Sept. 17, 1968 R. A. LABOMBARDE 3,401,608

APPARATUS FOR REMOVING SOLIDIFIED COATING FROM BOX BLANKS

Filed Jan. 5, 1967 2 Sheets-Sheet 1

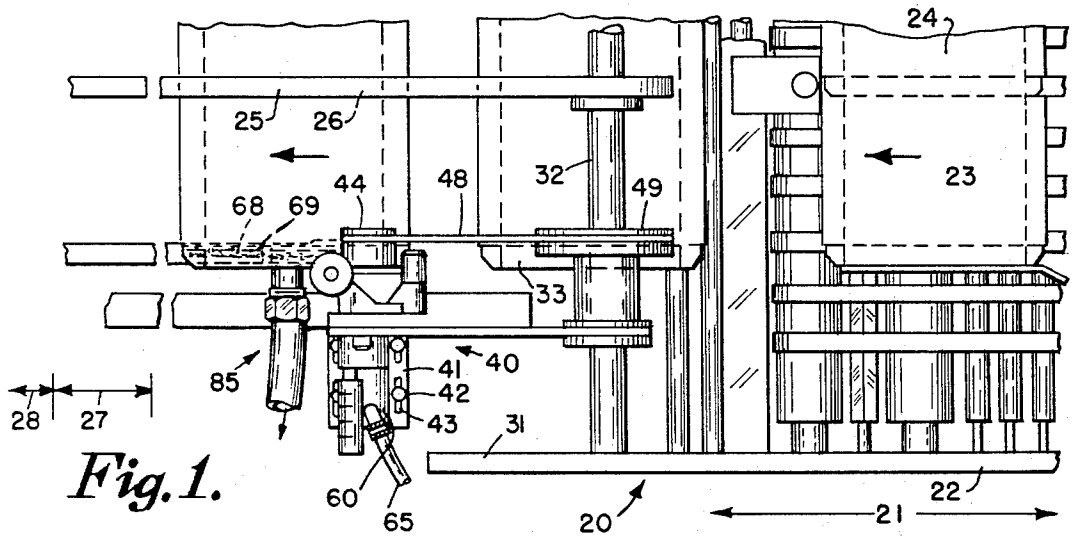


Fig. 1.

