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(54) A BOOK COVER APPLICATOR

(71) We, NORFIN, INC., a corporation organised under the laws of the State of Washington, United States of America, of 526 First Avenue South, Seattle, Washington 98104, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

This invention relates to a book cover applicator for applying a cover to a multiple sheet or book block which may be made up of a stack of sheets, signatures or folios which have been secured together along one edge. The invention is suitable for use in making for example hard cover books, paper backs, notebook pads and pamphlets. The invention also includes a method of applying a cover to a multiple sheet filler.

Modern bookbinding machines are complex generally automated devices designed primarily for large scale mass production bookbinding operations in which sheets are fed to a holding device, and assembled into multiple sheet signatures or folios which are then stitched and bound to covers. These machines, however, cannot be used effectively and economically in small scale bookbinding operations in which limited numbers of for example books are to be bound. Books of this type are commonly assembled by a sheet sorter or collator which operates in line with a duplicator or press and deposits the sheets in stacks into an array of receiving bins, jogs the stacked sheets so as to align at least one of their edges in a single plane, and secures or bonds the sheets together along the one aligned edge or spine to form a book block or filler. Until this invention, book covers have commonly been applied to this type of book in small scale bookbinding operations almost entirely by hand.

As used in this specification the terms "book block" and "filler" are synonomous and mean a stack of individual sheets, bound or stitched folios, or signatures which have been bonded together along one edge forming the spine. A "book" will be understood to comprise a "filler" or "block" and a "cover" bonded to the filler or block along its spine.

According to this invention there is provided a book cover applicator for applying a cover to a multiple sheet filler having a spine coated with a heat activatable adhesive, comprising:-

a support surface supporting the filler and cover at a cover applicator station for bonding of a portion of the cover to the spine of the filler; heating means mounted adjacent the support surface at the cover applicator station, the heating means being movable between a position engaging the spine with the cover portion and a position out of engagement with spine and cover portion, and the heating means being constructed and arranged to remain in the said engaging position for a period of time sufficient to activate the spine adhesive and effect an adhesive bond between the spine and a portion of the cover; and clamping means for holding the portion of the cover and filler in a fixed position during bonding of the portion of the cover to the spine. The invention also includes a method for applying a cover to a multiple sheet filler having a spine coated with a heat activatable adhesive, comprising:- activating the adhesive; de-activating the adhesive while simultaneously therewith engaging the spine with the cover for a time period sufficient to produce an adhesive bond formed by the adhesive between the spine and cover; applying hold-down pressure only at a location spaced from the spine during the activating step; and applying hold-down pressure only adjacent the spine during the deactivating step.

One such adhesive, herein referred to as a "hotmelt" adhesive, is a heat activatable adhesive which is liquid at temperatures above its melting point but which is a solid polymer at ambient temperature. The book cover applicator of the invention can be used effectively and economically to apply covers rapidly to books in batches suitable for commercial requirements.

Whilst manual feeding of the covers and fillers will be described below, automated feeding or conveying apparatus may be used.

The invention will now be described by way of example, with reference to the drawings, in which:-

Figure 1 is a perspective view of the book cover applicator of this invention with parts broken away;

Figure 2 is a top view of the book cover applicator of Figure 1 taken along lines 2-2 of Figure 1 with parts broken away;

Figure 3 is a side elevational view of the book cover applicator of Figure 1 taken along lines 3-3 of Figure 2;

Figure 4 is a fragmentary cross-section taken along lines 4-4 of Figure 3 with the position of the blower shown in phantom;

Figure 5 is a fragmentary cross-section taken along lines 5-5 of Figure 3 with parts broken away;

Figure 6 is a cross-section taken along lines 6-6 of Figure 2;

Figure 7 is a cross-section taken along lines 7-7 of Figure 2 with parts broken away;

Figures 8-13 are schematic outlines depicting operation of the book cover applicator of Figure 1;

Figure 14 is a circuit diagram of the electrical control system of the book cover applicator of Figure 1;

Figure 15 is a perspective view of a second preferred embodiment of the book cover applicator of this invention.

The book cover applicator of Figures 1-3 includes a generally rectangular housing open at its rear end (right end as viewed in Figure 1) and upper midsection. The housing is made up of two mutually parallel left and right side walls 10 and 12 respectively spaced apart at their ends by two pairs of transverse end rods 14 therebetween. A U-shaped front wall 16 is secured to the forward two rods 14. Forward and rear horizontal support plates 18 and 20 respectively extend between the forward and rearward upper edge portions of the side walls. These support plates are spaced longitudinally from each other by mutually opposed generally U-shaped recesses 22 in the upper edges of the side walls intermediate the lengths thereof. A multiple sheet filler or block S having hot melt adhesive applied to its spine, (Figure 3) is laid flat on the forward support plate 18 with its spine adjacent a cover applicator station. This station extends in a line transversely across the applicator housing adjacent the rear edge of the forward support plate 18, as shown (Figure 6). As most clearly shown in Figure 8, a cover C which is to be secured adhesively to the spine of the filler is also laid flat upon the two support plates: one-half underneath the filler S between the latter and the top surface of the support plate 18, the other half bridging the side wall recessess 22 and resting partially on the top of the rear support plate 20. The middle portion of cover C is scored such that the cover C is foldable in half conformably about the filler spine, as shown (Figure 6). The filler S and cover C are laid upon and removed from the book cover applicator one at a time in manual or non-continuous fashion; however, automated apparatus for feeding, positioning, holding, or removing both fillers S and/or covers C may be provided, if desired. The book cover applicator depicted in the example of Figure 1 is compact, lightweight, and can be placed on for example a table top during operation, although other means of support, of course, may be provided, if desired.

