

June 15, 1965

M. B. LUCAS

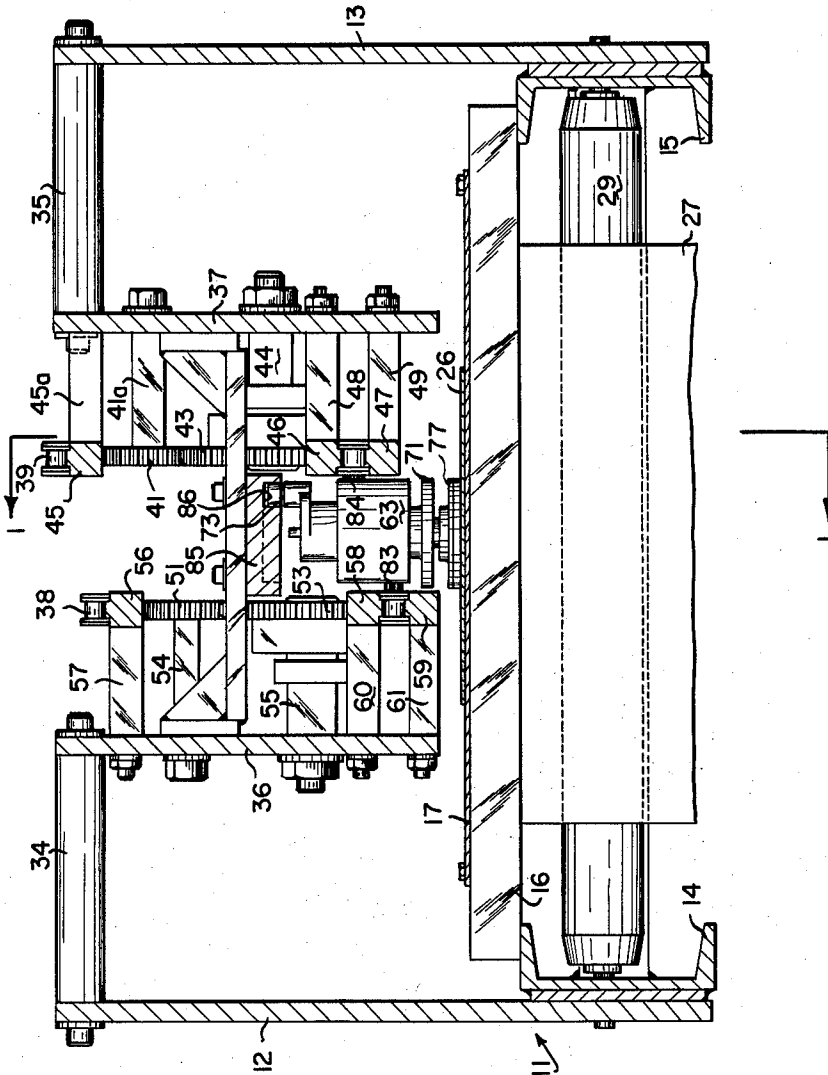
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SHEET TURNING MECHANISM

Filed Oct. 31, 1962

4 Sheets-Sheet 2

FIG-2

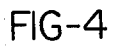
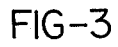


