April 14, 1970 R. A. LABOMBARDE ET AL 3,506,472

PATTERN COATING METHOD

Original Filed Jan. 3, 1964 5 Sheets-Sheet 1

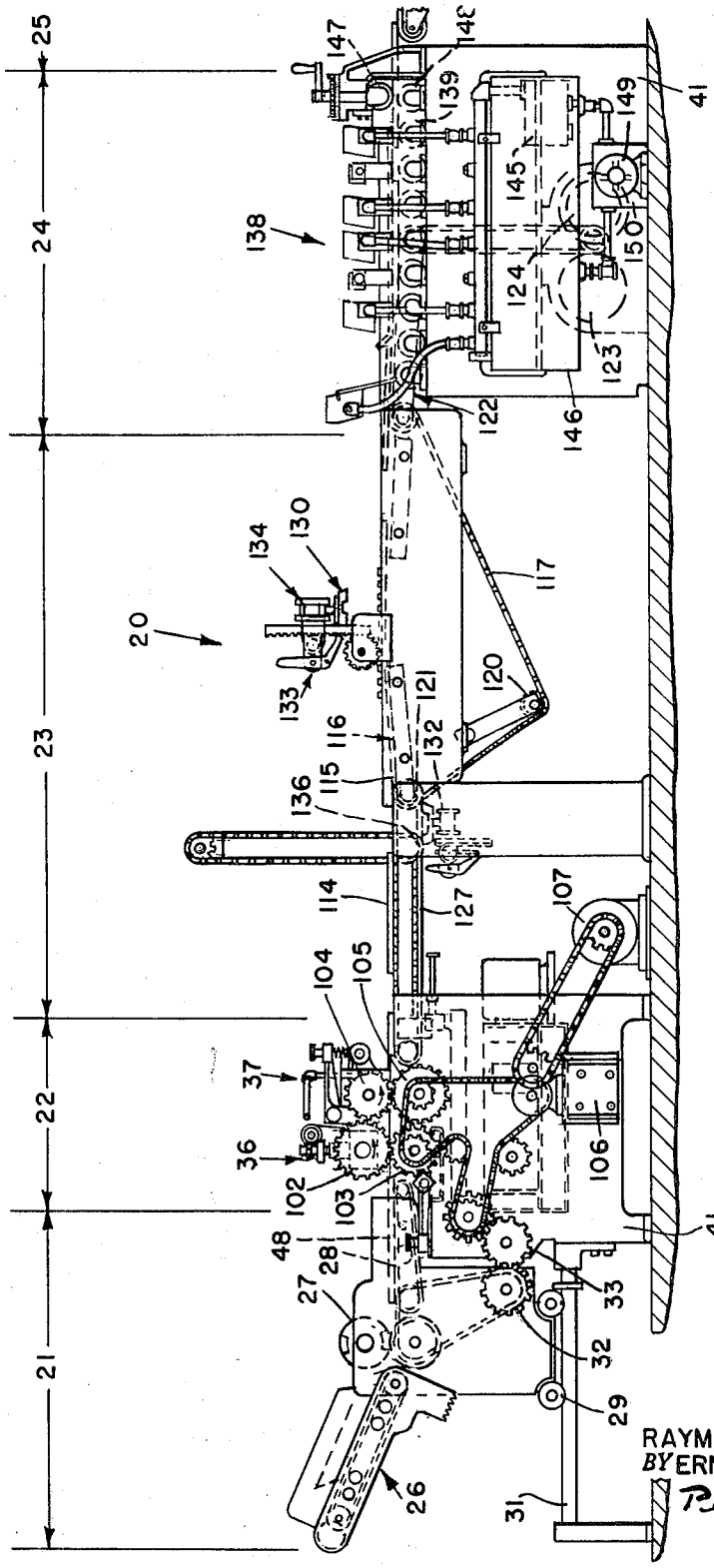


Fig. 1.

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Original Filed Jan. 3, 1964 5 Sheets-Sheet 2