The filler spine is coated entirely or at spaced intervals with a hotmelt adhesive. The adhesive is an adhesive which is a liquid at temperatures above its melting point and a solid polymer at ambient temperature. Preferably the adhesive has a short setting time during which it changes from its liquid to solid form when cooled from a temperature above its melting point to ambient temperature. For best results, the adhesive in its solid form also should provide a strong, flexible bond between the sheets of the filler S and between the filler spine and cover C. It will be recognized, of course, that other types of adhesives may be used.

The filler S and cover C are secured in position in the support plate by two clamps: a sheet clamp 24 engageable with the topside of the main body of the filler S and a spine clamp 26 engageable with the spine and adjacent portion of the cover C once the front half of the cover has been folded about and conformably engaged with the spine.

As best shown in Figures 1 and 3, the sheet clamp includes a generally flat, rectangular pressure plate 28 loosely supported between two mutually opposed horizontal end bars 30 to tilt relatively to the end bars such that the flat portions of the clamp plate underside conformably engage the topside of the main body of the filler S. The plate 28 is formed to include two spaced-apart V-shaped transverse channels, the forward of which is interengaged with a mounting rod 32 (Figure 3) extending underneath the plate between the sheet clamp end bars. The rear end of the plate 28 is secured to the end

bars by springs 34 (Figure 3). The lower end of each spring 34 is secured to the rear edge of plate 28, while the upper end thereof is engaged with a pin which projects from the adjacent end bar 30, as seen in Figure 3. Vertical guide rods 36, fixed to the midsections of the end bars 30 and extending through the sheet clamp plate just forwardly of rear V-shaped channel thereof, are slideably movable up and down between guides 38 which are secured to the outer surfaces of the housing side walls. The guide rods 36 extend through coil springs 40 which seat on top of the guides 38. These springs engage and bias the sheet clamp plate 38 upwardly when the sheet clamp is pulled down and engages the filler S.

The sheet clamp 24 is caused to vertically reciprocate by two outer cams 42 adjacent the respective outer surfaces the housing side walls (right outer cam not shown). These cams are secured to the ends of a cam shaft 44 extending between the housing side walls. An electric motor 46, mounted on the inside of the left side wall 10, as shown (Figure 2), is connected with the left side of the cam shaft by a chain 48. When energized by the electrical control circuit of Figure 14, presently to be described, this motor rotates the cam shaft 44. The guide rods 36 are adjustably connected at their lower ends to the upper ends of elongated, notched, vertical connecting arms 50 (right connecting arm not shown in Figures 1 and 3). Pivotally movable cam follower arms 52 are pivotally connected intermediate their ends with the lower ends of the connecting arms 50 to swing in a vertical plane adjacent the outer faces of the housing side walls. Follower rollers 54, rotatably mounted on the rear ends of the arms 52, are biased upwardly into engagement with the outer cams 42 by action of the springs 40. As these rollers follow the outer cam surfaces during rotation of the shaft 44, the arms 52 and, hence, the sheet clamp 24 are moved vertically between their clamping and release positions which are depicted in Figures 9 and 8, respectively.

The spine clamp 26 folds the cover C about the filler spine and clamps the interengaged portions of the cover and spine to the supporting plate adjacent the gluing station line. The spine clamp 26 includes an elongated nipper bar 56 having an upwardly inclined bottom face 57 (Figure 3). The spine clamp nipper bar 56 extends between the housing side walls and projects at each end transversely outwardly therefrom. The nipper bar is mounted between two pivotally mounted arms 58 to swing vertically between a lowered retracted position and an upright position. The retracted position is depicted in broken lines in Figure 3 wherein the bar extends through and is nestled within the side wall recesses 22, and the upright position is depicted in solid lines in Figure 3 wherein the bar registers with the cover and overlies the filler spine. Cam actuated heater means presently to be described drive the spine clamp from its lowered retracted position to its upright position. The bottom face 57 of the nipper bar allows the cover to remain in a semi-folded position and hence minimizes or eliminates creasing or scoring of the cover C when the spine clamp is in its upright position.

Both spine clamp arms 58 are rotatably supported on a two part pivot shaft (see Figure 5) which includes an inner shaft 60 and an outer shaft 62 concentric with and movable independently of the inner shaft. The outer shaft 62 serves to mount the heater bar presently to be described. The spine clamp arms 58 are mounted on the outer ends of the inner shaft 60 which project outwardly from the housing side walls through elongated slots in the arms 58. The arms can slide along these slots relative to the shaft 60 between an extended position (Figures 3 and 13) and a contracted position (Figures 10 and 11) when the spine clamp is in its upright position. Compression springs 64, seen most clearly in Figure 5, normally bias the spine clamp arms to their extended positions and cam means, presently to be described, produce a downward pull on the arms to clamp the nipper bar 56 against the cover and spine. As the left spine clamp arm is pulled downwardly away from its extended position, it engages and closes the first of three motor control switches 65a, 65b and 65c electrically connected with the control circuit of Figure 14. The first motor control switch 65a is mounted on the outside of the left side wall as viewed in Figures 1 and 3.

