May 8, 1945. H. O. SPERRY 2,375,330

METHOD OF SIMULTANEOUSLY MOUNTING AND CONTOUR-CUTTING PRINTED OR LITHOGRAPHED SHEETS AND MACHINE THEREFOR

Filed Jan. 12, 1942 4 Sheets-Sheet 1

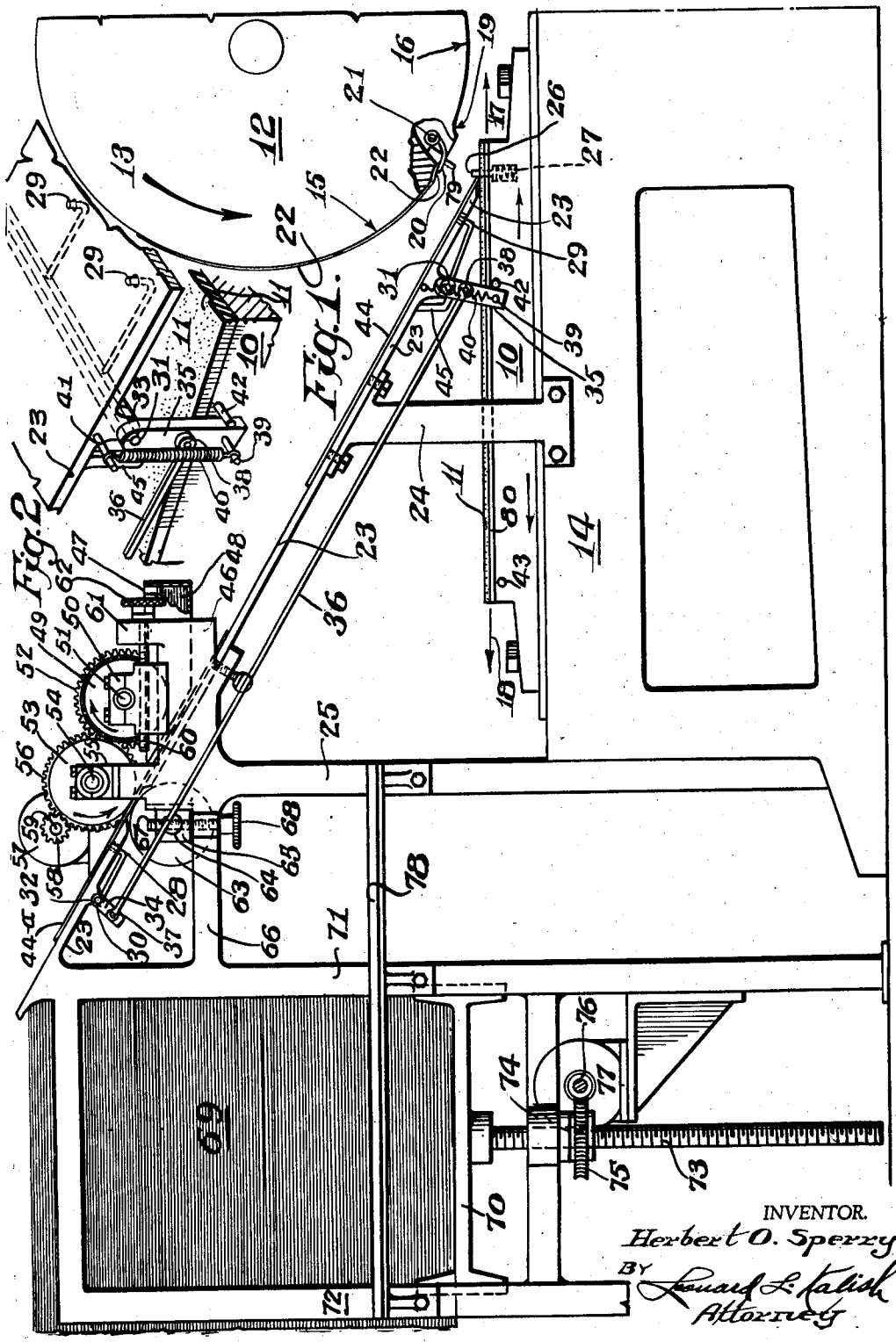


Fig. 1.

Fig. 2.