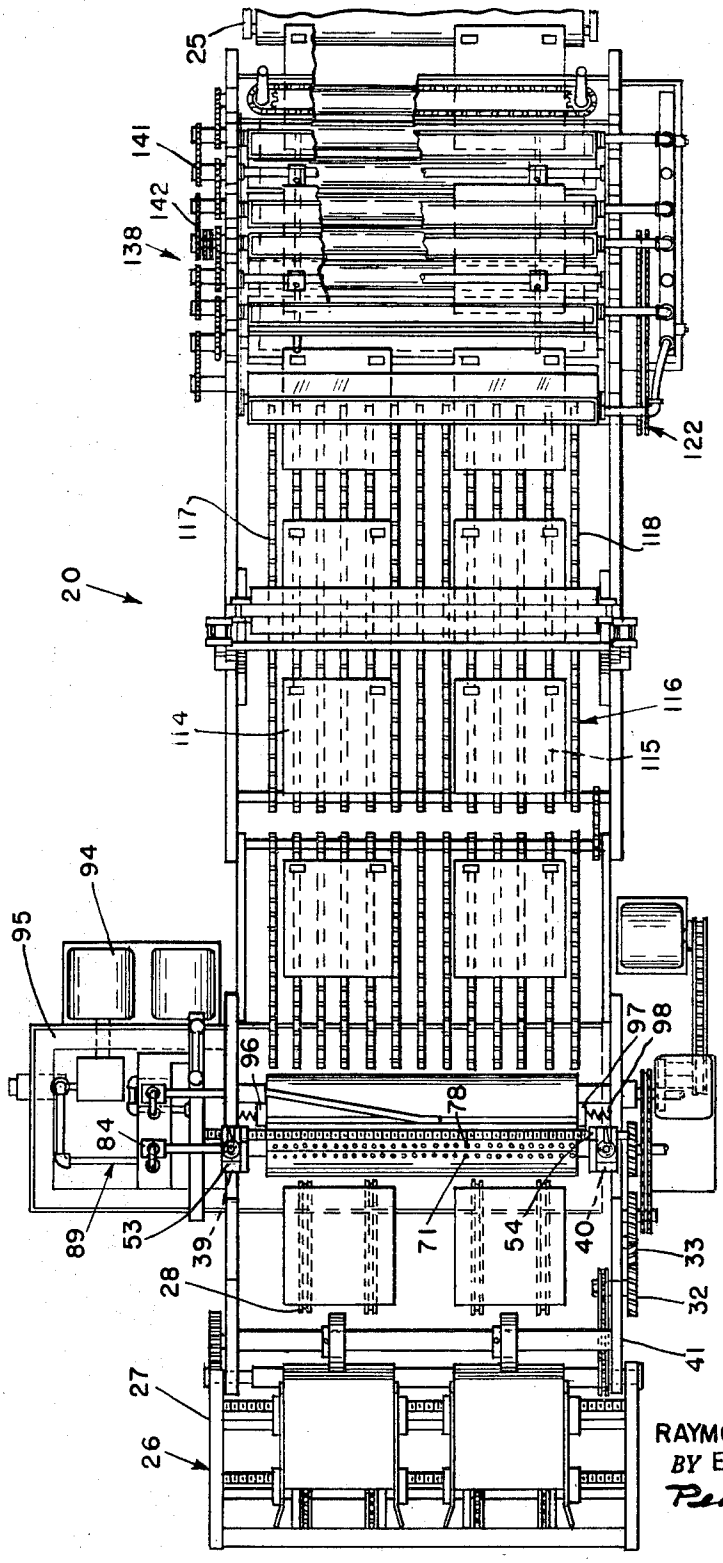
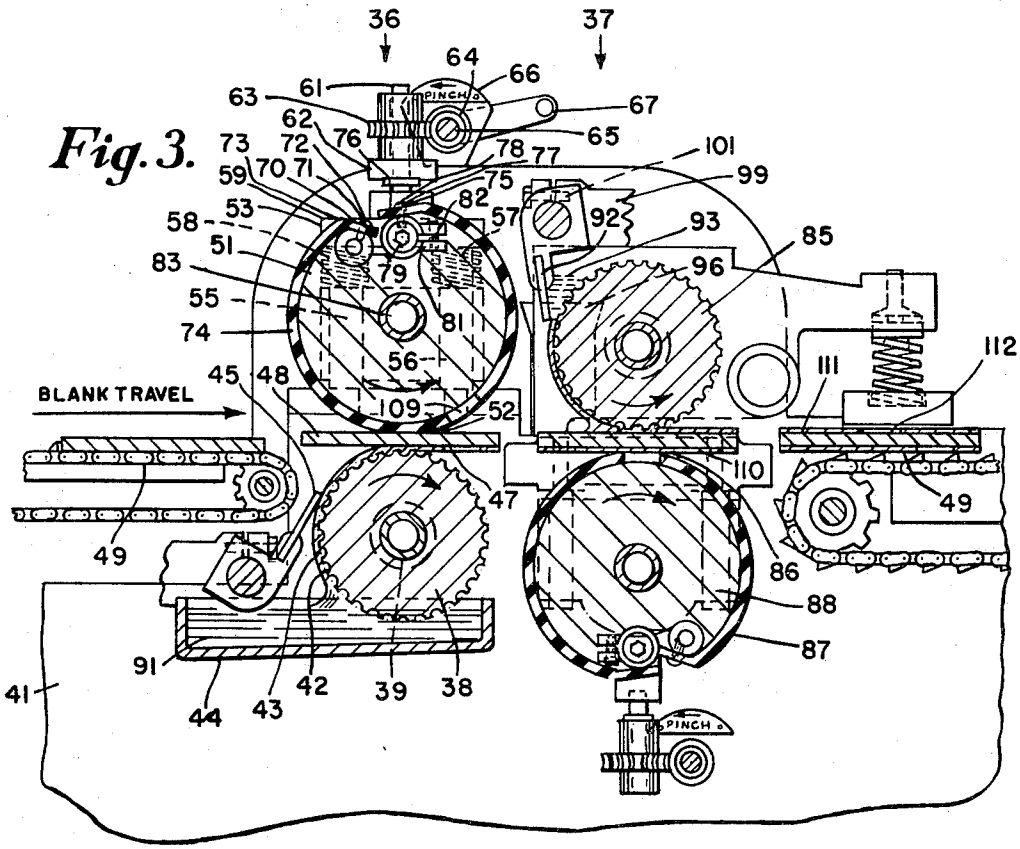