In addition to operating the sheet clamp 24 as described, the outer cams 42 further serve to operate the spine clamp arms 58 by causing them to move vertically between their extended and contracted positions. Rocker plates 66 are pivotally mounted to swing in respective vertical planes adjacent the outer faces of side walls and serve to interconnect the spine clamp arms 58 with the outer cams 42. The rocker plates 66 terminate at their rear ends adjacent the arms 58 in bifurcated extensions 68 which connect to slotted links 70. These links are pivotally connected at their upper ends with the lower ends of the spine clamp arms 58. Such movement of the rocker plates 66 is caused by cam follower rollers 72 (Figure 3) mounted on the forward ends of the rocker plates. These rollers engage and follow the surface of the outer cams 42. Thus with the spine clamp arms 58 in their upright positions, upward movement of the front ends

of the rocker plates 66 causes the arms 58 to be pulled downwardly against the bias of the springs 64 by virtue of their slotted engagement on the shaft 60. A shoulder 66a formed on the rear face of each rocker plate 66 engages and maintains the spine clamp arms 58 vertical when the rocker plates 66 are swung to their raised positions and the spine clamp is in its contracted position, as shown (Figure 10). The springs 64 return the arms 58 to their extended positions as the plates 66 return to their lowered positions of Figure 3. The second motor control switch 65b mounted on the outside of the left side wall is engaged and closed by an operator 76 projecting forwardly from the left rocker plate, when the left rocker plate reaches its lower position, depicted in Figure 3.

An electrical resistence heater bar 78, rectangular in cross-section, is mounted between pivotally movable arms 80 fixed to the outer shaft 62 of the two part pivot shaft (see Figure 5). The heater bar 78 swings between a retracted position depicted in broken lines in Figure 6 in which it is nestled within the side wall recesses 22 between the housing side walls and an upright position depicted in solid lines in Figure 6 in which its forward face contacts the folded cover and filler spine. The right heater bar arm 80 engages and closes the third motor control switch 65c (Figures 1 and 6) when it is at its retracted or lowered position. The heater bar arms project above the upper edge of the heater bar 56, as seen most clearly in Figure 1, and are engageable with the rear face of the spine clamp bar 56 such that the two are moved conjointly to their upright positions, as depicted in Figure 6.

The cam shaft 44 also mounts two spaced apart inner cams 84 for operating the heater bar between its upright and retracted positions. It is these inner cams which drive both the heater bar and the spine clamp from their retracted to their upright positions. Crank arms 86 are fixed to the outer shaft 62 and are pivotally connected to reciprocal follower plates 88 (see Figures 4 and 5), which are driven by the inner cams 84, to swing the heater bar vertically as the follower plates reciprocate in a vertically inclined direction indicated by the arrow in Figure 6. The lower ends of the follower plates 88 are provided with an elongated slot 87 (Figure 6) in which the cam shaft 44 is slidably engaged. Follower rollers 89, which are mounted between each pair of follower plates intermediate the lengths thereof, engage the surfaces of the inner cams. As these rollers follow the contour of the inner cams 84, the follower plates are reciprocated in the vertically inclined direction indicated, and hence the heater bar is swung between its upright and retracted positions.

To accommodate fillers of varying thickness, the support plate can be raised and lowered so that the upper face of the filler S is substantially flush with the upper edges of the housing side walls. As most clearly shown in Figures 4, 5 and 7, the forward and rear support plates 18 and 20 are supported at each side by left and right vertical positioning plates 90 and 92 which are interconnected by a U-shaped horizontal operator member 94 (shown in plain view in dotted lines in Figure 2). The operator member is supported between spaced-apart pairs of mounting pins which project inwardly from each side wall. Each of the positioning plates 90 and 92 includes an upper recess which registers with the side wall recesses 22 and oppositely inclined end edges which merge with generally vertical, parallel side edges 95. The side edges 95 are slidably engaged between the side wall mounting pins 96 such that the positioning plates are movable vertically between and guided by these pins. The operator member 94 includes connecting pins 97 which project through parallel inclined slots 98 in the positioning plates, as shown (Figure 7), such that horizontal reciprocation of the operator member 94 along the longitudinal axis of the housing causes the positioning plates to be raised and lowered. The forward mid-point of the operator member 94 is threadably engaged with an external hand crank actuator 100 mounted in the housing front wall 16. This actuator may be operated to reciprocate member 94 along the longitudinal axis of the housing to simultaneously raise or lower the front and rear support plates 18 and 20 respectively.

To accommodate and align fillers S and covers C of varying lengths relative to the gluing station, forward positioning pins 102 and a single rear pin 104 may be provided. The forward positioning pins 102 project above the surface of the support plate 18 and are secured to a flange 106 mounted on the front wall of the housing, as shown (Figure 7). The rear positioning pin 104 is secured to and projects above the surface of the support plate 20, as shown (Figure 7). The positions of the forward and the rear positioning pins may be varied along the longitudinal axis of the housing as desired.

A blower 108 (Figures 1-3), supported by a vertical mounting plate 110 secured between the rear rods 14, terminates in a horizontally disposed elongated nozzle 112 which extends perpendicular to the longitudinal axis of the housing. The nozzle is located so as to direct cooling air against the cover and filler spine at the gluing station.

Operation of the book cover applicator of this invention will now be described with reference to Figures 3, 6, and 8-13 of the drawings.