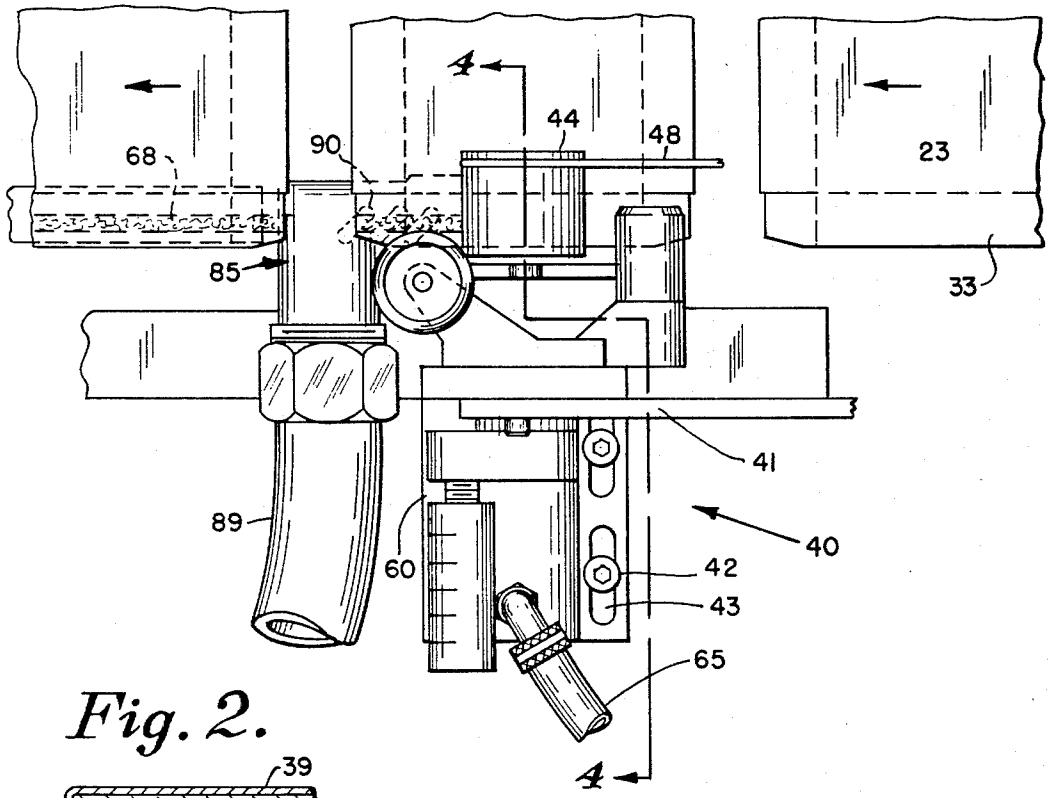


Fig. 2.

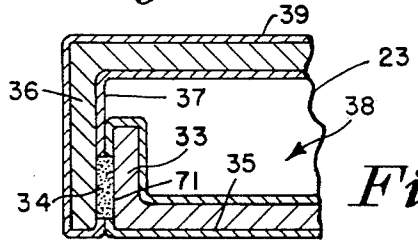


Fig. 3.

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Filed Jan. 5, 1967 2 Sheets-Sheet 2

Fig. 4.

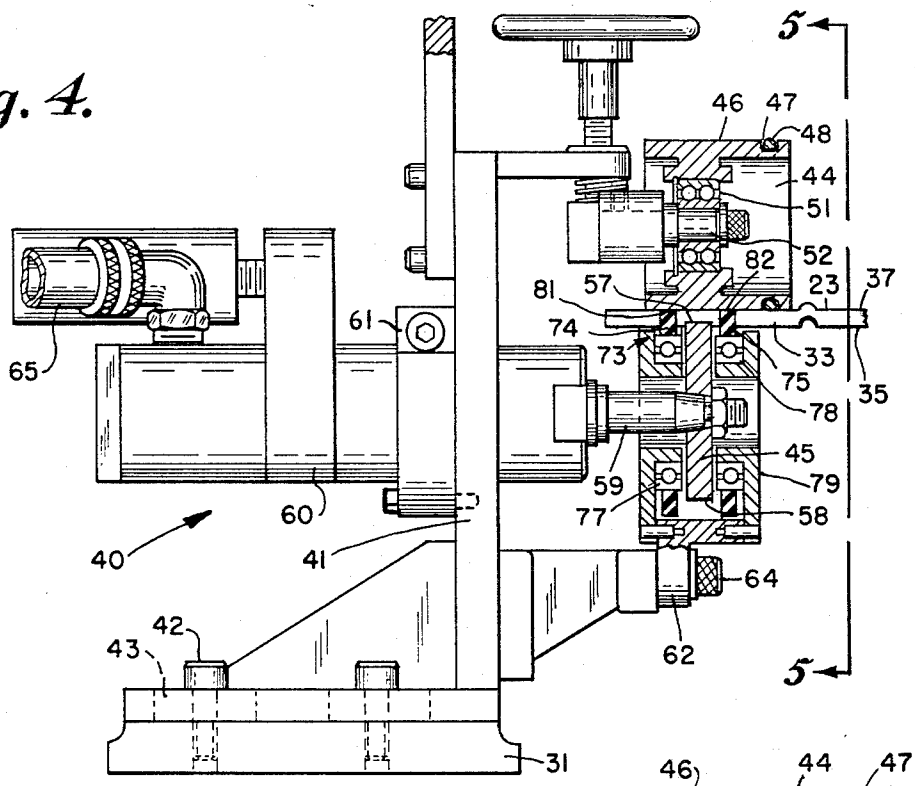
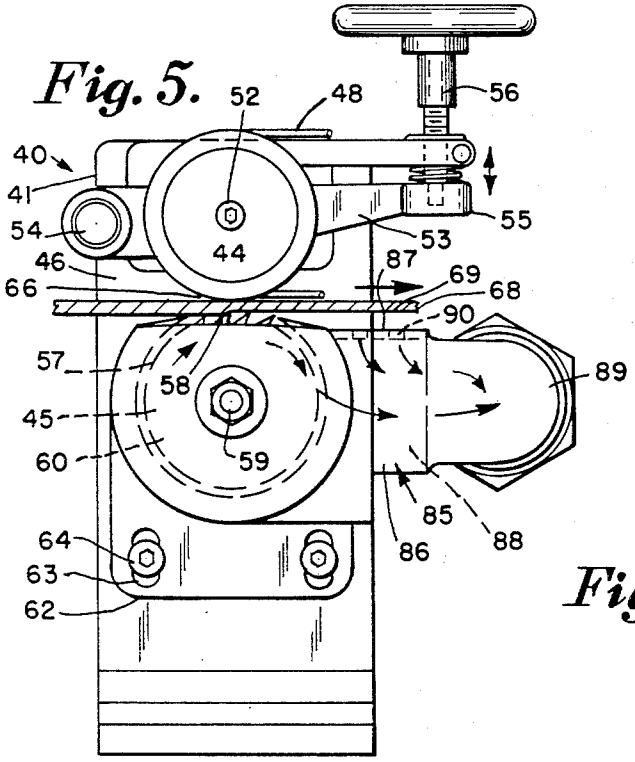