Fig. 2.

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Fig. 3.



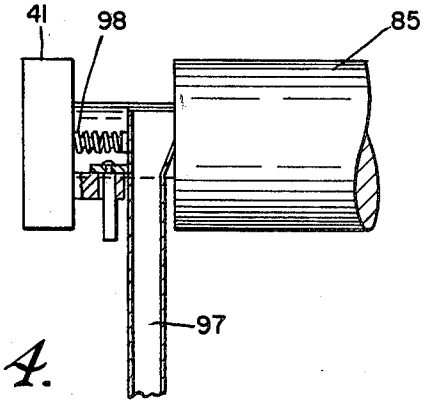


Fig. 4.

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PATTERN COATING METHOD

Original Filed Jan. 3, 1964 5 Sheets-Sheet 4

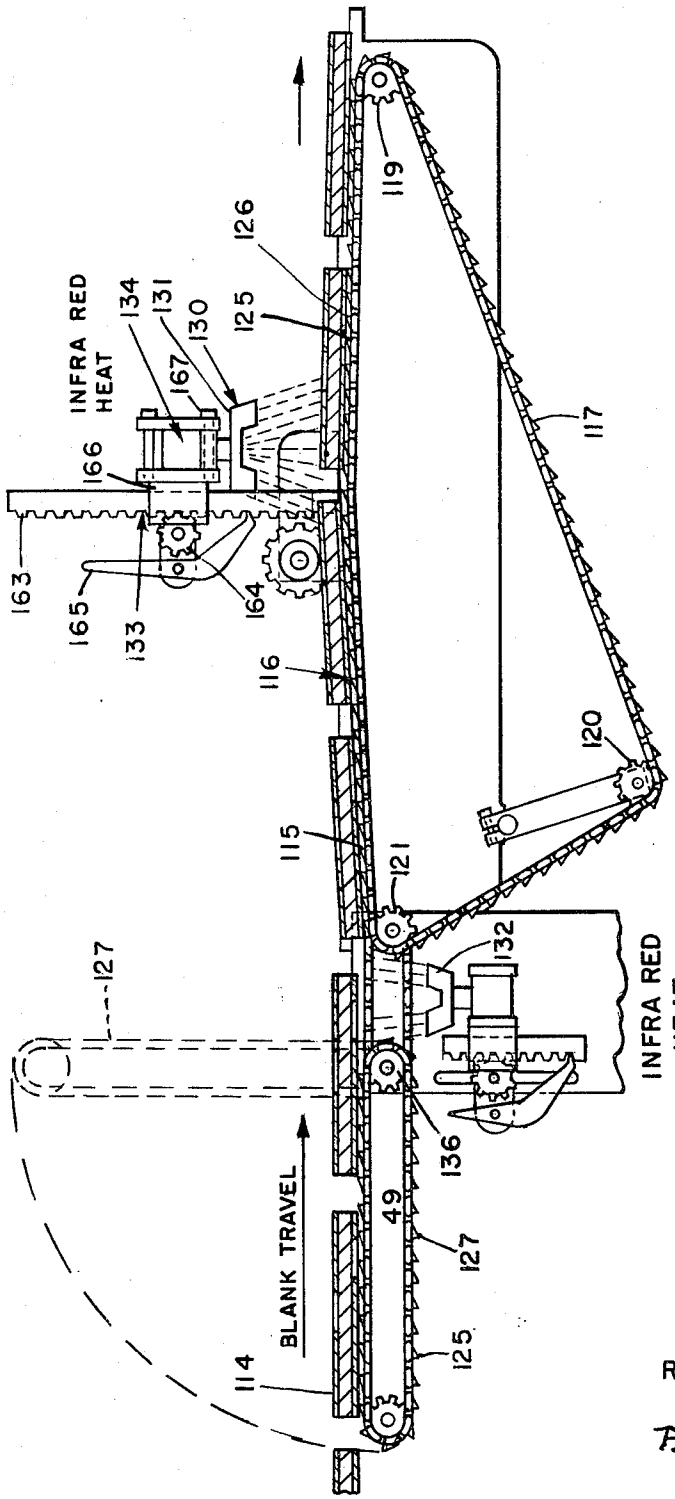


Fig. 5.

