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LAMINATING MACHINE FOR PRODUCING COMPOSITE WEBS OF PAPER

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The present invention relates to web forming or laminating machines, as they are sometimes called, for producing composite or laminated webs of paper or other material, such webs, for example, as those used in blanking machines for making box blanks.

It is the object of the present invention to provide a machine of this type which shall produce a composite or laminated web from a plurality of separate webs of suitable material with great accuracy and at high speed.

More specific objects of the present invention are to improve many of the combinations and mechanisms forming essential parts of machines of this type, for example, to provide improved supporting means which will permit replacement of the exhausted rolls of web material with a minimum requirement of time and effort on the part of the operator; also improved adjusting mechanism for properly positioning the rolls and webs with relation to one another; also simple and efficient tension devices for the webs; improved adhesive applying devices, web guiding devices and devices for turning over or folding the margin of one web over the edge of another web.

To the above ends the present invention consists in a web forming or laminating machine having web supporting means along which rolls of web material may be each rolled on their supporting shafts from reserve to operative position, also having devices for adjusting the supporting means to provide for different widths of web, and for properly positioning the web with respect to other webs; also having a pair of rolls for applying glue or other adhesive to one or more of the webs in regulated amounts with provision for collecting and returning to the supply any excess delivered to the rolls; also having mechanism for rendering the gluing rolls inoperative by throwing the webs out of contact therewith; also devices for stopping the machine automatically should paper wind around the gluing rolls; also by providing web guiding devices having provision for adjusting to accommodate various widths of web and for positioning properly the web with respect to another web; also having independently yielding folding devices for tightly folding the margin of one web over and around the edge of another web; the folding devices having provision for adjustment for varying widths of web.

In the accompanying drawings which illustrate what is now considered to be the preferred construction, Fig. 1 is a top plan view and Fig. 2 is a side elevation with parts in section, both somewhat diagrammatic in character, of the complete laminating machine, showing a unit or stand A for supporting and supplying a roll or web of cardboard material, and a second unit B which comprises a stand for supporting and supplying two narrow rolls of reinforcing paper and a wider roll of white cover paper, together with devices for applying adhesive and assembling the webs to form a composite web of cardboard, reinforcing strips, and cover paper; Fig. 3 is a perspective view on an enlarged scale of the completed composite web; Fig. 4 is a side elevation and Fig. 5 a top plan view, also on an enlarged scale of, the stands for supporting the reinforcing strips and the cover paper; Fig. 6 is a vertical section on lines 6—6 of Fig. 4, showing the rolls of reinforcing paper and the roll of cover paper in operating position; Fig. 7 is a side elevation, on an enlarged scale, of the guides for directing the cardboard web to the assembly or pressure rolls; Fig. 8 is a top plan view of the same; Fig. 9 is a vertical transverse section on line 9—9 of Fig. 8 of the web guides and their adjusting screws; Fig. 10 is a top plan view, partly in section, on a still larger scale, of the cardboard web guiding devices, with the edge guide members removed; Fig. 11 is a fragmentary side elevation of the devices for applying adhesive to the reinforcing strips and to the cover paper; Fig. 12 is a top plan view of the same, with the pressure or assembly rolls omitted; Fig. 13 is a side elevation, on a still larger scale, showing the rolls applying adhesive to the reinforcing strips and the cover paper, the devices for applying adhesive to the rolls, and the collector for collecting and removing the excess adhesive from the ends of the rolls; Fig. 14 is a vertical transverse section of the same on line 14—14 of Fig. 13; Fig. 15 is a top plan view of one end of the adhesive applying rolls showing the adhesive collector in position for collecting and removing excess adhesive from the ends of the rolls; Fig. 16 is a side elevation, partly in section, showing the adhesive applying rolls and the web through devices in operative position for maintaining the webs out of contact with the adhesive applying rolls when the operation of the machine is stopped; Fig. 17 is an enlarged vertical section on line 17—17 of Fig. 12 showing the spring mounting at the ends of one of the adhesive applying rolls to permit such roll to move away from the other adhesive applying roll if the paper web should break and wind up on either roll, with a micro-switch positioned to stop the operation of the machine when such separation of the rolls and movement of a bearing block takes place; Fig. 18 is a side elevation of the folding device for folding the reinforcing strips and the edges of the cover paper around the edges of the cardboard web; Fig. 19 is a top plan view of the folding members and their supporting and adjusting mechanism; Fig. 20 is a vertical section, on an enlarged scale, of the folding members taken on lines 20—20 of Fig. 19; Fig. 21 is a similar vertical section on line 21—21 of Fig. 19; Figs. 22, 23 and 24 are sectional details on lines 22, 23, and 24, respectively, of Fig. 19, showing the action of the folding members or plows upon the edges of the cover paper and the reinforcing strips to fold the same around the edges of the cardboard web.