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Filed Jan. 12, 1942 4 Sheets-Sheet 2

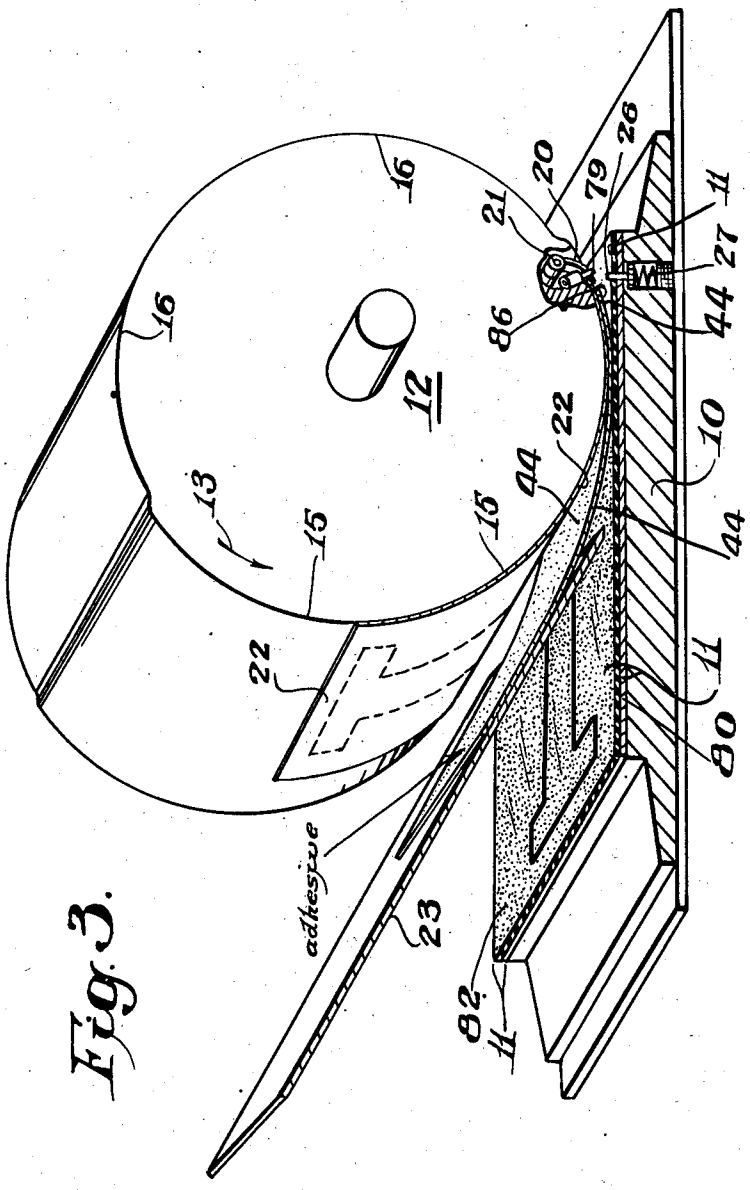


Fig. 3.

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Filed Jan. 12, 1942 4 Sheets-Sheet 3

Fig. 5.

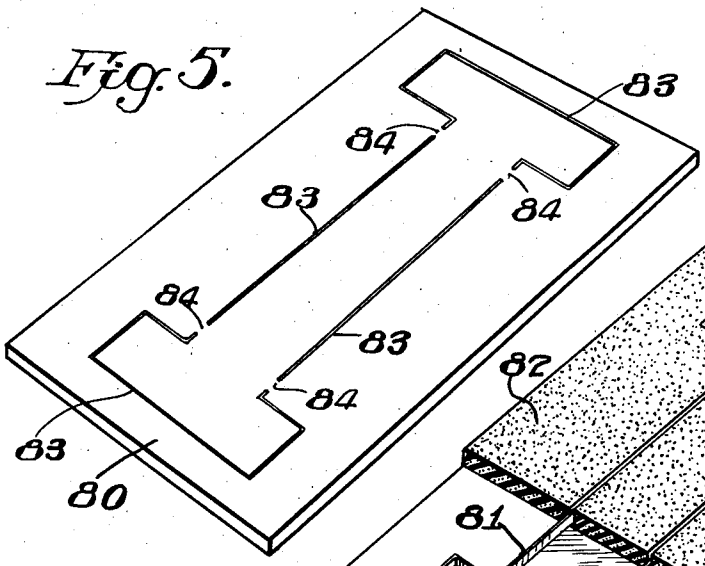
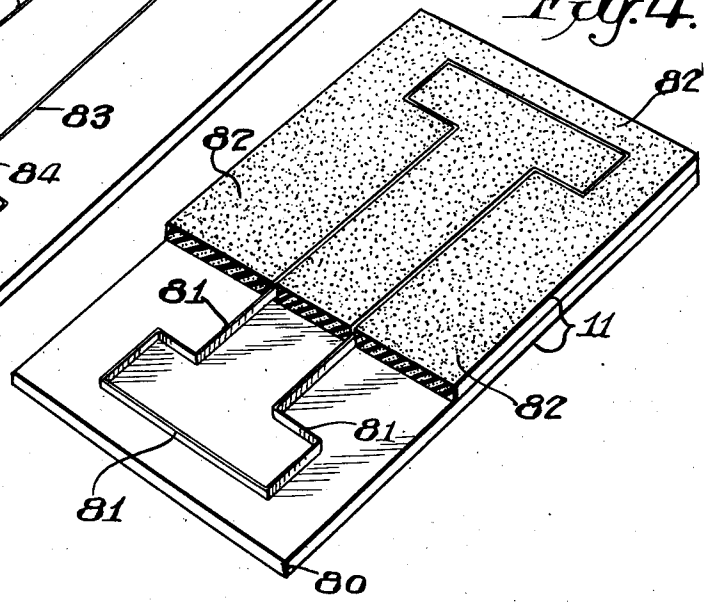


Fig. 4.