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PATTERN COATING METHOD

Original Filed Jan. 3, 1964 5 Sheets-Sheet 5

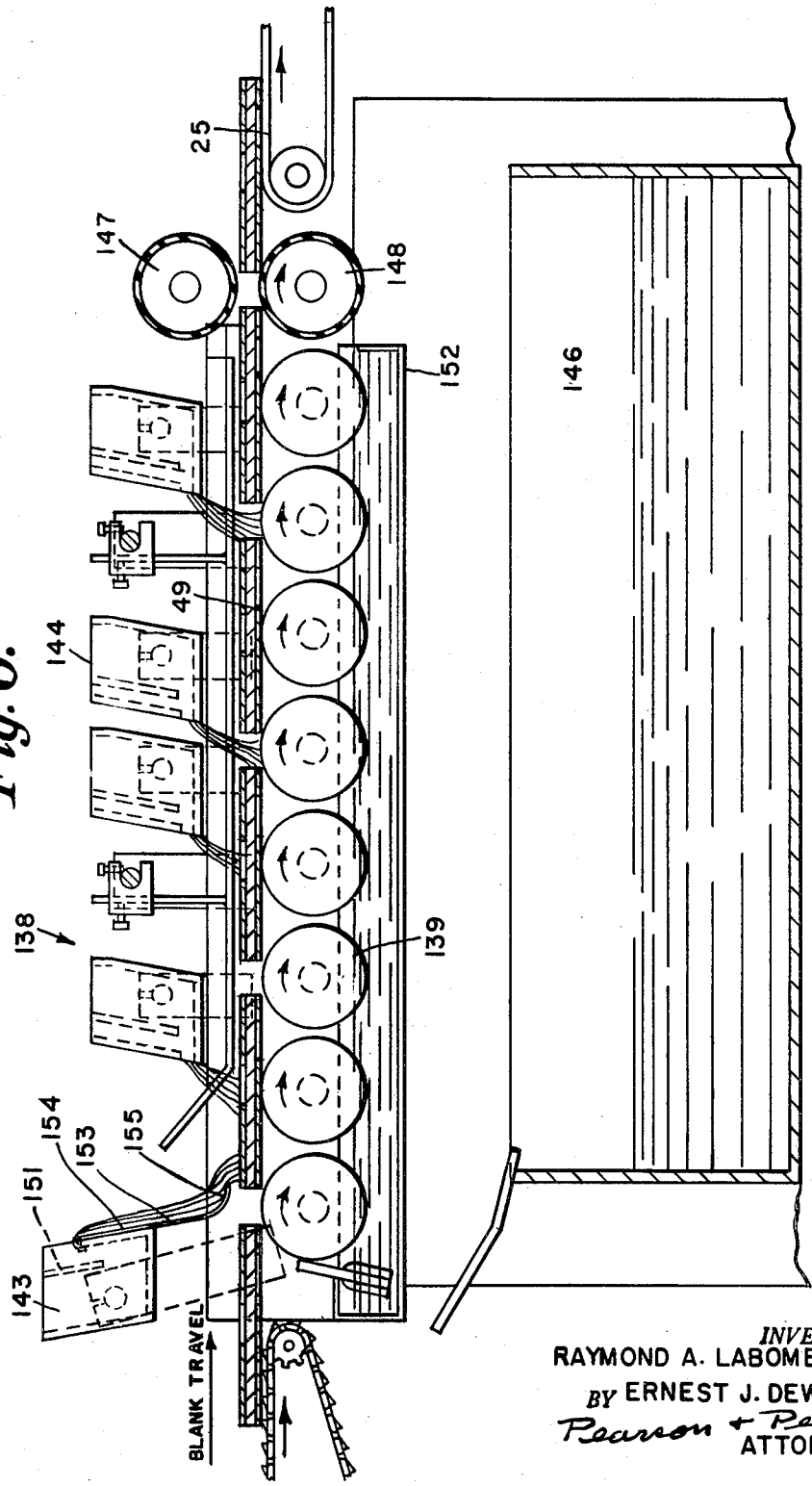


Fig. 6.

