddown elements and conveyors, the folded and dewaxed blanks may be transferred to a separate machine for application of adhesive and final folding. As shown somewhat diagrammatically, the adhesive coating rolls such as 101 may be revolved by a shaft 102, synchronized in a well known manner with conveyor 50, and carry pattern segments such as 103 which register with the flaps such as 23, 24, 25, 26, etc. and coat the same with adhesive. Also shown somewhat diagrammatically is a folding belt 104 for folding flaps 23 and 24 over on to the triangular flaps 25 and 26 to form a completed collapsed box, there being a similar belt for the other adhesive flaps which is not shown.

In operation the flat coated box blanks are first folded by any convenient means to cause the adhesive flaps thereof to overlie the portion of the blank to which they are articulated and to bring the surfaces to receive adhesive to the outside. In folded condition the blanks such as 21 and 22 are individually and successively carried by conveyor 50 under the heating bars 54, 55, 56 and 57, while being pressed upwardly against the heated underfaces 59 thereof with a yielding, resilient pressure by the rows of fingers such as 93. The coating on the exposed faces such as 34, 35, 39, 40, etc. of the overfolded flaps is removed or dissipated by melting, volatilizing or the like, by the sliding engagement with the heating bars whereby the flaps are delivered from the heating bars with their exposed adhesive receiving faces decoated. Thereafter, adhesive rolls such as 101 apply a spot of adhesive coating to the uncoated flaps and still later the end panels or flaps are overfolded to adhere the adhesive flaps and complete a collapsed box.

In view of the length of the heating bars with relation to the small area of the flaps engaged thereby, it will be apparent that there is ample time for the removal of the coating from the flaps even though the blanks are advancing at high speed. Similarly it will be apparent that no coating is likely to build up on a limited area of the heating elements, but that any such coating is spread throughout the length of the heating bars and subjected to continual heat therealong for eventually volatilizing such coating.

As shown in Fig. 4 a single heating bar 110 of stepped formation may be provided in place of two parallel, longitudinally extending bars such as 54 and 55. The heating face 111 of one side of bar 110 is in a higher plane than the heating face 112 of the other side of the bar 110 in order that the former may treat an exposed flap face of a double folded hinged flap while the latter may simultaneously treat an exposed flap face of a single folded, hinged flap. An asbestos cover 113 may be mounted over the upper parts of the electric heating unit such as 58 if desired.

In Figures 3 and 5 a modified form of the invention is shown in which the box blanks are folded and moved through the machine in inverted, or upside down condition. The efficiency and speed of the machine is con-

siderably increased by such inverted travel since it permits the faces of the heating bars to be up rather than down and enables gravity to be used in draining off surplus wax.

It should be understood that the step of first overfolding flaps to be treated and then treating the same in overfolded position by slideable engagement with treating elements eliminates the need for registering each blank and permits a high speed flow of blanks through the machine. It should also be understood that where the nature of the box permits, a straight line folding and glueing machine is ordinarily used instead of a right angular machine. However, the particular embodiment of this invention, selected for illustration in Figs. 1–5 is a right angular machine and registration chains providing a timed feed are used instead of upper and lower conveying and folding belts and an untimed feed. This is for the reason that while an overfolded flap may be decoated of wax and/or coated with adhesive in a longitudinal strip extending from the leading edge to the trailing edge of the flap with an untimed feed, it has been desirable to apply only a spot of adhesive within the confines of the spot dewaxed from the flap. Thus pattern type adhesive rolls are shown and registration chains for feeding the same, in order to secure the best results with only a slight reduction of speed and to prevent the adhesive from unduly spreading.

In the modification of Fig. 3, **120** represents the flap underfolding zone, **121** the decoating zone, **122** the coating, or glue applying zone and **123** the box folding zone. Zone **120** is termed a flap underfolding zone because the fold belts such as **124** are arranged to fold the panels, flaps, or tabs of the blanks **125** downwardly rather than upwardly and the exterior face of the blank bottom **126** is up rather than down. Among the advantages of folding and advancing the blanks in upside down condition are the facts that the glue pots may be under the paper line for higher speed application, less spattering and greater volume of glue in the pots. In addition, any wax decoated from the blanks may be drained downwardly by gravity and collected in suitable containers.

Each blank **125**, upon having its glue flaps and tabs overfolded downwardly in zone **120** is delivered to a right angular conveyor **128** formed of parallel registration chains **129** and **130** trained around sprockets such as **131** and **132**. Thus the blanks are advanced in timed relation by registration chains **129** and **130**, in a well known manner, with the underfolded flaps such as **133** and the underfolded diagonal tabs such as **134** moved over, rather than under, heating bars **135**, **136**, **137** and **138**.

Heating bars **135**, **136**, **137** and **138** are identical and similar to the heating bars **54**, **55**, **56**, and **57** of Fig. 2 or to heating bar **110**. However, as shown in Fig. 5 the heating face **139** of each bar such as **135** faces upwardly and is provided with a longitudinally extending groove **141** and a number of lateral grooves such as **142**. Each lateral groove **142** is arranged to drain into the groove **141** and groove **141** is arranged to drain into a discharge conduit **143** leading to a suitable container of any well known type not shown. While the bar shown in Fig. 5 is stepped, if the bar were not stepped, the latter grooves would be continuous from side to side and the longitudinal groove would be along one side or the other, or along both sides in order not to produce an untreated streak on the flaps. The heating bars **135**, **136**, **137** and **138** are each carried at the top of a pair of vertical posts such as **145** and **146**, each post being laterally movable by a set screw **147** on one of a pair of lateral frame rods **148** and **149**.