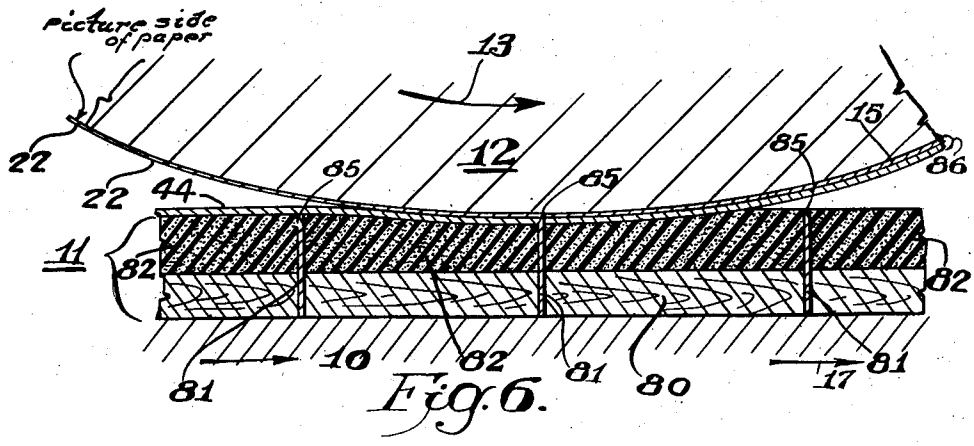


Fig. 6.

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Filed Jan. 12, 1942 4 Sheets-Sheet 4

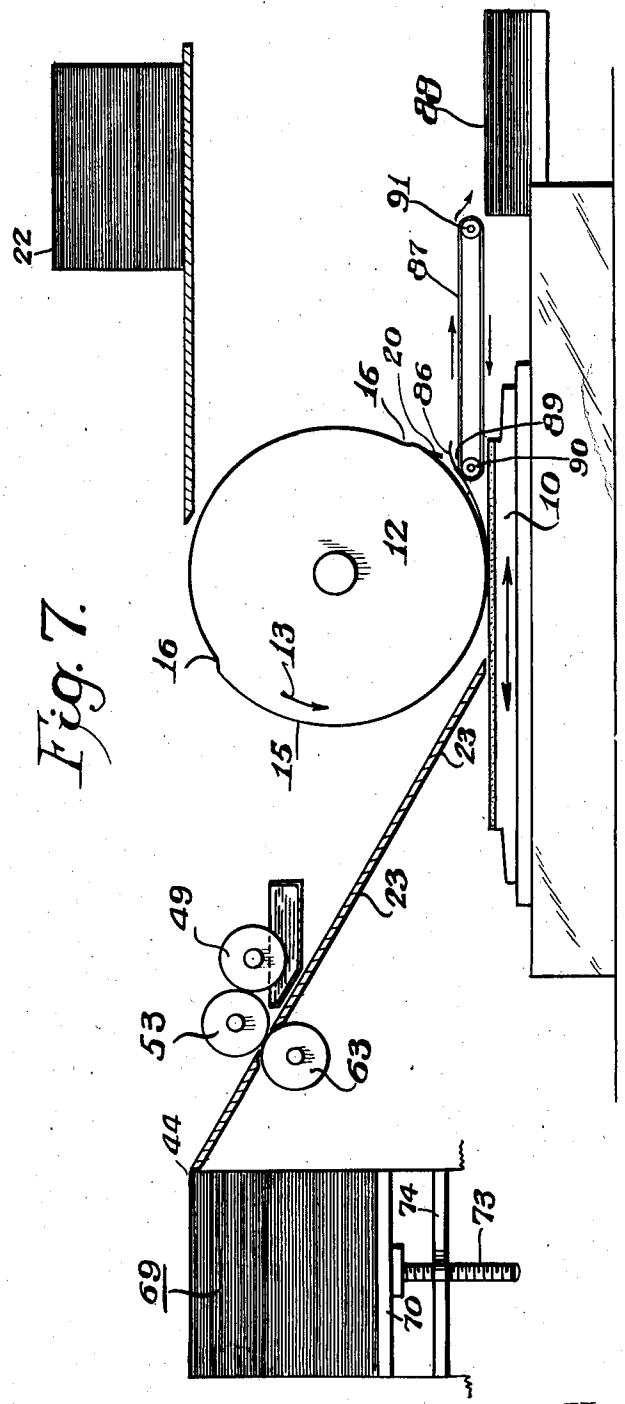


Fig. 7.