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United States Patent Office 3,506,472
Patented Apr. 14, 1970

3,506,472

PATTERN COATING METHOD

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Original application Jan. 3, 1964, Ser. No. 335,603, now Patent No. 3,313,270, dated Apr. 11, 1967. Divided and this application Mar. 10, 1967, Ser. No. 641,077
Int. Cl. B44d 1/09, 5/00
U.S. Cl. 117—38 3 Claims

ABSTRACT OF THE DISCLOSURE

A method for pattern, or spot, coating of a plurality of sheets advancing individually and successively, in timed relation along a path, in which the coating is applied in a roll nip formed by a gravure type applicator roll opposed by a resilient faced backing roll, the latter having relieved areas where no coating is desired to be applied. The resilient face with is relieved areas is preferably a low cost, detachable, rubber blanket, which remains cool to avoid deterioration and may be discarded after each run of blanks.

This application is a division of our application Ser. No. 335,603, filed Jan. 3, 1964, now U.S. Patent 3,313,270 of Apr. 11, 1967.

This invention relates to an apparatus and method for hot melt coating both the upper and the lower faces of a plurality of sheets in one pass through a machine and in a predetermined pattern.

In the paper box art, the production of wax, or other hot melt, coatings in a high gloss has become increasingly important and the spot, or pattern, application of such coatings has also become important.

It has been proposed to wax coat one, or both, faces of the cartons and then to remove the wax in certain areas, as a separate dewaxing step, in order to permit adhesive to be successfully applied to the carton for folding purposes. Needless to say dewaxing of this type is costly. It has also been proposed to use a pair of opposed wax applicator rolls, each having a gravure surface with the desired pattern formed therein, but such rolls are expensive, change-over time is high and they are practical only for long runs on the particular size and pattern of blank for which they have been prepared.

Another expedient now in use in the trade is the provision of a hot wax fountain roll with an overall knurled surface, the roll transferring hot wax to a patterned pad on an applicator roll, and the pad transferring the desired pattern of wax to one face of the sheets, or blanks.

Such pads are usually heated or, if not, the pad soon becomes heated by contact with the hot wax and the life of the pads are therefore short, whether of rubber, neoprene or any other suitable resilient material. A serious disadvantage of resilient, hot wax applicator, pads become evident when it is necessary to spot, or pattern, wax both the upper and lower faces of the sheets. In present machines, the opposed upper and lower applicator rolls form a nip and, when both rolls carry resilient, patterned, wax applicator pads, the relieved, or cutout, areas of one pad cause a failure to coat in the corresponding area of the other pad. It has thus proved necessary to traverse each cutout area with integral uncut strips, or to leave uncut spots throughout each cutout area, to provide suitable pressure in the area for achieving a proper coating on the opposite face of the sheets.

If each resilient, hot wax applicator pad were opposed by a solid smooth cylinder, rather than by a similar pattern pad, proper pressure might be achieved but, in present machines, two passes would be necessary to coat both faces of the sheets and the pads would still be subject to rapid deterioration because of the heat of the hot melt coating.

It is the principal object of this invention to completely eliminate the resilient, hot wax applicator, pattern pad of the prior art and to provide a resilient pattern pad which remains cool, which is a backing pad rather than an applicator pad to avoid contacting hot wax and which produces the desired spot coating.

Another object of the invention is to provide apparatus for applying a pattern coating to both the upper and the lower faces of individual and successive sheets, in one pass-through a coating zone, with the pattern pads remaining cool at all times.

A further object of the invention is to provide an apparatus and method for high gloss wax coating of both faces of a plurality of sheets wherein the coating is applied in a pattern, remelted to a gloss on both faces and then chilled, or quenched on both faces all without damage, running or dripping of the coating.

Still another object of the invention is to provide a waxing apparatus and method which achieves the accuracy and quality of rotogravure printing, achieves a rapid make-ready, and change of pattern pads and which achieves a long pad life, thereby substantially reducing cost while increasing the quality of the product.

A still further object of the invention is to provide a waxing machine of the pattern pad type in which the pads are quickly detachably rubber blankets and the backing rolls, which carry the blankets, are quickly accessible for changing over to a new run.

Other objects and advantages of the invention will be apparent from the claims, the description of the drawings and from the drawings in which:

FIG. 1 is a side elevation of a machine constructed in accordance with the invention,

FIG. 2 is a plan view of the machine shown in FIG. 1,

FIG. 3 is a diagrammatic, side elevation, on an enlarged scale of the pattern coating apparatus in the coating zone,

FIG. 4 is a fragmentary end view showing the wax overflow pipe of the upper applicator roll.

FIG. 5 is a diagrammatic side elevation on a scale similar to FIGURE 3 of the heating means in the heating zone, and

FIG. 6 is a diagrammatic side elevation on a scale similar to FIGURES 3 and 4 of the chilling means in the chilling zone.