With the book cover applicator in the

condition depicted in Figure 8, the cover C is laid flat on the support plate, one half of the cover resting upon the supporting plate 18 and the other half of the cover bridging the housing side wall recesses 22 and resting flat on the support plate 20. The cover score lines along which the cover is bent and applied to the filler spine are located adjacent the cover applicator station line. A filler S, having its spine coated with a hotmelt adhesive, is then laid flat on top of the cover C on the forward support plate 18 with its spline aligned with the appropriate score line of the cover adjacent the cover applicator station line.

The cam drive motor 46, when energized, simultaneously rotates the inner and outer cams 84 and 42 in a clockwise direction as indicated by the arrows in Figures 3, 6 and 8-13. As the outer cams 42 move from the position shown in Figure 8 to that shown in Figure 9, the sheet clamp cam follower arms 52 are driven downwardly and, hence, the sheet clamp 24 is drawn downwardly into engagement with the top surface of the main body of the filler S against the bias of the springs 40. Thereafter, as depicted in Figure 6, the inner cams 84 contact the rollers 89 to drive the heater bar follower plates 88 in an upward inclined direction so as to swing both the heater bar 78 and the spine clamp 26 from their retracted to their upright positions. As the spine clamp is thus swung to its upright position, it engages the underside of the rear or free portion of the cover C and folds the cover in half about its score lines such that the cover C conformably engages the filler spine. At its upright position, the front face of the heater bar 78 contacts the interengaged cover and filler spine and begins to apply heat to the hotmelt adhesive on the spine. As outer cams 42 continue to rotate, they cause the spine clamp arms 58 to be drawn downwardly toward their contracted or clamping positions at which the lower inclined face of the spine clamp nipper bar will engage the spine and the portion of the cover C engaged therewith, as depicted in Figure 10.

Before the spine clamp reaches its clamping position, however, the first motor control switch 65a is closed. (This takes place just after the spine clamp is pulled downwardly from its upright position of Figure 3 but before it reaches its clamping position of Figure 10). The first motor control switch 65a actuates a heating dwell timing circuit (Figure 14) and causes the cam drive motor 46 to be de-energized momentarily. Thus rotation, of the inner and outer cams is halted for a time interval of sufficient duration to allow the hotmelt adhesive to be melted sufficiently to its liquid form to coat both the filler spine and the portion of the cover C engaged therewith. Inasmuch as heat application takes place before the spine clamp engages the filler spine and cover C, uniform melting of the glue can occur such that lumps and similar discontinuities in the glue are allowed to spread evenly, and heat is distributed uniformly. At the end of the heating dwell time interval, the drive motor is again energized and the inner and outer cams continue to rotate in the clockwise direction and the spine clamp reaches its clamping position (Figure 10). Now the sheet and spine clamps, and the heater bar simultaneously engage the filler spine and the cover C. Such simultaneous engagement aligns the filler spine and cover, and ensures that the now molten glue will spread between and contact both. As depicted in Figure 11, further clockwise rotation of the outer cams 42 allows the sheet clamp 24 to be returned to its raised position under the bias of the springs 40. At about the same time, the inner cams 84 rotated sufficiently to allow the heater bar follower plates 88 to slide downwardly a sufficient distance to allow the heater bar to swing downwardly to its retracted position, as depicted in Figure 12. The rocker arm shoulders 66a hold the spine clamp upright in its clamping position.

Upon the right heater bar arm 80 reaching its retracted position, the third motor control switch 65c is closed. This switch actuates a cooling dwell timing circuit (Figure 14) and again momentarily de-energizes the cam drive motor, thus halting rotation of the inner and outer cams for a time interval of sufficient duration to allow the hotmelt adhesive to cool and set. During this cooling dwell the spine and cover are engaged by the spine clamp alone. Once set, the hotmelt adhesive provides a strong, flexible bond between the filler spine and cover. To assist cooling the hotmelt adhesive, the blower 108 and nozzel 112 direct an air blast against the now exposed cover and filler spine. Preferably, the blower operates continuously as does the heater bar. At the end of the cooling dwell time interval provided by the cooling dwell timing circuit, the drive motor is again energized and clockwise rotation of the inner and outer cams continues. As depicted in Figure 13, such continued rotation of the outer cams 42 allows the spine clamp arms 58 to first return to their extended positions under the bias of their compression springs 64 and then swing downwardly until the spine clamp 26 resumes its retracted position.

The second motor control switch 65b is closed when the left spine clamp rocker arm 66 reaches its lowered position depicted in Figures 13 and 8. This switch causes the drive motor to be de-energized at the end of the cover application process. The sheet and spine clamps are now in their original positions of Figure 8 ready for application of

another cover C.

With operation of the book cover applicator of this invention in mind, the electrical control system used will now be described with reference to Figure 14 of the drawings.

The electrical control system is made up of a DC electronic motor control circuit which includes the abovementioned three motor control switches 65a-65c, and an AC motor circuit which includes the cam shaft drive motor 46. These two circuits are respectively connected electrically with sources of DC and AC power. They are coupled to each other by an optical isolator 120 of conventional design which comprises an incandescent light 122 and a photoresistor 124 which are electrically connected in the DC and AC circuits, respectively. A transistor 126 controls DC current flow through the light 122. When this transistor is in its conductive state, light 122 emits light which lowers the resistance of the photoresistor 124. A triac 128 in the AC motor circuit and connected by leads 129 with the photoresistor 124, as shown, becomes conductive when the resistance of the photoresistor 124 is lowered to a certain level. The cam shaft drive motor 46 is then energized with AC power and begins rotating the cam shaft, as described above. The heater bar and blower are operated continuously by the same or generally similar AC power source as that associated with the AC motor control circuit indicated schematically in Figure 14.