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Patented May 8, 1945

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UNITED STATES PATENT OFFICE

2,375,330

METHOD OF SIMULTANEOUSLY MOUNTING AND CONTOUR-CUTTING PRINTED OR LITHOGRAPHED SHEETS AND MACHINE THEREFOR

Herbert O. Sperry, Drexel Hill, Pa.

Application January 12, 1942, Serial No. 426,476

7 Claims. (Cl. 154—2)

The present invention relates to a new and useful method of making printed or lithographed display cards in which the card is trimmed or cut to the contour of the picture or some part of the picture or design printed or lithographed thereon so as to give greater emphasis or outline to the picture or design—as customarily used for advertising and publicity materials, such as point of sale advertising or counter display signs.

In making advertising display material, such as counter displays or point of sale advertising display cards, it has been the practice to print or lithograph the picture or design and advertising copy on a comparatively thin sheet of paper and then mount the thin sheet of paper upon a relatively thick and more or less form-retaining cardboard or paper sheet, by means of securement thereon, and thereafter to cut the assembled or "mounted" composite paper and cardboard unit to the contour or outline of the picture or design printed on the paper sheet by means of a cutting machine having in it a cutter of the desired contour, which is brought into accurate registration with the picture or design printed on the sheet. According to the prior practice this required at least two operative stages, namely first the adhesive securement of the printed or lithographed paper sheet upon the cardboard, which was generally referred to as the "mounting" and then the subsequent contouring of the assembly or what was generally referred to as the "cutting."

According to the present invention this is accomplished in a single operation, whereby the single application of pressure between the paper sheet and the cardboard sheet serves simultaneously to unite or "mount" the sheets and to contour-trim or "cut" the assembled sheets.

Thus, according to the present invention, the printed or lithographed paper sheet and the cardboard of substantially the same size are brought into registration with each other along one of their edges at more or less the same time or just slightly before the outline or picture or design on the paper sheet is brought into registration with the "cutter" along one edge of the sheet, and thereafter the two sheets are progressively pressed against each other and against the "cutter" along a line which is gradually moved across the sheets from the leading edge to the trailing edge of the composite sheets, so that the sheets are gradually pressed together to establish permanent union between them and simultaneously pressed against the cutter to trim the assembled sheets, progressively across their co-extensive arrangements.

For the purpose of illustrating the invention, there is shown in the accompanying drawings a form thereof which is at present preferred, since the same has been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which the invention consists can be variously arranged and organized and that the invention is not limited to the precise arrangement and organization of the instrumentalities as herein shown and described.

In the accompanying drawings in which like reference characters indicate like parts,

Figure 1 represents a more or less diagrammatic or schematic view, in side elevation, of apparatus suitable for the practice of the present invention.

Figure 2 represents a fragmentary perspective view of the discharge end of the cardboard supplying and registering means.

Figure 3 represents a more or less schematic fragmentary perspective view of the apparatus at the point where the sheets meet each other.

Figure 4 represents a perspective view of the cutter and pressure plate, with part of the pressure pad broken away, so as better to expose to view the cutter.

Figure 5 represents another perspective view of the same shown from the reverse side.

Figure 6 represents a fragmentary cross-sectional view of the cutter and pressure plate and the main roll which co-acts therewith, showing, in a more or less schematic way, the manner in which the paper sheet and cardboard sheet are united and cut simultaneously.

Figure 7 represents a simplified diagrammatic or schematic side elevational view of a machine embodying the present invention.

In carrying out the method or process of the present invention, I may employ any suitable cutting press, as for instance, a cylinder-and-platen type cutting press shown schematically in Figure 1, wherein a reciprocable table 10 carries the cutting die which is designated, in its entirety, by the numeral 11, and a rotary pressure roll 12 adapted to rotate continuously in the direction of the arrow 13, when in operation.

The reciprocable table 10 is slidably mounted upon a base 14, upon suitable sliding guides or ways in somewhat the manner of the reciprocable table of a planer commonly used in machine shops. The driving mechanism for reciprocating the table 10 is not shown, as this can be any con-

ventional driving mechanism for reciprocating tables of planers and cutting presses, printing presses and the like. The driving mechanism for rotating the pressure roll 12 is likewise not shown, as this driving mechanism can likewise be of any conventional form. The driving mechanism of the roll 12 and of the table 10 are interrelated, however, in such a manner that the roll 12 and the table 10 will be operating in timed relation to each other, with one complete revolution of the roll 12 corresponding to one complete to-and-fro reciprocation of the table 10. One-half of the circumference of the roll 12 has a slightly larger diameter 15, while the other half of the roll 12 has a slightly smaller diameter 16. The reduced diameter 16, covering more or less approximately one-half of the circumference of the roll is such as to clear the cutting die 11 for the return stroke of the table 10, while the larger diameter portion 15 of the roll 12 is such that it will contact the cutting edge of the die, thereby to effect a cutting of the paper and cardboard assembly.