As shown in FIGURES 1 and 2, a coating machine **20** constructed in accordance with the invention includes the sheet feed zone **21**, roll coating zone **22**, heating zone **23**, chilling zone **24** and stacking apron **25**.

The sheet feeding means **26** in the sheet feed zone **21** may be of any well known type such as the timed top feed **27** with a register chain section **28**, and having a one, two or three stream feed depending on the size of carton to be run. However, in this invention, the feeding means **26** is an integral assembly mounted on wheels such as **29** rollable on tracks **31** so that the entire feed may be moved rearwardly away from the coating zone **22** to enable an operative to have easy access to the rolls in the coating zone for make ready purposes. Marked timing gears **32** and **33** are provided to permit rolling the feeding means **26** out of, and back into, engagement without the necessity for retiming the machine.

The spot, or pattern coating mechanism in the coating zone **22** of the machine **20** includes first roll coating means **36** and second roll coating means **37**, means **37** being close to means **36** and substantially identical thereto but inverted.

As best shown in FIGURE 3, first roll coating means **36** includes a first coating applicator roll **38**, non-yieldably mounted for rotation in the bearings **39** and **40** fixed to the frame **41** of machine **20**. The applicator roll **38** is of hard, unyieldable material such as steel.

The applicator roll **38** is provided with an overall precision engraved rotagravure surface **42** consisting of identical small pockets **43** and the roll is partially immersed in a coating supply pan **44**. Roll **38** rotates in the direction of the arrow so that the wax, or other hot melt, coating picked up by the gravure surface **42**, and metered by the doctor blade **45**, will be carried upwardly into engagement with the underface **47** of each sheet **48** advancing along the paper line **49** of the machine.

First roll coating means **36** also includes the first backing, or blanket, roll **51**, which forms the first pressure nip **52** with the gravure surface **42** of roll **38** and which is driven in the direction of the arrow. Backing roll **51** is journalled in bearings **53** and **54** and is resiliently and movably mounted, each bearing such as **54** being vertically slidable on a pair of posts **55** and **56** and resiliently pressed into pressure nip relationship by coil springs **57** and **58**. The posts **55** and **56**, of each bearing assembly, form part of an integral bearing block **59** supported on a rod **61** threaded in a frame member **62**. Rod **61** carries a gear **63** meshed with a worm gear **64** mounted on a transverse shaft **65**, whereby turning of shaft **65** raises or lowers both bearings **53** and **54** an equal amount. A calibrated dial **66** is associated with rod **65** so that turning of the rod **65** by hand crank **67** produces uniform precise, adjustment of the pinch of the rolls at first pressure nip **52**.

The backing, or blanket, roll **51** is provided with an axially extending first row **70** of spaced, headed buttons **71** for receiving a corresponding row of keyhole shaped apertures **72** at one end **73** of the make ready blanket **74**.

The blanket **74** is of resilient material such as rubber and is rolled, or wrapped round the cylindrical face of roll **51** until the row **75** of similar apertures at the other end **76** of the blanket is engaged on a second row **77** of spaced headed buttons **78**. The row **77** is carried by an axially extending torsion rod **79**, secured at the correct setting by a clamp **81**, and lock screw **82** whereby removal of one pattern blanket and replacement with a blanket of different pattern is a matter of several minutes time only. The blanket roll **51** and blanket **74** are cool during operation of the machine but the roll **51** is hollow and provided with a hollow shaft **83** so that it can be connected into the heating system of the applicator rolls by valve **84**, when the machine is not operating and it is desired to melt any inadvertent accumulation of the hot melt coating on the patterned surface of the blanket roll.

The second roll coating means **37**, is substantially identical with the first roll coating means **36**, but inverted so that the second coating applicator roll **85** is above the paperline **49** and forms a second pressure nip **86** with the second resilient pattern blanket **87** of the second backing, or blanket, roll **88**, the latter being below the paperline **49**. Preferably the rotagravure applicator rolls **38** and **85** are all over engraved, chrome plated, hollow steel cylinders and each roll is provided with a hollow shaft and rotary joint for the circulation of hot oil from the oil heating system **89** of the machine. Suitable thermostatic controls maintain the temperature of the applicator rolls at well above the melting point of the wax, or other hot melt coating composition, **91**.

Preferably the first, or upper, backing roll **51** is vertically adjustable relative to the first, or lower, applicator roll **38**, the latter being unyieldable. The second, or lower, backing roll **88** is vertically adjustable relative to the second, or upper, applicator roll **85**, but unlike the first coating means **36**, it is the applicator roll **85** that is spring loaded while the backing roll **88** is not spring loaded or resiliently mounted. To adjust for sheets of increased thickness, the first, or upper, blanket roll may be moved upwardly and the second, or lower, blanket roll may be moved downwardly.