The conductive and nonconductive states of the transistor 126 are controlled by a motor control logic circuit 130 of conventional design. This circuit is connected by lead 131 with the base of transistor 126. A reset circuit 132 produces a signal in lead 133 to clear the logic circuit 130 when DC power is first applied to the DC motor control circuit. To initiate a cover application sequence, which begins with the filler, cover, and applicator in their positions of Figure 8, start switch 134 is momentarily closed manually. The logic circuit 130 receives the signal from start switch 134 along lead 136 and causes the transistor 126 to become conductive, thus energizing the drive motor 46 which rotates the cam shaft 44 as described above.

When the first motor control or heating dwell switch 65a is closed in response to downward movement of the spine clamp 26 toward its clamping position (see Figure 10), a signal is produced in lead 138 to the logic circuit 130 which causes the transistor 126 to become nonconductive, thus de-energizing the drive motor 46 which halts rotation of the cam shaft. A second signal is produced simultaneously in lead 140 to a heating dwell timing circuit 142. This circuit includes conventional time delay circuitry, the time constant or time delay of which can be varied by means of an external adjustment (not shown). Thus, it is possible, by selecting a time delay of sufficient duration, to use different types of hotmelt adhesive having differing melting times. At termination of the heating dwell, the timing circuit 142 transmits a signal along lead 144 to the logic circuit 130 which then causes transistor 126 again to become conductive, thus re-energizing the drive motor 46 which continues rotating the cam shaft.

When the third motor control or cooling dwell switch 65c is closed in response to return of the heater bar to its retracted position (see Figure 12), a signal is produced in lead 146 to the logic circuit 130 which again causes the trnsistor to become nonconductive, thus de-energizing the drive motor 46 which halts cam shaft rotation, as before. A second signal is produced simultaneously in lead 148 to a cooling dwell timing circuit 150, the output of which is connected with the logic circuit 130 by lead 152. This circuit is generally similar to the heating dwell timing circuit 142 described previously and can be adjusted to enable use with hotmelt adhesives of differing setting times. At termination of the cooling dwell, the timing circuit 150 causes the drive motor to be re-energized, as before.

When the second motor control or stop switch 65b is closed in response to return of the left rocker plate to its lowered position (see Figures 8 and 13), a signal is produced in lead 154 to the logic circuit 130 which cause the drive motor 46 to be de-energized and cam shaft rotation halted, as before. The applicator is now in its initial position of Figure 8.

To reverse the drive motor 46 at any time during the cover application process, a reverse switch is provided. This switch includes a DC component 156 and an AC component 156'. When operated, the DC component 156 produces signals in leads 158 and 160 which are respectively connected with the reset circuit 132 and with the logic circuit output lead 131. In response to the signal in lead 158, the reset circuit 132 transmits signals along leads 162 and 164 to the heating and cooling dwell timing circuits 142 and 150, respectively. These signals prevent operation of both timing circuits until electrical transients produced by reversal of the drive motor have dissipated from the electrical system. The reset circuit 132 also clears the logic circuit 130, as before. The signals produced in lead 160 cause transistor 126 to become conductive and hence cause the drive motor to be energized. Simultaneously, the AC switch component 156' causes the now energized drive motor to reverse its direction of rotation.

A second preferred embodiment of this

invention illustrated in Figure 15 includes a modified and preferred form of the sheet clamp. The applicator is depicted in solid lines in condition for initiation of a cover application sequence with the spine and sheet clamps, and the heater bar retracted. Parts corresponding to those already illustrated and described are designated with the same reference numberals primed.

The sheet clamp of Figure 15 includes a generally flat cover 170 and a pressure plate 172 which is pivotally connected to the rear edge of the cover. The cover 170 has an outline which corresponds to the outline of the filler S and is pivotally supported between the front upper corners of the housing side walls 10' and 12'. The cover 170 swings up and down between an inclined loading or retracted position, depicted in solid lines, in which the filler S and cover C can be placed upon the applicator, and a horizontal clamping position, depicted in broken lines, in which the lower face of the cover 170 opposes the forward support plate 18' and presses flat against the filler S and cover C. The underside of the cover 170 includes two spaced apart elongaged holes 174 into which the forward positioning pins 102' are respectively inserted when the cover 170 is in its horizontal clamping position. The rear edge of the pressure plate 172 fronts along the gluing station line when the sheet clamp is in its horizontal clamping position. The cover 170 further includes an inclined rear surface 176 over which the cover C extends when it is folded in half about the filler spine.

The pressure plate 172 is maintained, by spring means not shown, in a position parallel to the lower face of the cover 170, as shown (Figure 15); however, to minimize disturbance to the glue joint as the sheet clamp is swung from its horizontal clamping to its loading position during the cover application sequence, the pressure plate 172 can be pivoted downwardly as it engages and is drive downwardly by the overlapping folded half of the cover C.