The composite web-forming or laminating machine illustrated in the drawing comprises two units, unit A is a stand or support for the two rolls of cardboard web, one roll supplying the web for immediate use while the other roll serves as an extra or spare to take the place of the first roll when the latter is exhausted. Unit B, where the composite or laminated web is assembled, is provided with a stand for two sets of pairs of rolls of reinforcing paper or the like, one pair of each set supplying the reinforcing strips for immediate use in the machine and the other pair being reserve or spare rolls for replacement use. The stand also carries a pair of rolls of cover paper, one feeding directly to the assem-
The stand of unit A, as shown in Figs. 1 and 2, comprises a pair of front end supports 25 connected by side members 27 with the rear supports 29. The front supports 26 are recessed at 31 to receive the ends of the spindle or roll upon which the active roll 35 of the cardboard web 37 is supported. A latch 38 is pivoted on the stud shaft 39 between the collars 40 and is provided with a semi-circular recess 41 in the bottom face to fit in the annular groove 42 in the shaft 33 and hold the shaft and roll in their axially adjusted positions. The inner end of stud shaft 39 is externally threaded and is mounted for rotation in an internally threaded bore in the side of the front member 25 by means of hand wheel 44 which the operator will actuate in one direction or the other to bring the roll 35 to some desired position.

The rear supports 29 are provided with similar bearing notches 42 and are fitted with a latch 45 pivoted on short stub shaft 46 fixed in the rear frame member 29. The latch 45 is provided with a recess on the bottom face which fits within the groove 42 on shaft 47 to hold the latter from axial displacement.

When the active roll 35 of cardboard becomes exhausted, the operator momentarily stops the feeding of the cardboard web and immediately attaches, by adhesive, the rear end of the web 37 to the front end of the web on the reserve or spare roll 49. He then raises the two pivoted latches 38 and 45 and turns them until they hang vertically downward. Then with suitable tackle or other means lifts the shaft 47 out of bearing notches 43 and 44 and clears out the shelves 61 on the top surfaces of the supports 29, lowering the shaft onto the side members 27.

Next he starts the feeding of the web 37 from the reserve or spare rolls and as the web is drawn off, the roll rotates and its shaft 47 begins to roll along the top of the side members 27. As soon as the rolling movement begins the operator withdraws axially the empty or spare shaft 33 from the notches 31 in the front end support 25, leaving these notches free to receive shaft 47 of the reserve roll. When this occurs he returns the latch 38 to horizontal position with its recessed end positioned in the groove 42 in shaft 33. Later, after the new active roll has been replaced and set in position, and has been made to rotate a few turns on its end, the latch 45 is returned to its normal horizontal position in notch 42.

The stand for the rolls of reinforcing strips and cover paper at the rear end of unit B, best shown in Figs. 4, 5 and 6, comprises a base having front and rear walls 55 and 57 respectively, each provided with top, intumescence bearing flanges 59 and connected by the side members 61. Mounted to slide toward and from one another on these bearing flanges are the two side base blocks 65 and middle block 66, having top and bottom guide or retaininig lips 67 and 69 on their front and rear edges, which embrace said bearing flanges.

Fixed upon the base blocks 65 are the vertical supports 71 of angle iron construction, each carrying at its top a pair of horizontal supporting bars 73 for the rollers of reinforcing strips, and lower down a shorter supporting bar 75 for the rolls of cover paper. The top bars 73 are notched at 77 to receive the shafts of the active rolls of reinforcing strips 78 and at 79 to receive the reserve rolls 80. The vertical supports 71 are provided with the inclined notches 81 to receive the active roll of cover paper 82, and the vertical notches 83 to receive the inactive or reserve roll 84.