The upper doctor blade **92**, corresponding to doctor blade **45** not only meters the desired thickness of coating but also forms a fountain **93** in cooperation with the upper applicator roll **85**. Hot wax is continuously pumped into the fountain **93**, and into the supply pan **44** for the lower applicator roll **38** by a pump **94**, from a sump **95**, the pan being kept full and overflowing into the sump. An overflow wax return funnel **96** and **97** is mounted at each opposite end of the upper, or second, applicator roll **85** to catch, and direct, excess wax from the fountain back into the sump **95**. Each funnel such as **97** is spring mounted at **98** on the frame **41** of machine **20** and serves to avoid contamination or splashing of wax onto other parts of the machine.

The doctor blades **45** and **92** are each mounted on a pivoted arm such as **99**, controlled by a set screw **101** so that light or heavy applications of the wax coating may be achieved as desired.

The blanket roll **88**, is hollow and cool during operation but arranged to be heated to remove accumulations of wax, by connection to the valve **84**.

All of the rolls of the first and second coating means are driven in the direction of the arrows by gears **102**, **103**, **104** and **105**, on the same side of the machine, through a suitable speed reducer **106** and by the motor **107**. The feed means **26** is driven by the same motor all in a manner well known in the trade and not necessary to describe herein. Similarly the hot oil heating system and the hot wax circulation system of machines of this type are well known and not necessary to describe in detail.

The first applicator roll **38** engages the underface **47** of each successive sheet, or blank **48**, while the pattern blanket **74** of the first backing roll resiliently presses against the upper face **46** of the sheet to remove from the gravure surface **42** the measured amount of coating from the engraved pockets **43** and to apply the coating on the underface of the sheets. However, while blanket **74** is cool and does not contact the coating on the applicator roll, each relieved, or cutout, area such as **109** eliminates pressure on the sheet, and on the applicator roll, at the nip and results in a predetermined, dry, uncoated, area **110** on the underface of the sheet. It is these uncoated spots on which adhesive may later be applied to successfully fold the sheet into the desired carton. The first pressure nip **52** thus not only applies a pattern of the hot melt coating on the underface of each sheet, but also advances the sheet into the second pressure nip **86** for pattern coating of the upper face **46** of each sheet.

At the nip **86** the second applicator roll **85** deposits coating on the upper face **46** of each successive sheet while the second pattern blanket **87** resiliently presses on the underface **47** to create predetermined coated areas **111** and predetermined uncoated, dry areas **112**. The sheets, or blanks, **48** thus emerge from the coating zone **22** with a pattern of coating on each opposite face thereof, in one pass through the machine and with no deterioration of the pattern rubber pads or blankets.

As best shown in FIGURE 5, the pattern coated sheets such as **114** are delivered by the second coating means **37** onto the upper stretch **115** of endless conveyor means **116** which supports and advances the sheets through the heating zone **23**. Conveyor means **116** is preferably a plurality of endless chains of stainless steel such as **117** and **118**, each trained around sprockets **119**, **120** and **121**, driven by a power train **122** from the motor **123** and reducer **124**. A plurality of sharp pointed lugs, or pins, **125** are spaced around the chains and are in upstanding position along the upper stretch **115** whereby the pointed terminal tips **126** support the pattern coated underface of the sheets **114**. Thus both the upper and lower pattern coated faces of the sheets, are exposed and may be heated to melt and glaze the coating without marking the underface of the sheets.

A section **127** of the conveyor means **116**, about two feet in length, is upwardly pivotable on the axes of the intermediate sprockets **136** so that an operative has access to the second blanket roll **87** for "make ready" purposes.

In addition, the upper stretch **115** is not entirely horizontal but includes a section which is arched upwardly in the centre a slight amount such as one or two inches, and supported on an arched track. Thus the sheets being advanced on the chains are first carried upwardly and then delivered in a downward sloping direction into the chilling zone.

The heating means **130**, in the heating zone **23** is an infrared ray refractory type, gas fired burner **131**, mounted at a spaced distance above the centre of the arched section of paper line **49** and arranged to remelt and liquefy the hot melt, patterned coating into a mirror-like, glossy pool with high gloss. The slight arching of the conveyor is not sufficient to cause the remelted coating to run, or drip, or to flow over the uncoated, dry patterned spots, but since the coating has been applied in a gravure pattern of small spaced dots, the dots are caused to flow toward each other to form a smooth coating. Preferably the heating means **130**, also includes a second gas burner **132** similar to burner **131**, but mounted at a spaced distance below paper line **49** to apply heat to the underfaces of the coated sheets if a glaze is desired on both faces. Vertical adjustment means **133**, and horizontal adjustment means **134** are provided for adjusting the burners **131** and **132** and preferably burner **132** is located under the gap between the pivotable section and the arched section of the conveyor means **116**.