In the second preferred embodiment, the vertical connecting arms 50' lock the cover 170 in its clamping position. The cover 170 is moved manually to and from its horizontal clamping position. The vertical connecting arms 50' terminate in shoulders (not shown) which can project inwardly through vertical slots 178 in the housing side walls 10' and 12' and engage slots 180 in the sides of cover 170 to lock the sheet clamp in its horizontal clamping position. These shoulders are driven inwardly by inclined cams 182, which are secured to the outer surfaces of the sidewalls 10' and 12' and project through vertical slots 184 formed in the upper ends of the arms 50', into locking engagement with the cover slots 180 as the arms 50' are pulled down by the follower arms 52'. The shoulders are driven outwardly by generally similar oppositely inclined cams (not shown) as the arms 50' are pushed upwardly by compression springs 186 which engage the bottoms of the follower cams 52'.

The motor control switches 65a'-65c' of the applicator depicted in Figure 15 may be operated and connected in the electrical control circuit of Figure 14 and are generally similar to the switches already described; however, they are mounted to be responsive to the positions of different structural members. Switch 65a' is closed when an operator 188 is engaged and moved upwardly by the left rocker plate 66'. Switch 65b' is engaged and closed by the lower forward corner of the left rocker plate 66' when the latter reaches its lowered position, as shown. Switch 65c' is closed when an operator 190 is engaged by a pin (not shown) projecting outwardly from the left end of the heater bar 78' (not shown in Figure 15).

A tension spring 192 pulls the forward end of the left rocker plate 66' against the surface of the left outer cam 42'. This rocker plate, of course, may be weighted and this spring eliminated.

WHAT WE CLAIM IS:-

1. A book cover applicator for applying a cover to a multiple sheet filler having a spine coated with a heat activatable adhesive, comprising:- a support surface supporting the filler and cover at a cover applicator station for bonding of a portion of the cover to the spine of the filler; heating means mounted adjacent the support surface at the cover applicator station, the heating means being movable between a position engaging the spine with the cover portion and a position out of engagement with the spine and cover portion and the heating means being constructed and arranged to remain in the said engaging position for a period of time sufficient to activate the spine adhesive and effect an adhesive bond between the spine and a portion of the cover; and clamping means for holding the portion of the cover and filler in a fixed position during bonding of the portion of the cover to the spine.

2. The applicator of claim 1, comprising cooling means mounted adjacent the cover application station and operative on termination of heat application by the heating means to the portion of the cover and spine to cool the spine adhesive.

3. The applicator of claim 2 wherein the cooling means includes a blower which directs air toward the cover application station.

4. The applicator of claim 1 wherein the heating means includes an electrical resistance heater bar.

5. The applicator of claim 1 wherein the clamping means are operative to apply hold

down pressure only at a location spaced from the spine during adhesive activation and only adjacent to the spine during adhesive deactivation.

6. The applicator of claim 5 wherein the clamping means are still further operative for applying hold down pressure

i) only at the location prior to adhesive activation, and

ii) simultaneously applying hold down pressure at a location adjacent the spine following adhesive activation until initiation of adhesive deactivation.

7. The applicator of claim 6 wherein the clamping means includes sheet clamp means for engaging the main body of the filler at the location spaced from the spine and spine clamp means for engaging the filler adjacent the spine.

8. The applicator of claim 7 comprising cam actuator means for moving the sheet clamp means, spine clamp means, and said heating means to their respective clamping and bonding positions, and control means responsive to the positions of said spine clamp means and said heat application means for operating said cam actuator means, and said control means deactuating said cam actuator means during heating and cooling of the spine adhesive.

9. The applicator of claim 8 wherein the sheet clamp means comprises an elongate member, and means mounting the elongate member adjacent the support surface for reciprocal movement to and from a clamping position in which it engages the main body of the filler.

10. The applicator of claim 9 wherein the sheet clamp means comprises a cover member having an outline which substantially registers with the outline of the filler, and means mounting the cover member adjacent the support surface for pivotal movement to and from a clamping position in which it engages the main body of the filler.

11. The applicator of claim 1 comprising edge contact means upstanding from the support surface for engaging the opposite edge of the sheet stack and aligning the spine relative to the heating means.

12. A method for applying a cover to a multiple sheet filler having a spine coated with a heat activatable adhesive, comprising:- activating the adhesive; de-activating the adhesive while simultaneously therewith engaging the spine with the cover for a time period sufficient to produce an adhesive bond formed by the adhesive between the spine and cover; applying hold-down pressure only at a loction spaced from the spine during the activating step; and applying hold-down pressure only adjacent the spine during the deactivating step.

13. The method of claim 12 including the additional steps of applying hold-down pressure only at the said location prior to the adhesive activation step, and simultaneously applying hold-down pressure at the said location and adjacent the spine upon completion of the activating step until initiation of the deactivating step.

14. The method of claim 12 wherein the activating step includes the additional step of activating the spine adhesive by heat application, and the deactivating step includes the additional step of deactivating the spine adhesive by cooling.

15. A book cover applicator constructed and arranged substantially as herein described and shown in the accompanying drawings.

16. A method of applying a cover to a filler substantially as herein described with reference to the drawings.

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Agents for the Applicant.