To replace the active rolls of the reinforcing strips, it is only necessary to lift the bare shafts or spindles 85 out of their notches 77, lift the shafts 87 of the spare or reserve rolls 80 out of their notches 79 and then roll them on their shafts 87 along the horizontal bars 73 until they drop into notches 77. Similarly, a bare cover paper shaft 89 will be removed from the inclined notches 81, and the spare roll 84 lifted and rolled on its shaft 91 along the top of the support 75, and finally lifted to position its shaft in the inclined notches 81.

In order to maintain the active cover paper roll with one edge, that is, the left hand as viewed in Fig. 6, in engagement with the left hand support 71, and also to apply a suitable tension to the roll, a tension bar 93 is provided having pins 95 passing loosely through the walls of the right hand support 71, with tension springs 97 surrounding the pins and positioned between the tension bar 93 and the wall of the support 71.

Tension is applied to the reinforcing webs 99 by means of the tension bar 101 fixed between the front ends of each pair of top supporting bars 73, as shown in Fig. 4. As web 99 of the reinforcing strips passes over the tension bar 101 it is pressed against the same by the pressure shoe 103, adjustably mounted upon horizontal pins 105 which are pivotally mounted through the horizontal supporting members 73. A spring 109 secured at one end to the vertical arm of the bell crank lever 105, and at the other to the upward extension 111 of one of the horizontal members 73 presses the web of the reinforcing strip against the tension pin with sufficient pressure to maintain the tension upon the reinforcing strips 99. From bar 101 the reinforcing strips pass under fixed bar 112 from which they pass to the gluing devices. See Figs. 2, 11 and 16.

Tension is applied to the cardboard web 37 by means of two tension bars 113 under each cover paper web which is drawn. Tension is applied by the cover paper clips 115 by bars 116 and 117 beneath which the web passes, supplementing the tension imparted to the web by the tension device shown in Fig. 6.

In order to provide for the use of cover paper webs of varying widths for use with varying widths of cardboard, the means for supporting the cover paper rolls and the rolls of reinforcing strips, including the base blocks 65, the vertical supports 71 and the supporting bars 73 and 75 are provided, the flange 59 of the front and rear walls 55 and 57 of these bars and base supports are provided with side members 61 and 67, whereby the operator may easily and quickly adjust these parts transversely in accordance with the width of the cardboard web to be used.

These adjusting means, as shown in Figs. 4, 5 and 6, comprise a rotatable shaft 118 mounted at its extremities in the side members 61 of the base and at its middle in the member 66. This shaft is threaded outwardly in both directions from a plain middle portion 119, one section 120 having right hand threads, and the other section 121 having left hand threads. The base blocks 65 are provided with bores or holes to receive the shaft 118, and these bores are internally threaded with right and left hand threads corresponding to the threads on the portions of the shafts within the bores. A hand wheel 122 is fixed upon one projecting end of the shaft by means of which the latter may be rotated in one direction or the other, to adjust the parts for a wider or narrower cover paper web and for greater or smaller spacing of the reinforcing rolls from one another.

Means are also provided for adjusting the above-mentioned supporting devices for the cover paper roll and the reinforcing strip rolls as a unit, to bring the web from these rolls into proper register with the cardboard web. These means comprise the middle base block 66, with its ends mounted to slide along the bearing flanges 59 of the front and rear walls of the base.

Adjacent the rear end of this middle base block 66 is a plain transverse bore to receive the unthreaded middle portion 119 of the shaft 118, being held from movement...
lengthwise of said shaft by collars 123 secured thereto. Adjacent the front end of this middle block is another transverse bore which is internally threaded to receive the threaded middle portion 124 of the second shaft 122 rotatably mounted in the side members 61. Collars 126 are fixed on the shaft to hold the shaft from axial movement.

A hand wheel 127 fixed on the end of the shaft 125 provides convenient means for the operator to rotate the shaft 125 thereby moving the middle base block 66 transversely and with it shaft 119 and side blocks 65 carrying the supporting devices for the web, and thus adjusting the cover paper and the reinforcing strip rolls simultaneously as a unit without disturbing the spacing of the supporting means with respect to each other.