Fig. 5.



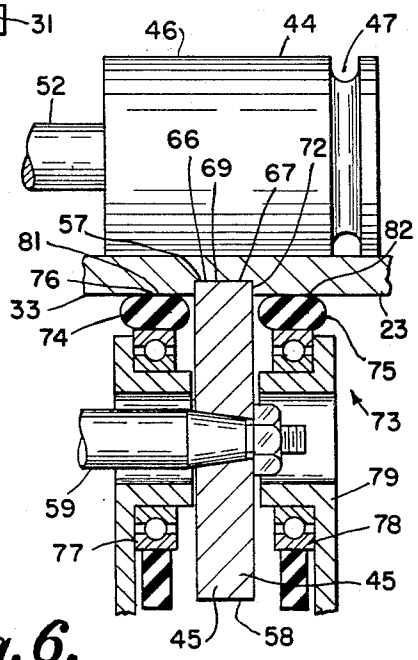


Fig. 6.

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APPARATUS FOR REMOVING SOLIDIFIED COATING FROM BOX BLANKS

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10 Claims. (Cl. 93—36)

ABSTRACT OF THE DISCLOSURE

An apparatus for removing solidified coating of the difficult-to-bond type from the coated face of a flat box blank advancing along the paper line of a folder-gluer machine. A hard-faced, bed roll, driven at blank speed, forms a nip on the paper line with a high speed, driven, rotary cutting or abrading disc, the nip clearance being predetermined and unyieldable. Juxtaposed to the cutting disc is a clamping roll having a yieldable, resilient face forming a yieldable nip with the hard-faced bed roll and freely rotatable at blank speed. The resilient-faced roll prevents lateral and longitudinal displacement of the blank during removal of coating and urges the leading and trailing edge of the blank away from the cutter disc to prevent chewing and gouging.

Field of the invention

This invention relates to an improved apparatus for physically removing a strip of solidified coating from each of a succession of coated, flat box blanks, the coatings being of a difficult-to-bond type.