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1577898 COMPLETE SPECIFICATION
5 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

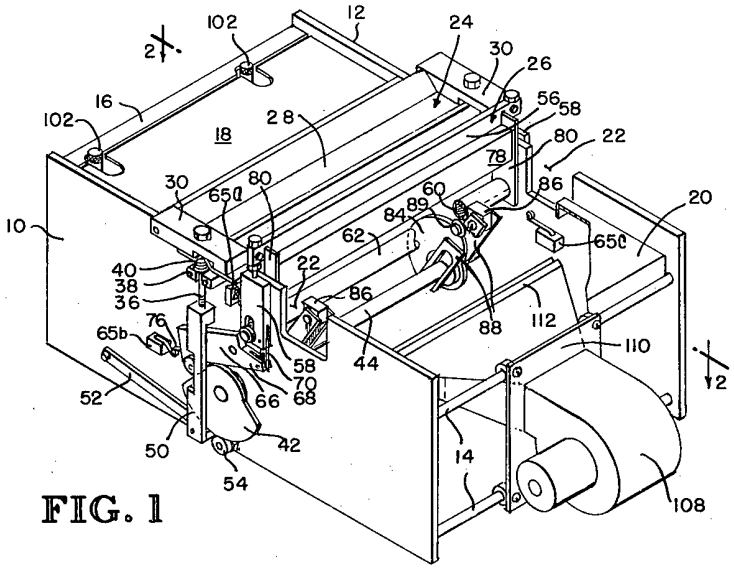


FIG. 1

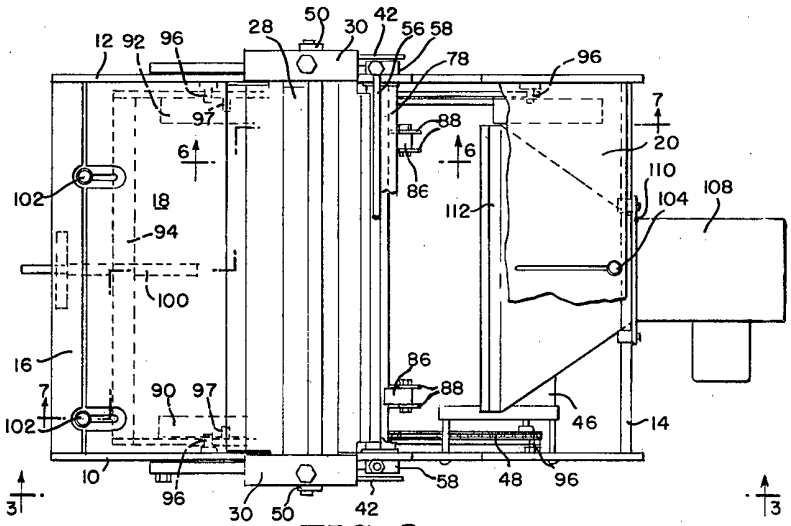


FIG. 2

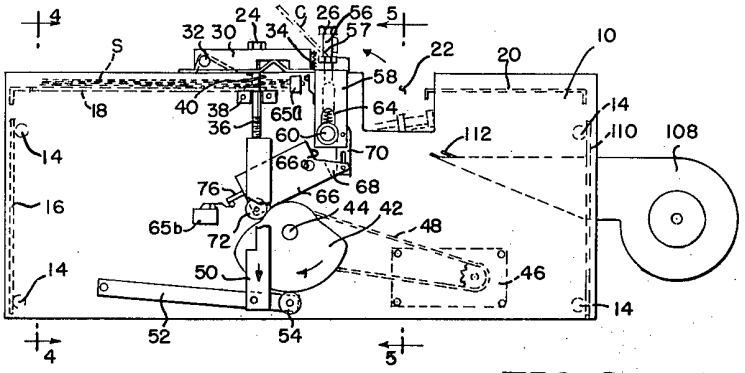


FIG. 3

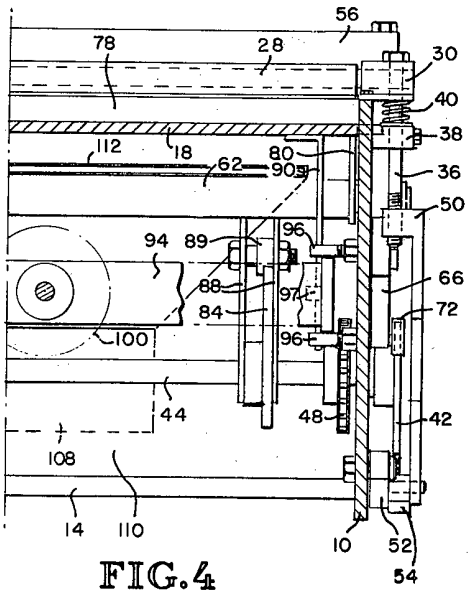


FIG. 4

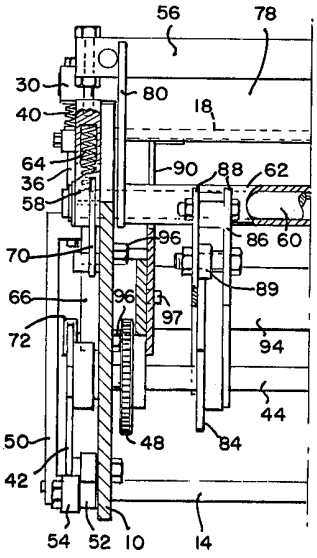


FIG. 5

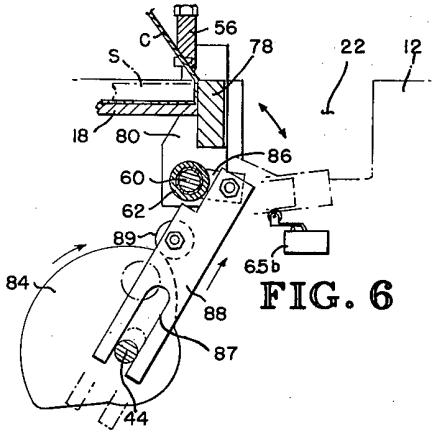
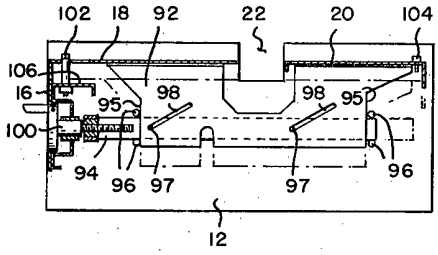