In the operation of the laminating machine of the type herein disclosed, the operator makes periodic inspection of the composite or laminated web delivered from the machine, to see, among other things, if the cover paper and reinforcing strips are properly registered with respect to the cardboard web. The operator makes such inspection while standing at the discharge end of the machine, that is, the extreme left hand end of the machine as seen in Figs. 1 and 2, and it is of advantage to provide a second hand wheel or other suitable means adjacent such operator's position, to enable him to readjust the supporting means for the cover paper and the reinforcing strips to bring such paper and strips back into proper position on the cardboard web. Accordingly, a second hand wheel 129 has been mounted upon the frame of the machine at its discharge end, and connected through a series of sprockets 130, 132, 134 and 136, and chains 131, 133 and 135 with shaft 125. Thus the operator may, without changing his position, manipulate the hand wheel 129 until he is satisfied from inspection of the composite web that the component webs have been brought into the proper register.

The cardboard web 37, the two webs of reinforcing material 99, and the web of cover paper 115 are assembled and united by the pressure rolls 137 between which the webs pass. Immediately prior to this assembling and uniting operation, the two reinforcing webs and the cover paper web are coated with glue or other suitable adhesive, which is applied to the lower faces of the reinforcing strips and the upper face of the cover paper by means of glue rolls, the reinforcing strips being reversed or turned through 180° so that the glue carrying face is uppermost and contacts with the bottom of the cardboard web, and also the glued face of the cover paper. A composite or laminated web is thus produced, the top layer of which is the cardboard web and the bottom layer the cover paper with the reinforcing strips between the adjacent side margins of the web and cover paper as shown in Fig. 3.

In order to control the position of the cardboard web 37 as it is presented to the pressure rolls 137, the web is passed from the tension bars 113 through the edge guiding devices shown generally at 139 in Figs. 1 and 2, and in detail in Figs. 7 to 10. These devices are adjustable not only with respect to one another to accommodate different widths of web, but also bodily as a unit to position the web accurately as it comes to the pressure or assembly rolls. These adjustments are secured by the following mechanisms.

Rotatably supported in the front and rear pairs of bearing blocks 141 and 143, mounted on the front and rear vertical members 145 and 147, respectively, of the frame are the front and rear transverse shafts 149 and 151, which carry a longitudinal member 153 and two side members 155 having the reinforcing blocks 156 at their rear and front ends. Fixed upon the top of the side members are the edge guides 157, as shown in Fig. 9.

Adjustment of these edge guides toward and from each other is provided in the following manner. The transverse shafts 149 and 151 are oppositely threaded outwardly from an unthreaded middle portion 159, as shown at 161 and 163 on shaft 149 and at 165 and 167 on shaft 151 in Fig. 10, and bores on the front and rear ends of the side members 155 are correspondingly internally threaded to receive the threaded portions of the shafts passing therethrough. Thus when the shafts 149 and 151 are rotated clockwise as viewed in Fig. 10, the side members and their edge guides will be cause to move apart to accommodate a wider cardboard web. Similarly, when these shafts are rotated in a counterclockwise direction, the members and their edge guides will move towards each other to take a narrower web.

Simultaneous rotation of the adjusting shafts 149 and 151 to maintain parallelism of the edge guides 157 is secured through the sprockets 169 and 171, fixed upon the right hand ends of the shafts, looking in the direction of movement of the cardboard web, shown by arrows 173, with connecting sprocket chain 175. Shaft 151 is actuated by the operator by means of the hand wheel 177 fixed upon the opposite end of the shaft 151 from the sprocket chain 171.