Thus, on the operative stroke of the table 10 and cutting die 11, in the direction of the arrow 17, the larger diametered half 15 of the circumference of the roll 12 will come in contact with the cutting die 11, and will travel at the same linear speed, at its circumferential portion 15, as the speed of the table 10 and die 11 in the direction of the arrow 17. On the return stroke of the table 10 and die 11 in the direction of the arrow 18, the smaller diametered portion 16 of the circumference of the roll 12 will be in juxtaposition to the die 11, so that the die 11 and table 10 may be retracted, in the direction of the arrow 18, without touching the cylinder, and this retractive motion may be at any speed, and preferably at a slightly increased speed, so that the table 10 and die 11 will have been brought back to their initial position shown in Figure 1 before the larger diametered portion 15 of the cylinder again rolls around for the next operative portion of the cycle. Of course, it is understood that the circumferential length of the larger diametered portion 15 of the roll 12 corresponds generally to the effective length of the maximum length of the die 11 to be used.

At or near the starting point 19 of the larger-diametered portion 15 of the cylinder 12, a pair or three or four similar and aligned sheet-gripping jaws or fingers 20 are projected, carried upon a suitable shaft 21, one of which fingers is exposed to view by partly breaking away the surrounding portion of the cylinder 12. The shaft 21 carries at one or both of its ends (projecting from the corresponding ends of the cylinder 12) a smaller terminal arm or lever or what is sometimes called a "dog," which is engaged by operating means carried by the stationary part of the frame (not shown) generally at the bottom and at the top of the machine, so that when the shaft 21 and fingers 20 carried thereby reach a position somewhat past the bottom of their circular path where the leading edge of the sheet 22 must be released, after it has passed the zone of tangency between die 11 and roll-surface 15, the shaft is turned just sufficiently to cause the fingers 20 to be released from the paper sheet 22, while similar operating means at the top of the machine serve to turn the fingers 20 inwardly again, after a new sheet of paper 22 has been placed against the throat-portions of the fingers 20 or against suitable stationary (and retractable) stop pins 79 cooperating with the fingers 20 for determining the position of the leading edge of the sheet 22. These edge stops 79 and paper-gripping fingers 20 may also be of the conventional form of construction now generally employed on cutting-presses as well as on printing presses, and, for that reason, no further detailed explanation thereof is deemed necessary here.

An inclined chute-like cardboard guiding table 23 is provided, carried by pairs of suitable upright supports 24 and 25 on each side, and having laterally adjustable side-rails for giving lateral guidance to the cardboard sheets to be delivered down the incline. The lower end of the inclined table 23 is just above the upper surface of the cutting die 11, as shown in Figures 1 and 7, with its discharge edge just clear of the registering pins 26 carried by the table 10. The registering pins 26 (of which there may be two, three or more) which define a line extending across the table in a direction at a right angle to the direction of travel thereof, are spring-pressed from beneath by suitable helical coil springs 27 so arranged that when the cylinder-surface 15 meets the die 11, the registering pins 26 may be depressed with their upper ends flush with the die, so as not to obstruct the pressure portion 15 of the cylinder 12.

The inclined table 23 is provided with upper and lower sets of releasable cardboard stop-fingers 28 and 29, respectively, which extend through suitable apertures in the table 23 in their projected positions, and are retracted to the positions shown in Figure 1 when the cardboard is to be released. The finger arms 28 and 29 are carried by corresponding pivot rods 30 and 31, respectively, suitably journalled in bearing lugs 32 and 33. The pivot rods 30 and 31 have lever arms 34 and 35 secured thereto, which are, in turn, interconnected by a connecting rod 36 pivotally secured to the arms 34 and 35 at the pivot points 37 and 38, respectively. The lever arm 35 is slightly longer, and is provided with a spring anchorage pin 39 to which one end of a helical tension spring 40 is secured, the upper end of which is secured to a stationary anchorage pin 41 carried by the table 23 and in such a position that a slight swinging of the arm 35 will place the line of the spring 40 or the line between the pins 39 and 41 on either one side or the other side of the pivot rod 31 so that the spring 40 will tend to retain the stop fingers 28 and 29 either in the projected position shown in Figure 2 or in the retracted position shown in Figure 1. A pin 42 carried by the reciprocable table 10 serves to swing the arm 35 to the retracted position of the pins 28 and 29, while a similar pin 43 at the other end of the table tends to swing the arm 35 to the position where the pins 28 and 29 will be in their extended or operative positions.