FIG. 6

FIG. 7



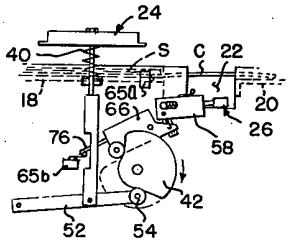


FIG. 8

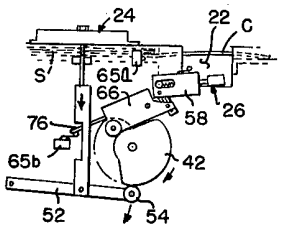


FIG. 9

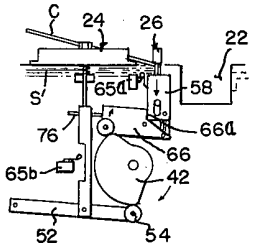


FIG.10

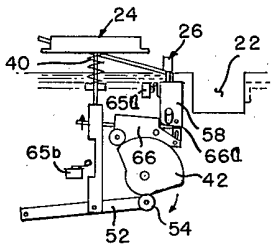


FIG.11

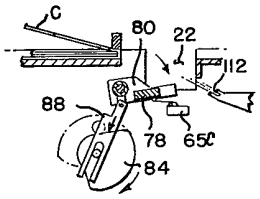


FIG. 12

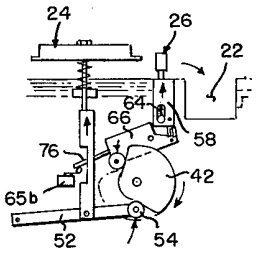


FIG. 13

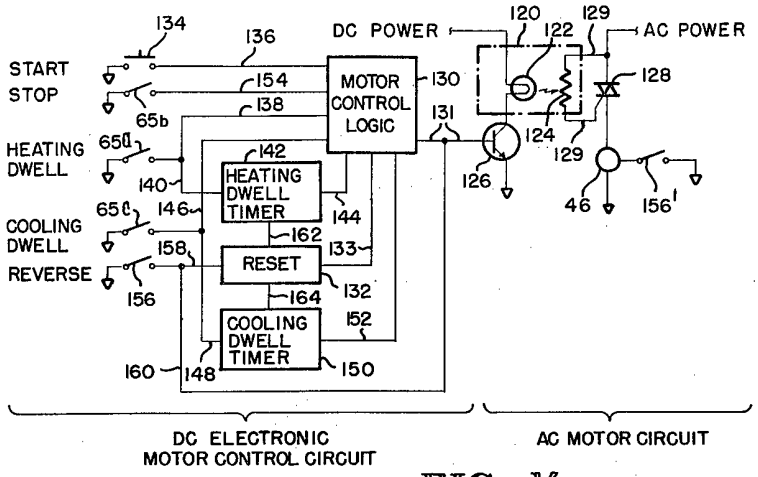

START
STOP
HEATING DWELL
COOLING DWELL
REVERSE
DC POWER
AC POWER
MOTOR CONTROL LOGIC
HEATING DWELL TIMER
RESET
COOLING DWELL TIMER
DC ELECTRONIC MOTOR CONTROL CIRCUIT
AC MOTOR CIRCUIT

FIG. 14

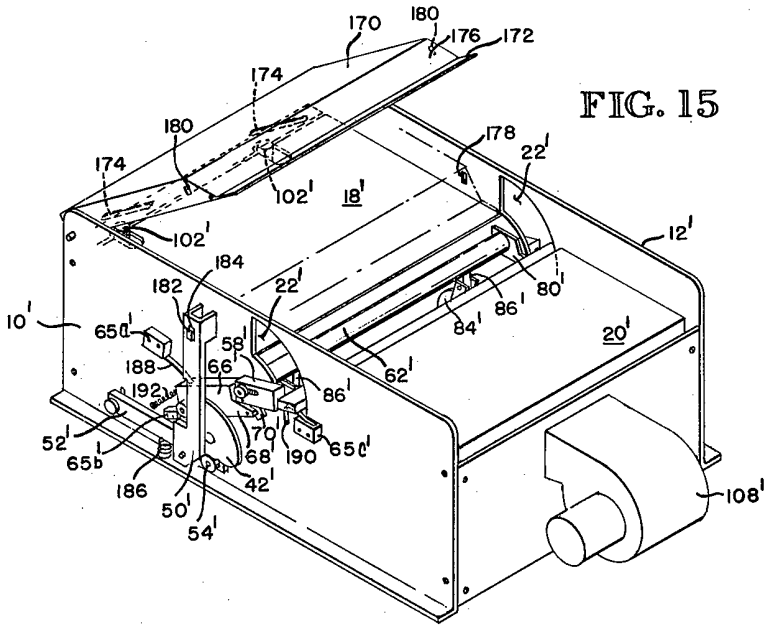


FIG. 15