In order to adjust the cardboard web laterally of the pressure rolls, the edge guides 157 and their connected mechanism are arranged for bodily transverse movement as a unit in the following manner. Rotatably mounted upon the left hand end of the shafts 149 and 151, looking in the direction of the arrow 173 in Fig. 10, are the externally threaded sleeves 179 and 181, passing through internally threaded openings in the bearing blocks 141 and 143. Keyed upon the threaded sleeves are the sprockets 183 and 185 connected by the sprocket chain 187. Fixed upon the sleeves 179 on shaft 149 is the hand wheel 189 by means of which, through the sprocket and chain connection, the operator may simultaneously adjust transversely the shafts 149 and 151, and with them the edge guides 157 without altering the spacing of such guides from one another. Collars 191 and 193 fixed upon shaft 149 and collar 195 and pin 197 on shaft 151 insure lateral movement of both webs when the threaded sleeves 179 and 181 are rotated by the hand wheel 189.

The gluing mechanism is shown in detail on Figs. 11 and 12 and on an enlarged scale in Figs. 13 to 16. The two glue rolls 201 and 203 are rotatably mounted in the frame of the machine, the upper applying glue to the reinforcing strips and the lower to the cover paper. These rolls are geared together by means of gears 205 and 207 fixed upon the shafts 209 and 211 of the rear and front gluings rolls, respectively. These gears rotate in contact with one another in opposite directions. Gear 207 is driven by sprocket 213 and chain 215 from some suitable source of power, not shown.

In order to insure even distribution of the glue over both rolls, rear roll 201 is rotated at slightly lower speed than front roll 203 by means of a slightly larger gear 205 for driving roll 201 than gear 207 on shaft 211 of roll 203. Preferably the peripheral speeds of rolls 201 and 203 are slightly lower than the linear speeds of the reinforcing tapes 99 and of the cover web 115, respectively. These differences in speed, which are taken up by slight slippage of the tapes and web on their gluing rolls, assist in the distribution of the glue over the gluing rolls.

The glue or adhesive is supplied to the bite of the rolls through elbow 217 on the horizontal pipe 219 and vertical connections 221 with the gear pump 223, taking the glue from the bottom of the glue tank 225 through connection 227. The rate of discharge of the glue to the rolls is regulated by hand valve 229, which may be adjusted to by-pass more or less of the glue discharged by the pump and return it to the tank through the connection 231. A cut-off valve 233 is provided in the line with actuating handle 235 and connecting rod 237 to prevent dripping of the glue when the machine is out of operation. As the glue falls into the bite of the rolls midway their ends, it is spread lengthwise of the rolls by their rotation, any excess which reaches the ends of the rolls being delivered to the collectors 239 held against the ends of the rolls by the collars 241, and discharged.
into the inclined trough 243 beneath and returned through pipe 245 to the glue tank 225. Provision is made for holding the webs of reinforcing strips and the web of cover paper material out of contact with the glue rolls when necessary or desirable, as, for example, when the operation of the machine is to be stopped. This is done by means of throw-off bar 247 extending beneath the reinforcing strips 99, and the bars 248 and 249 between which the cover paper 115 passes. Bar 247 is carried on one arm 251 of the bell crank lever 252, pivoted at 253 on the frame of the machine, and having on the other arm 255 the spring pressed actuating handle 257. The inner end of which is positioned to enter the recess 258 in the frame of the machine when the handle is lowered. Bars 248 and 249 for the cover paper are mounted on arm 259 of the bell crank lever 252, pivoted on end of bar 117 and actuated by the other arm 261 of the bell crank lever with the spring pressed handle 262 and recess 263.

During normal operation of the machine the bell crank levers are in the position shown in Fig. 11, the bar 210 being lowered and held by gravity, out of contact with the reinforcing strips 99 with arm 255 in contact with stop pins 264 and 265 and engaging paper 248 and 249 being raised and held in position with the handle on arm 261 in recess 263 and the web of cover paper in contact with the glue roll 203. When it is desired to throw these webs out of contact with their respective gluing rolls 201 and 203, as, for example, when the machine is to be brought to rest, the handle 257 will be depressed by the operator to raise bar 247 and lift reinforcing strips 99 out of contact with their glue roll 201, the inner end of the handle entering recess 258 to lock the handle in lower position. The handle 257 will also be depressed to move the bars 248 and 249 away from the glue roll 203, thus withdrawing the web 115 of cover paper from contact with glue roll 203, the lever being supported in position by the handle 262 engaging the stop pin 264. The position of the web deflecting devices and of the webs is now as shown in Fig. 16.