Description of the prior art

It has heretofore been proposed to provide de-waxers, or de-coaters, for use on conventional coated blanks, for example by squeezing off a strip of still hot, melted wax by means of nip rolls, by wiping off the same with felt, absorbent rolls or by vaporizing the same with heated bars. In United States Patent 1,546,725 to Gaylord of July 21, 1925, it is proposed that individual flat box blanks, advancing successively through a machine, while held in belt type carriers, be passed through a yieldable nip, formed between a rotary brush and a spring pressed plate, for brushing off parafin wax coatings. In this patent the brushes rotate on axes parallel to the path of the blanks and engage the blanks tangentially along longitudinal lines thereby tending to impart lateral displacement to the blanks. In United States Patent 2,996,238 to Linde of Aug. 15, 1961 scuffing rolls are proposed, rotating on axes normal to the path of a coated web, which rolls, if attempted to be used on belt-held, individual blanks, would tend to impart longitudinal displacement or twist to the blanks.

In this invention, a scuffing, cutting or abrading roll is used, on untimed, advancing, belt-held individual blanks, the axis of the roll being normal to the blank path but the coating removal apparatus preventing lateral, oblique or longitudinal displacement of the blanks in the carrier belts. The coating removal nip is adjustable in depth but unyieldable and formed between a rotary disc tool and a hard, smooth-faced bed roll thereby producing a channel of rectangular section in the solidified coating on the blanks which permits adhesive to grip the boxboard over the entire area of the strip. Lateral displacement is avoided by reason of the longitudinal direction of rotation of the tool and by the walls of the rectangular cut while oblique twists or longitudinal displacement are avoided by resilient clamping of the blanks during the removal of the coating. The clamping action is obtained in a yieldable nip formed preferably by a pair of resilient deformable,

rubber-like tires, each freely revolving on an opposite side of the rotary disc tool and each normally engaging the bed roll so that each blank deforms the tires into bulged cross section in passing through the yieldable nip.

The principal object of the invention is, therefore, to provide coating removal apparatus capable of forming a channel in solidified difficult-to-bond coatings on individual untimed box blanks without displacing the same in their belt carriers, even if the coating is removed only on one side flap of the blanks.

Another object of the invention is to provide a rotary disc type tool for removing difficult-to-bond surface coatings from areas of untimed, advancing, solidified, coated box blanks, the tool being operable in an unyieldable nip of predetermined, fixed, clearance and associated with suction collection mechanism for removing the displaced particles of coating, thereby avoiding speckling of the blanks and contamination of the ambient atmosphere.

A further object of the invention is to provide a pair of rotary cutters each operable on either face on either side of a plurality of untimed blanks advancing individually and successively along a path, each cutter being opposed by a bed roll driven at a surface speed equal to that of the blanks and each blank being resiliently clamped against the bed roll during cutting. The blanks are thus subjected to rotary cutting action while firmly held against twist displacement in their carrier belts, thereby permitting the physical removal of a strip of solidified, difficult-to-bond coating by each cutter.

A further object of this invention is to prevent the normal tendency of the cutter to rip off the leading and (more predominantly) trailing edges of the glue flap due to the digging action of the cutter as it enters and leaves the pinch.

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

FIGURE 1 is a fragmentary plan view of a conventional folder-gluer machine showing a coated removal apparatus of the invention, mounted in rear of the untimed feed zone of the machine.

FIGURE 2 is an enlarged plan view of the coating removal apparatus of FIGURE 1.

FIGURE 3 is a diagrammatic, enlarged, sectional view showing a typical folding box blank, having a difficult-to-bond solidified coating, strips of the coating having been removed to enable a firm adhesion of the flaps.

FIGURE 4 is a front elevation, in section on line **4—4** of FIGURE 2, of the apparatus shown in FIGURE 2, with no blank in the nip.

FIGURE 5 is a side elevation, on line **5—5** of FIGURE 4, but with blank in the nip, and

FIGURE 6 is an enlarged, diagrammatic, front elevation, similar to FIGURE 4, but showing a blank in the nip.