The means **133** and **134**, each include a fixed gear rack such as **163**, a gear **164** meshed in the rack and a pawl, or dog, **165** for adjusting the height of the burner support **166** and the support **166** includes clamping bolts **167** for transversely adjusting the burner in the support.

The arched section of the conveyor means, indicated at **135** delivers the remelted sheets, or blanks, downwardly into the chilling zone **24** to uniformly chill the sheets without water "back up" thereby eliminating any tendency of water marking. As shown in FIG. 6, the chilling means **138**, in the chilling zone **24**, includes a series of light, chrome plated steel cylinders, or rolls, such as **139** driven in the direction of the arrows and journalled in the sides of frame **41**. The rolls **139** are driven by the gear train **141** through a power train **142** by the reducer **124** and serve to tangentially engage the pattern coated underfaces of the sheets while advancing the sheets individually and successively through the chill zone **24** to the stacker apron **25**. In addition, the rolls **139** are partially immersed in a water pan **152** and constitute applicators for applying a film of the coolant water to the under coatings to quench and harden the pattern coating.

The chilling means **138** also includes a series of about five water fall, or head, boxes such as **143** and **144**, each spaced above the paper line **49** and arranged to discharge a low, unbroken, liquid curtain on the upper coated faces of the sheets advancing therebelow. A suitable high volume centrifugal pump **145** maintains water circulation from the water tank **146** to the water pan **152** and to each of the water boxes **143** and **144** and a pair of driven, wringer rolls **147** and **148** are positioned at the end of the chill zone **24** to dry and deliver the sheets to the apron **25**. A separate pump **149** integral with the water chilling unit **150** maintains the water in the water tank **146** at the required temperature.

The water box **143** includes a partition **151** for trapping any sediment, and a transverse sloping curtain member **153** for guiding the water downwardly and forwardly in an unbroken, liquid curtain to fall on the sheets advancing downwardly and forwardly thereunder. Thus the water cannot back up the sheet to create water marks and the coatings are instantly quenched, hardened and chilled. The remaining boxes **144** continue to quench, harden and chill the coating as the sheets advance through the machine at a speed of about 400 feet per minute.

The water boxes **144** are of known type and shown in U.S. Patent 3,070,457 to Labombarde of Dec. 25, 1962 but in this invention, they are reversed with the water cascading in a uniform sheet toward the oncoming blanks. The water box **143**, however, provides the instantaneous quenching effect desirable for hardening the glossy wax coatings, with the unbroken, continuous transverse sheet of liquid coolant gently falling in the direction of advance of the blanks to eliminate any undesirable water marks. Because of the relatively long cascading flow of the coolant down the slope **154** of member **153**, splitting of the stream by foreign particles is avoided and any such split tends to eliminate itself before reaching the arcuate shelf **155**.

While the apparatus of the invention is especially useful with hot coatings, it will be understood that water soluble compositions may also be pattern coated by the apparatus, in which case the applicator rolls **38** and **85** are cool, at ambient temperatures, rather than heated. Similarly, while a resilient surface, or resilient blanket **74** or **87**, is preferred on the backing rolls, a yieldable material such as felt may sometimes give satisfactory results and is intended to be included within the scope of the invention.

We claim:

1. The method of pattern wax coating a plurality of sheets on the upper and lower faces thereof by means of upper and lower hot wax applicator rolls having overall gravure surfaces each forming a nip with lower or upper resilient faced backing rolls having relieved areas therein, said method comprising the steps of:

passing said sheets individually and successively in timed relation along a path over said lower, hot wax application roll and coating the lower faces thereof while said upper backing roll is resiliently pressing on the upper faces thereof except in said relieved areas where no coating is desired, and

passing said sheets individually and successively, still in timed relation further along said path, under said upper, hot wax applicator rolls and coating the upper faces thereof while said lower backing roll is resiliently pressing on the lower faces thereof except in said relieved areas where no coating is desired.

2. A method as specified in claim **1** plus the additional steps of advancing said sheets, subsequent to said coating on both faces, individually and successively further along said path while supporting the same on a plurality of spaced pin point areas;

and exposing said coating on the upper faces of said sheets, while so pin supported and while advancing upwardly on a slight incline to heat sufficient to reliquefy and glaze said coating.

3. A method as specified in claim **2** plus the additional steps of still further advancing said sheets individually and successively along said path while roll supporting the same through a cooling bath while simultaneously showering cooling liquid on said sheets from a series of spaced, low, sheet-like waterfalls.

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U.S. Cl. X.R.

117—64, 68, 111