The position of the pin 42 is so located on the table 10 that it will retract the pins 29 just in time to permit the cardboard sheet 44 to meet the registering pins 26 on the last portion of the retracting stroke of the table 10. The pin 43 is so located, that it will strike the arm and deflect the arm 35 just before the cardboard 44 has fully passed the lower stop pins 29, so that it will catch the next cardboard 44—*a* which has previously been released by the pins 28.

An arm 45, carried by the pivot shaft 31, serves to abut against the under-surface of the inclined table 23, and thereby to limit or determine the retracted position of the pins 28 and 29.

If desired, the spring anchorage pin 41 can be

so arranged that the line of the spring 40 will always be on the right side of the pivot rod 31, so that the spring will never retain the pins 28 and 29 in the retracted position but will always tend to project them into the advanced or extended position, so that the pins 28 and 29 will be retracted only momentarily at the end of the retracting stroke of the table 10 and will thereafter be extended again so that once the cardboard 44 has been released by the pins 29 and the cardboard 44 similarly released by the pins 28, the pins will be projected again ready to catch the next set of cardboards while the cardboards just released will ride over the projected pins.

From the upright frame members 25, a pair of lateral frame members 46 are extended, for carrying a liquid container 47 for containing a supply of liquid adhesive material 48—the end of the reservoir 47 nearest the surface of the table 23 being inclined at the same angle as the table 23 and clearing the table 23 just sufficiently to permit the cardboard sheet to pass between it and the table 23 with safe clearance.

Upon the pair of frame members 46, an adhesive pick-up roll 49 is journalled, in suitable journal blocks 50 and upon a suitable shaft 51—the lower periphery of the roll 49 dipping into and being submerged beneath the surface of the liquid adhesive 48, so that the roll 49 will serve to pick up a supply of liquid adhesive from the reservoir 47. The roll 49 may be of any suitable material, as for instance, metal or a resilient material such as rubber or similar more or less resilient material commonly used for inking rolls including rolls formed in part of gelatin and the like. To one end of the shaft 51 carrying the roll 49 a gear 52 is secured, by means of which the roll 49 is driven, the journal blocks 50 are preferably slidably mounted on the frame members 46, so that they may be advanced or retracted for greater or lesser clearance between the pick-up roll 49 and the applicator roll 53 with which it coacts. The applicator roll 53 is carried upon a shaft 54 journalled in suitable bearing blocks 55 also carried by the frame members 25. The applicator roll 53 may likewise be either of rigid material such as metal or it may be of resilient material such as rubber or other elastic composition or may be made of any of the material similar to those of which inking rolls are made. To one end of the shaft 54 another gear 56 is secured, meshing with the gear 52, so as to cause the pick-up roll 49 to be driven positively through the same source of power which drives the applicator roll 53. The applicator roll 53 is in turn driven by the electric motor 57, through the pinion 58 carried by the shaft 59 thereof, which pinion 58 meshes with the gear 56.

The adjustable journal blocks 50 are preferably held in position by the adjustment screw or screws 60, the ends of which are held by the frame portions 61, so that by turning the knob 62, the journal blocks 50 may be advanced or retracted in relation to the shaft 54, so as to increase or decrease the clearance between or the pressure between the rolls 49 and 53, and thereby to vary the amount of adhesive which is transferred from the roll 49 to the roll 53 (the excess adhesive dripping back into the reservoir or well 47).

An idle pressure roll 63, carried by a shaft 64, journalled in vertically adjustable bearings or journal blocks 65, is carried by the horizontal frame members 66, the pressure roll 63 extending through a suitable clearance or slot in the table 23, with the upper surface of the table 23 more or less tangent to the periphery of the roll 63.

The journal blocks 65 are carried by similar screw posts 67, whereby they can be raised and lowered slightly by turning the knobs 68, so that the clearance between the roll 63 and the applicator roll 53 may be varied to accommodate different thicknesses of cardboard to be fed therethrough.

The cardboard sheets are preferably supplied in a stack 69 held upon an elevating platform 70 which is guided, vertically, within two or more vertical guiding uprights 71 and 72 and is moved vertically at any desired rate by a feed screw 73, threaded through the stationary base member 74 and revolved by the worm gear 75 (or any other suitable means) keyed to the screw post 73, and in turn driven by the worm 76 rotated by the motor or other suitable means 77. The speed of the vertical rights of the cardboard stack 69 is adjusted so the uppermost sheet of cardboard will always be at the operating position so that the operator, standing upon the stationary platform 78, may take the uppermost sheet from the stack and place it on the upper end of the inclined table 23, against the stop pins 28.