As shown in FIGURE 1, **20** designates a well known type of folder-gluer machine, such machines conventionally having a blank feeding zone **21**, containing a blank magazine **22**, for feeding blanks **23**, individually and successively from a stack **24** of identical blanks. Each successive flat blank **23**, is received between upper belt carriers **25** and lower belt carriers **26** and advanced by this untimed belt carrier means along a predetermined longitudinal path, or paper line, from the feeding zone **21** through an adhesive treatment zone **27** to a folding zone **28**. Machine **20** includes the frame **31** and suitable drive means (not shown) for advancing the blanks at a predetermined speed in untimed sequence, the upper belt carrier shaft **32**, therefore being a driven shaft.

Each flat box blank **23**, may be of any well-known type adapted to be folded at high speed into a flat tube, or other desired form, and usually includes at least one longitudi-

nally extending glue flap 33, upon which adhesive 34 is roll coated in the adhesive zone 27. The longitudinal application of adhesive on flap 33, is usually deposited on the under face 35 of the blank, this usually being the outer printed face so that, when the blank is folded, the printing will be on the exterior face. A side wall panel 36 of each blank has its portion of the upper, or interior, face 37 of the blank folded into adhesive contact with the glue flap 33 in a well known manner and as shown in FIGURE 3 in the erecter box 38.

Prior to deposit in the feed magazine 22, the blanks 23 in stack 24 have been surface treated, usually on both faces, with a difficult-to-bond coating, or moisture barrier 39, which creates problems when used with thermoplastic adhesives, often applied cold and liquid and bonding only when the mating coated surfaces are heated. The apparatus of this invention permits the blanks to be surface treated with such difficult-to-bond coatings while permitting the mating flaps to be adhered with low cost adhesives such as simple dextrin or other common glues. The cost of specialized adhesives is, therefore, eliminated by physically removing a layer of the solidified, coating, barrier as the blanks advance into the adhesive zone, and the low cost adhesive is applied in a strip or channel in which the original fibreboard of the blank is exposed. The bonding surface is preferably roughened by the action of the rotary disc tool, thereby assisting in adhesive penetration into the fibres. The solidified coating is removed whether the blank is foil lined, lined with extrusion coated polyethylene, full varnish coated or otherwise barrier treated.

The solidified coating removal means 40 of the invention includes a frame member 41, affixable by bolts 42 to the machine 20, on either side thereof, so that it is mounted alongside the longitudinal path of the blanks being advanced by the belt carrier means 25 and 26. Suitable elongated slots 43 are provided for bolts 42, to permit lateral adjustment of the frame member 41 relative to machine frame 31.

A pair of rolls 44 and 45 are rotatably mounted in the apparatus, roll 44 being a bed roll and roll 45 being a rotary disc tool preferably of the milling cutter type, although it can be an abrasive grinding disc.

Bed roll 44 includes the relatively wide, smooth, hard, circumferential face 46, preferably of metal such as steel, face 46 including a groove 47 at the outer end for a drive belt 48 of round cross section. Belt 48 is driven by a grooved pulley 49 fast on driven shaft 32, the surface speed of the bed roll face 46 being equal to the surface speed of the carrier belts 25 and 26 to avoid imparting twist to the blanks. Thus regardless of the high speed of the blanks, the blank contacting portion of roll face 46 travels at the same speed. Bed roll 44 is supported in suitable bearings 51 for rotation on shaft 52, shaft 52 extending laterally relative to the longitudinal path of the blanks and being fixed centrally of the lever 53. Lever 53 is pivotally mounted at one end 54 to frame 41 and the opposite end 55 is movable by thrust screw 56 so that the vertical position of the bed roll can be controlled, adjusted and fixed as required.