Resilient pressure members such as **151**, **152**, **153** and **154** are provided, each similar to the members **92** and each having a plurality of spring fingers **155** similar to fingers **93**. Each member **151** cooperates with a heating bar such as **135** to press an advancing sheet downwardly into resilient contact with the face of the heating bar as the sheet passes through the decoating zone **121**. Each member such as **151** is supported on a bracket such as **157**, the brackets being slideable laterally on a cross rod **158** of square cross section carried by the frame **159** and each bracket is slideably adjustable to the desired lateral position by set screws **160**.

The coating zone **122** includes glue pots such as **162**, only two of the four required being shown for clarity, each glue pot being mounted below the path of the blanks in any convenient manner well known in the art. As stated above, the capacity of the glue pot may be as great as desired and the glue applied directly by a pattern roller **163** because the flaps are folded beneath the blank. The frequent refills of small size upper glue pots and the additional rollers for applying glue downwardly onto the upper face of a blank made necessary when flaps are overfolded upwardly, are thus avoided. As in the embodiment shown in Fig. 2, the blanks **125** and underfolded flaps and tabs such as **164** emerge from decoating zone **121** with the exposed outer face of each folded flap or tab dewaxed and the dewaxed flaps and tabs register with the patterns such as **165** of the glue rollers **163** for the application of a spot of glue within the periphery of the area of the flap or tab.

The waxed blanks are thus ready to be folded into a collapsed box in box folding zone **123**. The folding of the glue flaps and tabs of the blank in zone **123** is accomplished by the fold belts such as **170**, **171** of a well known type, the belts being suitably mounted on pulleys **172** carried by shafts such as **173**. Completed collapsed wax covered boxes are thus delivered by the machine with no halting of the blanks while in flat sheet-like condition or while in folded condition.

In Figs. 6 and 7 the invention is illustrated as applied to a straight line folding and gluing machine **200** with the folding mechanism adapted to underfold rather than overfold. A flap underfolding zone **201** is provided as well as a decoating zone **202**, a coating or glue applying zone **203** and a box folding zone **204**. In this embodiment of the invention the feed is untimed and no registration is required whereby the blanks may flow along the paper line at high speed. Pairs of flap and tab underfolding belts such as **205** and **206**, underfold the flaps and tabs of the article to be folded in zone **201**, the belts **205** and **206** being similar to the belts **124** and similar to the belts **31** and **32**, except that they are in upside down relationship. Thus each individual and successive foldable sheet, such as a box blank **207**, is underfolded in zone **201** to arrive at zone **202** in condition for gluing of its flaps and tabs **208** and for folding into the desired article such as a collapsed box. The blanks such as **207** travel continuously without registration through the decoating zone **202** where the exposed outer faces of the flaps and tabs, which face downwardly are pressed against the elongated heater bars such as **209** by the fingers **210** of the resilient pressure members **211**. As shown, heater bars **209** are supported on machine **200** by transverse rods **213**, **214** passing through suitable holes **215** and **216** therein. The pressure members **211** are each supported from a bracket such as **218**, the bracket being carried by a transverse rod **219** of machine **200**.

The exposed under faces of the flaps and tabs **208** of each blank having been treated in zone **202**, the blanks then move continuously through coating zone **203** where the exposed underfaces of the flaps and tabs pass over a smooth faced, untimed, glue roller such as **220**, fed with glue by a glue pot **221** of a well known type. A pressure roller **222** mounted on a pivoted arm **223** is provided to press down on the upper portions of the blanks to secure a proper coating contact.

The blanks then move continuously through box folding zone **204** for folding of the glued flaps and tabs in a downward direction to form the finished article such as a collapsed box **225**. The articles **225** may pass through the nip **226** of rolls **227**, **228** and are then

delivered to conveyors 230, 231 or to any convenient receptacle.

In operation it will be seen that the device of this invention permits straight line, high speed, untimed folding of glued containers from flat sheets of bendable material and permits the flap and tab areas of such sheets to be coated or decoated as desired. With particular reference to waxed boxes the application of the adhesive coating to the dewaxed flaps and tabs may be more accurate and better controlled by registering the dewaxed areas with pattern glue rollers whereby a spot of adhesive is accurately applied within the periphery of a larger dewaxed area.

I claim:

In apparatus for spot removing the coating from coated foldable box blanks in areas where said blanks are to be coated with adhesive the combination of untimed means for advancing a plurality of said blanks individually and successively along a path while underfolding the hinged elements of said blanks to present the faces thereof, to be decoated, in a downward direction; endless conveyor means for receiving said folded blanks and advancing the same through a decoating zone; a plurality of laterally spaced, longitudinally extending, heating bars mounted below the path of said blanks in said zone to engage the downwardly presented faces of said hinged elements; an upwardly presented heating face, on each said bar, said face including lateral grooves, a longitudinal groove and a discharge conduit for draining liquid from said face, and electric means, connected to said heating bars, for heating the heating faces thereof and volatilizing the coating from the faces of the hinged elements of said blanks.

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