The reason for the reversal of the reinforcing strips between the glue roll 201 and pressure rolls 203 as indicated at 267 is to permit the glue to be applied to the bottom face of the reinforcing strips, which are afterwards turned upside down so that the glazed surfaces will be applied to the bottom surface of the cardboard web 37.

In the operation of the machine it sometimes happens that the cover paper or one or both reinforcing strips tear apart between the glue rolls and pressure rolls, leaving the free end of the web sticking to a glue roll and winding up on the same as the roll continues to rotate. If the web is permitted to accumulate on the roll, the pressure from the other roll will result in breakage or other damage to the rolls and their adjacent mechanism.

In order to avoid the possibility of such damage to one of the rolls, the bearings for the rear roll 202 are in yielding supported bearing blocks 270 which normally press roll 202 towards roll 203, but which permit roll 202 to move away from roll 203 when pressure from the latter roll becomes excessive. Such movement only prevents the pressure on roll 202 from becoming excessive, at least for a time, but it also serves to actuate the means for cutting off the power supply to stop the machine.

The devices for cutting off the supply of power and stopping the machine when the gluing rolls are forced apart comprise a micro-switch 295 at each end of roll 201 with suitable connections, not shown, to the circuit of the power supply, and having a contact roll 297 carrying the contact points 299, positioned to be engaged by roll engaging lug 301 on the rear bearing block 273. When the latter is forced rearward by an accumulation of the web wound upon one of the glue rolls, the engaging lug 301 engages the roll 201 and the engaging actuating arm 297 of the micro-switch 295 tripping the latter to break the power circuit and stop the operation of the machine.

The web of cover material 115 is slightly wider than the web of cardboard 37 so that as the composite web leaves the pressure rolls there is at each edge a narrow margin of the cover paper projecting from beneath the edge of the cardboard web 37 with a narrow reinforcing strip between, as shown in Fig. 22, and the exposed top surface of the strip and the cover paper being coated with glue. As the final step in the making of the composite web, these projecting margins of cover and reinforcing paper are turned upwardly around the edge of the cardboard, and then downwardly onto the top surface of the cardboard, by means of a group of folding devices or plows shown generally at 363 in Figs. 1 and 2, and in detail in Figs. 18 and 19, and on an enlarged scale in Figs. 20 and 21, and their mode of operation is illustrated in Figs. 33, 23 and 24.

These plows consist of a bottom strip of metal 305 and a side strip 307 attached thereto which has its top surface substantially flush with the top surface of the bottom strip at the entrance end of the device, as shown in Fig. 22, but is progressively turned upwardly until it is vertical midway the end, as shown in Fig. 23, and then inwardly until it is parallel to the bottom strip 305, but spaced therefrom, as shown in Fig. 24, at the discharge end.

The plows are so mounted that they may be adjusted toward and from one another to accommodate different widths of web, and are also made slightly yielding, their front ends being movable inwardly toward one another under independent spring pressure and movable outwardly away from one another to take care of slight variations in the width of the cardboard web.

The bottom strips 305 of the plow are mounted upon longitudinally moving flat bars 309 having at their rear ends the depending lugs or supporting blocks 310 and 311, respectively. Each of the blocks 310 is provided with a transverse bore internally threaded to receive right and left hand threaded portions of the rear and front transverse shaft 315 and 317 respectively, the latter being mounted for rotation in bearings carried by the brackets 319 secured to the frame of the machine. The shafts are provided at one end with sprockets 321 connected by
chain 322 so that when shaft 315 is rotated by its hand wheel 335, shaft 317 will also be rotated in the same direction and to the same extent. Thus the plows may be easily and quickly adjusted toward or away from each other to accommodate different widths of webs.

In order to permit each plow to yield slightly at its front end transversely of the web and independently of one another, each supporting strip 305 is pivotally mounted at its rear end on pivot stud 327 which passes loosely through the rear end of bar 295 with its upper end threaded and screwed firmly into the rear end of a bottom strip 305. See Fig. 22. The front ends of the plow members are given limited transverse movement by means of the studs 329 passing through transverse slots 331 in the front ends of bars 309 with their upper ends threaded firmly into bottom strips 305. See Figs. 19 and 24.