The rotary disc tool 45 includes the sharp edged circumferential face 57, including the spaced cutting teeth 58, and is mounted for rotation on the shaft 59 of a high speed air motor 60, the shaft 59 being parallel to shaft 52 and extending latertlly and transversely of the longitudinal path of the blanks. The tool 45 rotates at a surface speed substantially greater than the speed of advance of the blanks. Air motor 60 is held fast to frame member 41 by clamp 61 and suitable bolts. The bearing support 79 is mounted on a sub frame 62, having elongated slots 63 for bolts 64 threaded in frame 41 so that the clamp rolls 74 and 75 can be moved vertically and fixed in position relative to the rotary tool face 58 at the nip. Conduit 65 connects air motor 60 to a suitable source of air under pressure for driving the tool 45 at high speed.

The hard, unyieldable, undeformable face 46 of bed roll 44 and the hard, unyieldable, undeformable, sharp edged face 57 of rotary tool 45 form a substantially unyieldable nip 66 for receiving each successive individual blank 33, the nip 66 being of predetermined clearance less than the thickness of the coated blanks and adjustable to space the bed roll from the cutter in thousandths of an inch to determine the depth of the cut 67 into the solidified coating. A longitudinal strip 68 of the coating, is thus physically removed from the glue lap, or side wall panel of each blank passing through the unyieldable nip, 66, leaving a longitudinal channel 69 of rectangular cross section on the blank which exposes the fibres 71 of the paperboard and permits the adhesive 34 to penetrate into the fibres. The exposed surface of the channel 69 is also roughened by the cutting, or grinding, of the tool 45 for better adhesion and the vertical side walls 72 of the channel, tend to prevent lateral displacement of the blanks during the coating removal step.

Clamp roll means 73 is also provided including at least one clamp roll 74 and preferably a pair of such rolls 74 and 75, each freely revoluble on an opposite side of the rotary tool 45, and opposed to the face 46 of bed roll 44 to form a yieldable nip 76 therewith. Each roll 74 or 75 is of resilient, deformable, yieldable material such as the solid rubber tire shown and supported for free rotation substantially coaxially with tool 45 on bearings 77 or 78. The bearings in turn are mounted in the bearing support 79 carried by the sub frame 62.

The blank contacting surfaces 81 or 82 of each roll 74 or 75, normally extend beyond, and outside, the corresponding sharp edged face 57 of tool 45, so that when there is no blank in the nip, the surfaces 81 and 82 may touch the face 46 of bed roll 44 while the cutting face 57 is at the desired distance therefrom to cut the desired depth of coating from the blanks. This is illustrated in FIGURE 4 wherein the nips are clear but a glue flap is shown approaching the nip.

However, as shown in FIGURE 6, when the next successive blank 23 enters the unyieldable nip 66 for removal of coating, it also enters the yieldable, or clamping, nip 76 compressing and deforming the blank engaging portion of the clamp rolls 74 and 75 into bulged configuration while being clamped against the face 46 of bed roll 44. Since the surface speed of the driven bed roll is equal to that of the blanks, the blank being cut, on one side, or on both sides simultaneously, is firmly gripped and prevented from twisting in the belt carrier means. It will be understood that subjecting the blanks 23, which may be advancing at a speed of 15 feet per second, to the action of a high speed rotary cutting tool at a side of the blank far removed from the centre belt carriers can easily cause the blanks to twist, to accelerate or decelerate relative to the belts thereby causing a jam-up requiring a halt in the production line. The clamping means 73, permits the blanks to continue traveling at high speed along their path without jams or stoppage while having a strip of solidified coating removed therefrom.