When the pins 28 and 29 are thrown into their retracted position, the upper cardboard sheet 44—*a* is released to the rolls 53 and 63, which engage it and between which it is driven through by the drive of the motor 57. The speed of the drive of the rolls 53 and 63 is so adjusted that the cardboard 44—*a* will be released by the rolls 53 and 63 just slightly after, or simultaneously with the release of the pins 28 and 29 to their projected position, so that as the cardboard 44—*a* is released by the rolls 53 and 63, and is free to slide down to the lower end of the table 23, the pins 29 will be ready to receive it and to stop it. Thus, while the pins 28 receive the cardboard sheets from the operator, so the pins 29 receive the cardboard sheets, with mucilage or any other adhesive applied to their upper surfaces from the rolls 53 and 63.

Each cardboard 44, with tacky or live adhesive on its upper surface, is released by the pins 29, just in time to meet the paper sheet 22 which is being brought down by the roll 12, with its leading edge held by the fingers 20—the final registration between the paper sheet 22 and the cardboard sheet 44 being determined by the position of the registering pin 26 in relation to the registering pins 79 carried by the cylinder.

The cutting die which is generally designated by the numeral 11, and which also serves as a pressure plate for pressing together the paper sheet and cardboard sheet, is formed of a base plate 80 which may be a piece of multi-layer plywood in which the thin steel cutting strip 81 is set, and a resilient pressure plate 82 formed of sponge rubber or the like, of an area at least as great as the common area or the coinciding areas of the paper sheet and cardboard sheet.

In the drawings, particularly in Figures 3, 4, 5 and 6, I have illustrated but a sample contour, namely, the contour of what resembles the capital letter I. This is done merely in order to simplify the illustration, although it is to be understood that the shape to be cut may be of any intricate contour, as for instance, the outline of any picture which would constitute the advertisement or display.

In making the combined cutter and pressure plate 11, the plywood board 80 is first cut, with a jigsaw or a band saw, to provide in it a cut or slit 83, of a width equal approximately to the thickness of the steel blade or strip 81 and of

a contour of the shape to be cut. The blade-receiving slit or slot 83 is continuous for the contour, except for a few bridging gaps 84, at which the slot is interrupted, so as to keep the several parts of the base plate 80 together. The cuting blade or srip 81 is shaped to the shape of the slot—the height of the blade or strip 81 being substantially greater than the thickness of the base plate 80. At the points 84, a notch is cut into the blade strip 81, just sufficient to clear the bridging portions 84 of the base plate, but without interrupting the continuity (at these points) of the cutting edge of the steel strip 81.

A sponge rubber or other similar resilient and highly compressible pressure plate 82 is provided, of an expanded thickness, or of a thickness, in its released position, greater than the height of the projected portion of the cutting blade 81 above the base 80. The sponge rubber plate 82 is cut similar to the base plate 80, but with a continuous slit to receive the blade 81, so that the entire base plate 80 is covered with the rubber plate 82.

By this means, the bevelled or sharpened cutting edges 85 of the cutting blade 81 are concealed beneath the upper released surface of the sponge rubber pressure plate 82, until the pressure surface 15 of the roll 12 meets the plate 82 and compresses it so as to expose the cutting edge 85 and to press the cutting edge 85 through the assembled cardboard and paper combination. Thus, the resilient plate 82 serves as a resilient pressure member to press the paper 22 and cardboard 44 into union with each other (the union being made permanent by the adhesive on the upper surface of the cardboard 44), and also serves thereafter to raise the assembled and cut cardboard and paper from the blade 81.

This is illustrated, schematically, in Figure 6, where the die 11 is moving in the direction of the arrow 17 and the roll 12 is moved in the direction of the arrow 13. The assembled and contour-cut material 86 may then be lifted from the cutting die 11 by hand, or it may be removed by travelling endless belts 87 or any other conventional sheet-transfer mechanism and stacked thereby as at 88.

While the pressure surface 82 is resilient, the pressure surface 15 of the roll 12 is preferably hard or relatively non-resilient, that is, relatively harder in relation to the pressure surface 82, and the distance is so adjusted that the pressure surface 15 will just contact the cutting edge 85 of the cutting strip or cutter 81, so as to cut through the assembled sheets—unless it is desired not quite to cut through both sheets, in which event any suitable clearance may be provided between the surface 15 and the cutting edge 85 so as to cut through the assembled sheets to any desired and predetermined depth and without cutting entirely through them. However, where it is desired to cut completely through the sheets, the surface 15 should just make contact with the cutting edge 85.