The front end of the plow members are normally pressed yieldingly towards each other by means of compression springs 333, seated in the recesses 335 in the front supporting blocks 313 with their free ends projecting through and engaging the depending fingers 337 fixed upon the side strips 307 of the plow members. See Fig. 21. The plow members are thus held yieldingly and independently of one another against the side edges of the web, moving slightly towards and away from one another in slight variations in the width of the web may require, but is thus under close contact at all times to insure the folding of the cover paper tightly around the edges of the cardboard web and reinforcing strips.

From the plows the assembled composite web passes between the final pressure rolls 347 which press the turned over margins of the cover paper 115 and reinforcing strips 99 down firmly against the top surface of the cardboard web 37 and then discharge the completed web from the machine.

The operation of the machine shown in the accompanying drawings and above described, is as follows: A roll of cardboard slightly less in width than the desired width of the composite laminated web to be produced is mounted in the front of the rear unit 1, and adjusted axially by the operator means of the hand wheel 44. If space permits the reserve roll of the same material is mounted in the rear end of the unit.

The strips and the paper are applied to the cardboard web as it passes between the idler pressure rolls 347, through the reinforcing rolls 137, and the pressure rolls 307, and between the final driven pressure rolls 347.

The reinforcing strips are fed from the rolls over the tension bar 101, beneath the pressure shoe 103, beneath the stationary bar 112, over the bar 247 which is then in raised position to hold the tapes out of contact with the glue roll 201. The front end of the tapes are then given a 180° twist and are passed through the pressure roll 137 beneath the cardboard web through the plows, and then between the final pressure rolls 347.

The cover paper is passed from its roll under fixed tension bars 116 and 117, and thence between rolls 249 and 249 which are in position to hold the cover paper web away from the gluing roll. The web is then passed through the inner pressure rolls 137, beneath the reinforcing tapes and the cardboard web, thence through the plows, and finally through the final pressure rolls 347 which have been rendered inoperative by raising the upper roll by hand actuated devices, not shown.

The cardboard web roll and guides 139 are now adjusted to present the cardboard properly to the pressure rolls, and the supporting devices for the reinforcing strips and the cover paper are adjusted transversely to position the strips and the paper properly upon the bottom surface of the cardboard web at the inner pressure rolls.

Preferably the machine is started and operated in the following manner: Glue having been supplied to the glue tank, the machine is set in operation to cause the final pressure rolls 347 to rotate, but with the upper roll raised so that the webs and tapes remain motionless at the same time the glue pump and gluing rolls are set in operation. The valves in the glue conveying pipes are now opened and adjusted to deliver the desired quantity of glue to the rotating gluing rolls, roll 201 being also adjusted toward or from roll 203 to secure the proper thickness of the film of glue upon the rolls.

Now the machine is stopped to bring the glue rolls to rest. The upper pressure or feed roll 347 is lowered upon the stationary web, and the bell crank levers are actuated to bring the tapes and cover paper into contact with their respective glue rolls. Immediately the machine is set in operation, causing the cardboard web, reinforced tapes, and cover paper to advance through the several instrumentalties, and to be assembled and united to form the complete composite web which is finally discharged from the front end of the machine.

If the machine has to be stopped temporarily for any reason as, for example, to replace an exhausted roll of cardboard, the operator, as the machine is coming to rest or immediately thereafter, actuates the bell crank levers to move the reinforcing tapes and cover paper out of contact with the gluing rolls, and raises the upper pressure or feed roll 347. The machine is then immediately started in operation again, with the pressure rolls inoperative to feed the webs, but the gluing rolls rotating and glue continuing to flow to them.

As soon as replacement of the cardboard or other web has been effected, the machine is stopped bringing the glue rolls to rest. Immediately the upper pressure or feed roll is lowered upon the web and the bell crank levers are actuated to bring the tapes and cover paper into contact with their respective glue rolls. The machine is then started and assembled and unites the several webs to form the complete composite web. By starting and stopping the machine in this manner the waste of web materials in the starting and stopping operations is reduced to a minimum. Furthermore, the danger of having the stationary webs wind up on the rotating glue rolls is avoided.