The rapid flow of blanks through machine 20, coupled with the high speed rotation of the cutting tools 45 generates considerable scrap particles and chips of the coating 39, which may speckle the blanks and create undesirable fouling of the air and floor in the vicinity of machine 20. Suction means 85 is therefore provided including the suction box 86 carried on the sub frame 62, box 86 having a perforated face 87 extending along the path of particles discharged by the tool 45 at nip 66. The major particles or chips are collected in the interior 88 of box 86, being drawn away from the teeth of the cutter and moved into the suction conduit 89 which is connected to a suitable source of suction such as mill vacuum (not shown). The minor particles or cuttings are drawn through the apertures 90 in the perforated face 87, as shown, for removal by conduit 89. The direction of rotation of the tool 45 is along the glue flap, rather than lat-

erally across the blank, thereby avoiding the spewing of particles of coating all over the interior, or exterior, of the faces of the blank. In fact the portions of the blank which are subject to receiving the discharge of the cutter, if it is not removed by the suction, are portions which are to be overlapped and adhered and thereby not visible in the completed box. The perforated face **87** extends longitudinally substantially at the level of the unyieldable nip **66** and includes slots proximate the nip for receiving major cuttings.

In operation each successive blank **23** is advanced in the untimed, upper and lower carrier belts **25** and **26**, with the glue flap **33** on one side of the blank entering nips **66** and **76** of one means **40** while the side wall panel **36** on the other side of the blank enters nips **66** and **76** of another means **40** on the opposite side of the paper line. The means **40** operable on the glue flap is usually operable to cut the lower face of the blank while the other means **40** cuts the upper face of the blank, and preferably both cutters rotate in the same direction, namely the direction of travel of the blanks. The opposite sides of each blank are held against the bed roll, to prevent twist, while each cutter removes a strip of predetermined depth of the coating. The blanks continue along the paper line for the application of adhesive in the channel formed by one, or both, of the cutters and are then folded into tubular form in the usual manner.

While the clamp rolls **74** and **75** are preferably coaxial with cutter roll **45**, it will be understood that clamp rolls of larger or smaller diameter can be used if desired for example clamp rolls of smaller diameter could be entirely on one side of the axis of the cutter and could rotate on an axis not in parallelism with the cutter axis while still being within the scope of the invention.

It should also be noted that the entrance throat of the yieldable nip **76**, formed by the resilient surfaces **81** and **82** of clamp rolls **74** and **75** and the unyieldable, hard, curved face **46** of bed roll **44**, is at a higher level than the level of cutter face **57**, as the leading edge of each successive blank approaches the pinch area. The leading edge is thus urged resiliently upwardly by the resilient, lower side of the entrance throat, to avoid a chewing engagement with the cutter, and the leading edge is then urged downwardly by the curved face **46** of the bed roll, to compress the yieldable material and engage the cutter in the lower level nip **66**. Because the resilient surfaces **81** and **82** are flattened against the blank and because the blank is backed by the curved face **46** of the bed roll, the blank is imperceptibly bowed into an arcuate configuration as it passes through nips **66** and **76**. Upon leaving the cutting nip, the trailing edge of each blank is urged upwardly away from the cutter by the resilient lower side of the exit throat, and chewing or gouging of the trailing edge is therefore avoided.

What is claimed is:

1. In a machine for folding and adhering the component parts of flat box blanks, each blank having a solidified coating thereon, the combination of:

untimed belt carrier means for advancing a plurality of said blanks individually and successively along a path through said machine at a predetermined speed;

solidified coating removal means mounted along said path, said means including:

a disc tool rotating on an axis transverse to said path and having a sharp edged surface travelling at substantially greater surface speed than the speed of said blanks for physically removing a longitudinal strip of said solidified coating on one face of each successive blank;

a bed roll, rotatably mounted on said machine opposite said disc tool and forming an unyieldable nip therewith of predetermined clearance;

at least one clamp roll, rotatably mounted on said machine in juxtaposition with said disc tool and opposite said bed roll, said clamp roll forming a yieldable nip with said bed roll alongside said unyieldable nip and

drive means for driving said bed roll at a surface speed equal to the speed of advance of said blanks

whereby said bed roll and clamp roll yieldably retain each successive blank against twist displacement in said carrier means while said blank is subjected to the greater surface speed contact of said disc tool.