While the foregoing method is described with special relation to the making of advertising or display materials, it is to be understood, of course, that the herein disclosed method of simultaneously assembling and contour-cutting a plurality of sheets is not limited in its scope to the making of advertising or display material but may be used for other purposes, as for instance, wherever it is desirable or necessary both to assemble sheets as well as to cut them to a predetermined contour. Thus, for instance, this method may be used in making the blanks from which cardboard boxes are to be formed, where, for instance, the cardboard is to be covered with an outer or an inner paper covering either printed or not printed, and where the adhesively united paper and cardboard assembly is to be cut to a predetermined shape to constitute the cardboard box blank. In like manner, the method of the present invention may be used for many other purposes where sheets are to be adhesively united and are to be cut or trimmed to some predetermined contour.

While in the foregoing disclosure, reference is made particularly to a cutting press of the roller-and-platen type, it is to be understood that this part of the apparatus may be a two-plate mechanism, in which the pressure roll 22 is replaced by a pressure plate brought into pressure contact with the die and then retracted therefrom in somewhat the fashion of the pressure plate of a platen press used for printing.

The paper sheets 22 are preferably made slightly larger, at least in the dimension parallel to the direction of travel thereof than the corresponding dimension of the cardboard sheets 44 and the registration of the leading edges of the paper sheets and cardboard sheets is preferably so set that the leading edge of the paper sheets will project slightly beyond and clear of the leading edges of the cardboard sheet with which they are united. By this means the fingers 20 may be permitted to continue their grip upon the leading edges of the paper sheets for a short interval after such leading edge has been adhesively united with the cardboard, so that this excess paper edge on the leading portion of the combined or assembled sheets 86 serves as a guide tab by which the fingers 20 may guide the combined or assembled sheets 86 onto the receiving end 89 of the set of endless belts 87, the upper portions of which travel in the direction of the upper arrow and the lower portions of which travel in the direction of the lower arrow (over suitable rolls 90 and 91, one of which is power-driven) so that the assembled sheets 86 will be given a start onto the transfer belts 87 by which they may be transferred automatically to a stack 88. Thus, the fingers 20 are preferably not swung into their released positions until after the leading edge of the cardboard is just above the receiving end 89 of the endless belts 87.

Having thus described the invention, what is hereby claimed as new and desired to be secured by Letters Patent, is:

1. A method of simultaneously uniting a plurality of sheets and contour-cutting the same which comprises separately feeding said sheets in timed relationship with each other, applying an adhesive coating to at least one of each pair of opposed surfaces of said sheets, and simultaneously pressing said sheets together and contour-cutting all of said sheets, thereby to form an adhesively-united contour-cut multi-ply sheet.

2. A method of simultaneously uniting a plurality of sheets and contour-cutting the same which comprises separately feeding said sheets in timed relationship with each other, applying an adhesive coating to at least one of each pair of opposed surfaces of said sheets, and progressively exerting line-pressure upon said sheets while simultaneously contour-cutting all of said sheets, thereby to form an adhesively-united contour-cut multi-ply sheet.

3. A method of simultaneously uniting a plurality of sheets and contour-cutting the same which comprises separately feeding said sheets in timed relationship with each other, applying an adhesive coating to at least one of each pair of opposed surfaces of said sheets, and simultaneously resiliently pressing said sheets together and contour-cutting all of said sheets, thereby to form an adhesively-united contour-cut multi-ply sheet.

4. A method of simultaneously uniting a plurality of sheets and contour-cutting the same which comprises separately feeding said sheets in timed relationship with each other, applying an adhesive coating to at least one of each pair of opposed surfaces of said sheets, and progressively exerting resilient line-pressure upon said sheets while simultaneously contour-cutting all of said sheets, thereby to form an adhesively-united contour-cut multi-ply sheet.

5. A method of simultaneously uniting a plurality of sheets and contour-cutting the same which comprises separately feeding said sheets in timed relationship with each other, applying an adhesive coating to at least one of each pair of opposed surfaces of said sheets, exerting line-pressure upon said sheets generally transversely of the direction of travel thereof and simultaneously contour-cutting all of the pressed-together sheets, and causing progressive relative movement of the line of pressure and the sheets in a direction generally parallel to the travel of said sheets, thereby to form an adhesively-united contour-cut multi-ply sheet.

6. A method of forming a multi-ply contour-cut sheet or the like which comprises feeding a pair of sheets of generally the same size along converging paths, applying an adhesive coating to at least one of the opposed surfaces of said sheets, registering said sheets at their zone of meeting, and simultaneously pressing the sheets together into permanently-united relationship and contour-cutting both of said sheets.

7. A method of forming a multi-ply contour-cut sheet or the like which comprises feeding a pair of sheets of generally the same size along converging paths, applying an adhesive coating to at least one of the opposed surfaces of said sheets, registering said sheets at their zone of meeting, pressing together the leading edges of the registered sheets, and progressively applying pressure to successively rearward portions of said sheets while simultaneously contour-cutting both of said sheets.

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