If during the operation of the machine the operator observes any improper positioning of the reinforcing strips and cover paper along the cardboard web, he will readjust the proper supporting and guiding devices for these webs by actuating the appropriate adjusting hand wheel or wheels without stopping the machine.

This application is, in part, a division of our pending application Serial No. 714,234 filed December 5, 1946, now abandoned and also of our pending application Serial No. 13,388, filed March 6, 1948, now abandoned.

While in the accompanying drawings and in the foregoing specification the present invention is shown and described as embodied in a laminating machine for producing a composite web of cardboard, reinforcing paper strips and cover paper, the invention is not limited to such materials, nor to the specific forms and arrangements of mechanisms as therein shown and described except as hereinafter specifically set forth in the claims, but may be embodied in other forms and arrangements, and operated upon other suitable materials to form composite or laminated webs adapted for many different uses and in many different types of machines for producing many different articles.

Having thus described the invention, what is claimed is:

1. A laminating machine having, in combination, a pair of rolls, mechanism for rotating the rolls in opposite directions, the rolls being held in close relation to form a bite, means for supplying a spreadable adhesive material to the roll surfaces entering the bite, means to adjust the bite of the rolls to smooth and spread said material thereon, means for feeding a pair of webs to be...
11 joined having provision for causing one web to bear upon one roll and the other web upon the other roll, said webs passing over the rolls externally of the bite, and means to join the coated webs.

2. A laminating machine having, in combination, a pair of rolls, mechanism for coupling the rolls and for rotating them in opposite directions, the rolls being held in close relation to form a bite, means for supplying a spreadable adhesive material to the roll surfaces entering the bite, means to adjust the bite of the rolls to smooth and spread said material thereon, means for feeding a pair of webs to be joined having provision for causing one web to bear upon one roll and the other web upon the other roll, said webs passing over the rolls externally of the bite, and means to join the coated webs.

3. A laminating machine having, in combination, a pair of rolls, a pair of gears coupling the rolls, mechanism for rotating the gears, the rolls being held in close relation to form a bite, means for supplying a spreadable adhesive material to the roll surfaces entering the bite, means to adjust the bite of the rolls to smooth and spread said material thereon, means for feeding a pair of webs to be joined having provision for causing one web to bear upon one roll and the other web upon the other roll, said webs passing over the rolls externally of the bite, and means to join the coated webs.

4. A laminating machine having, in combination, a pair of rolls, mechanism for rotating the rolls in opposite direction, the rolls being held in close relation to form a bite, and said mechanism producing different peripheral speeds of the adjacent roll surfaces at the bite, means for supplying a spreadable adhesive material to the roll surfaces entering the bite, means to adjust the bite of the rolls to smooth and spread said material thereon, means for feeding a pair of webs to be joined having provision for causing one web to bear upon one roll and the other web upon the other roll, said webs passing over the rolls externally of the bite, and means to join the coated webs.

5. A laminating machine having, in combination, a support to hold a pair of rolls in close relation to form a bite, limiting means for one of the rolls defining the closest proximity of the rolls at the bite, said support including means for yieldingly urging the rolls to close the bite, mechanism for rotating the rolls in opposite directions, means for supplying a spreadable adhesive material to the roll surfaces entering the bite, said limiting means including provision to adjust the bite of the rolls to spread and smooth a material thereon, means for feeding a pair of webs to be joined having provision for causing one web to bear upon one roll and the other web upon the other roll, said webs passing over the rolls externally of the bite, and means to join the coated webs.

6. A laminating machine having, in combination, a pair of rolls, mechanism for rotating the rolls in opposite directions, the rolls being held in close relation to form a bite, means for supplying a spreadable adhesive material to the roll surfaces entering the bite, said means comprising a reservoir for the adhesive, a pump and connections for delivering the adhesive to the downwardly moving, adjacent faces of the rolls intermediate their ends, scrapers for scraping the excess adhesive from the ends of the rolls, and conductors for conducting such excess to the reservoir, means to adjust the bite of the rolls to smooth and spread said material thereon, means for feeding a pair of webs to be joined having provision for causing one web to bear upon one roll and the other web upon the other roll, said web passing over the rolls externally of the bite, and means to join the coated webs.

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