2. A machine as specified in claim **1** wherein:

said clamp roll is mounted for free revolving substantially on the axis of said disc tool and comprises a resilient, yieldable, rubber-like wheel normally engaging said bed roll but resiliently yieldable away therefrom during the passage of a blank through said yieldable nip.

3. A machine as specified in claim **1** wherein:

said disc tool is a milling cutter having a plurality of spaced identical teeth forming said sharp edged surface and

said bed roll is a metal roll having a smooth, hard circumferential surface.

4. A machine as specified in claim **1** wherein:

said disc tool is a grinding wheel having abrasive material therearound forming said sharp edged surface.

5. A machine as specified in claim **1** plus:

adjusting means, supporting said bed roll on said machine, said means including a lever in which said bed roll is rotatable, said lever being pivotably mounted at one end to said machine and having a threaded turn screw at the other end for controlling the spacing of the surface of said bed roll from said disc tool.

6. A machine as specified in claim **1**, plus suction means associated with said solidified coating removal means, said suction means including a suction box located in the path of coating particles removed from said blanks by said disc tool and suction conduit means for connecting said suction box to a source of suction.

7. A machine as specified in claim **6** wherein said suction box includes a perforated face extending substantially at the level of said unyieldable nip along the path of said blanks, said perforated face including slots proximate said disc tool for collecting major cuttings and a plurality of holes remote from said disc tool for collecting minor cuttings.

8. In a machine for folding and adhering the component parts of flat box blanks, each blank having a solidified coating thereon; the combination of

means for advancing a plurality of said solidified coated blanks individually and successively along a predetermined longitudinal path from a feeding zone, through an adhesive treament zone to a folding zone in said machine;

solidified coating removal means mounted along said path, in rear of said feeding zone and in advance of said adhesive treatment zone, for physically removing a longitudinally extending strip of the solidified coating on each successive blank on one face thereof;

said solidified coating removal means including:

a pair of rolls mounted to rotate on axes transverse to the path of said blanks, each on an opposite side of said path, one said roll having a sharp edged surface forming an unyieldable nip of predetermined clearance with the surface of the other said roll;

a pair of clamp rolls, each rotatable on an axis substantially parallel to said transverse axes, on one of the opposite sides of said one roll, the blank contacting surfaces of said rolls normally extending beyond the corresponding surface of said one roll and forming yieldable nips normally of less clearance than said predetermined clearance, with the surface of said other roll,

and means for rotating said one roll at high speed whereby each successive blank is yieldably clamped

in said yieldable nips while said one roll physically removes said strip of solidified coating from said blank in said unyieldable nip.

9. Apparatus for removing solidified coating from coated box blanks to permit the adhesion of difficult-to-bond blank surfaces, said apparatus comprising:

a frame adapted to be mounted on a folder-gluer machine in the path of the blanks being treated thereon;

a pair of rolls, rotatably mounted in said frame to form a nip through which said blanks must pass, one said roll being a smooth, hard faced fed roll and the other said roll being a coating removal tool with a sharp edged face, said rolls having a predetermined nip clearance for removing a longitudinal strip of said coating to a predetermined depth;

drive means for rotating said bed roll at the speed of advance of said blanks;

drive means for rotating said coating removal tool at substantially greater surface speed than the speed of said blanks, and

clamp roll means rotatably mounted on said frame op-

posite the smooth, hard face of said bed roll, said clamp roll means forming a resilient yieldable nip with said bed roll for pressing each blank thereagainst while said blank is subjected to the higher speed contact of said coating removal tool.

10. Apparatus as specified in claim 9 wherein:

said clamp roll means comprises a pair of resilient, deformable, yieldable, rubber-like tires, each freely revoluble on an opposite side of said coating removal tool in juxtaposition therewith, the circumerential faces of said tires normally extending radially beyond the corresponding face of said tool to engage the face of said bed roll but being deformable away therefrom when a blank is passing through said nip.

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BERNARD STICKNEY, *Primary Examiner.*