INVENTOR.
MALCOLM B. LUCAS

BY *Fredrick H. Braun*
ATTORNEY

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4 Sheets-Sheet 3



ATTORNEY

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M. B. LUCAS

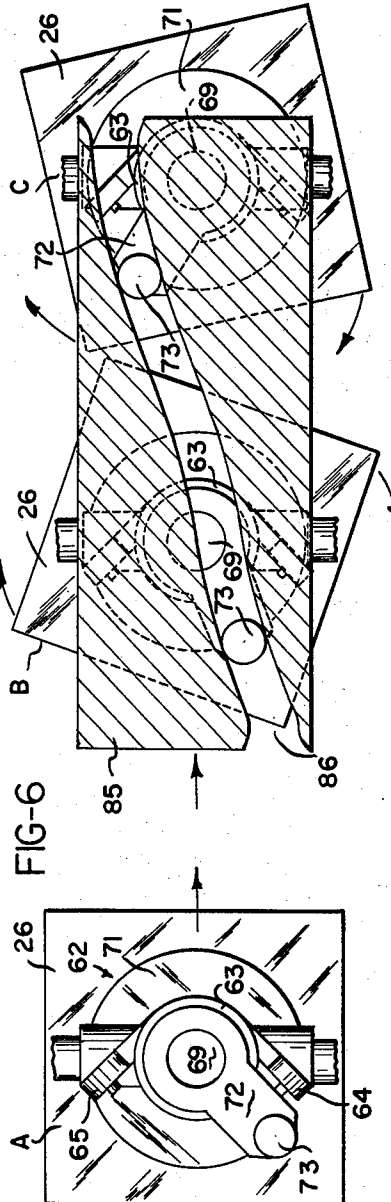
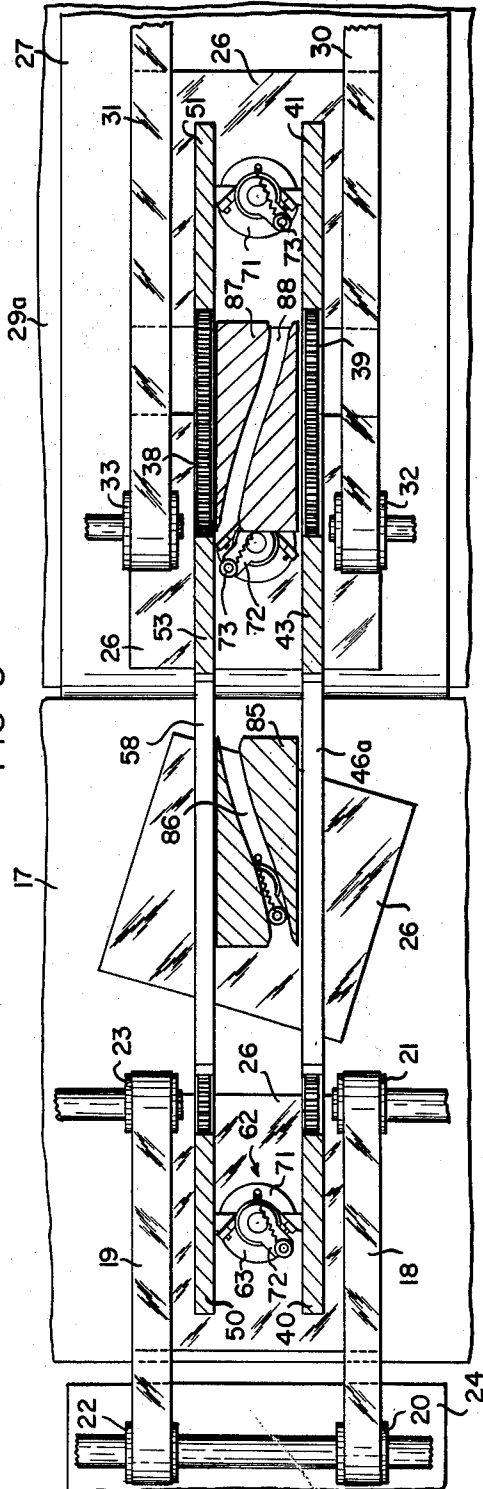
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4 Sheets-Sheet 4

FIG-5



INVENTOR.
MALCOLM B. LUCAS
BY *Fredrick H. Braun*
ATTORNEY

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SHEET TURNING MECHANISM

Malcolm B. Lucas, Cincinnati, Ohio, assignor to The Procter & Gamble Company, Cincinnati, Ohio, a corporation of Ohio

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5 Claims. (Cl. 198—33)

The present invention relates to an apparatus for turning sheet material. More particularly, the invention contemplates an apparatus for receiving and thereafter turning a moving sheet or pad in its own plane prior to delivering same to a take-away conveyor.

In the manufacture of articles of flexible sheet material on high speed equipment, it is usually considered more desirable to perform folding and/or gluing steps on the longitudinal edges of the sheet material rather than on transverse edges with respect to their path of travel as they are conveyed through the machine. This theory dictates the need for a device to turn flat polygonal articles through a substantial arc while the articles are in motion. For example, in the manufacture of disposable diapers of the type described and claimed in the application of Robert C. Duncan et al., Serial No. 124,422, filed July 17, 1962, and commonly owned by the assignee of the present invention, a plurality of layers of creped cellulose wadding are enclosed by a top sheet of either paper or a non-woven fabric. The four edges of the top sheet are folded over and adhered to the superposed wadding sheets in order to complete the structural fabrication of a disposable diaper pad. In the course of doing this, the superposed plies of wadding and the top sheet are moved along in the machine so that the two longitudinally disposed edges (with respect to the direction of movement) of the top sheet are folded over and adhered. The remaining edges are transverse to the direction of motion so that the pad must then be rotated 90° in order to permit the final folding and adhering of the top sheet with the least amount of machine complication.

For convenience, the present invention will be described in terms of its operation in connection with diaper pads of the type heretofore described. It will be understood, however, that the utility of the invention is not limited to this particular type of product. It can be used with comparable effectiveness on sheets of paper or other types of sheet material that are handled in similar fashion.

An object of the present invention is the provision of a mechanism for receiving a moving diaper pad or the like and rotating same in its plane of motion as it moves through the apparatus in order that the pads will be in proper orientation for further manufacturing steps.

Another object of the invention is the provision of a turning mechanism of this character which is relatively simple and inexpensive and yet is very reliable in operation so that it will not affect the efficiency and performance of associated machinery components.

The nature and substance of the invention can be briefly summarized as comprising a turnaround member, including a rotatably mounted high friction bottom surface, which is carried in a circuitous path by a pair of carrier chains. At one end of its path, the turnaround member moves downwardly and contacts a pad received from a forwarding belt, thereafter moving the pad forward without any substantial change in speed over a highly polished dead plate. As the turnaround member moves along with the pad underneath, a cam member rotates the bottom surface of the turnaround causing equivalent rotation of the pad. As the turnaround member continues to move forward, rotation of the pad is completed and the pad is delivered to a take-away conveyor which receives the turned pad and carries it away from the turnaround mechanism.

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter regarded as forming the present invention, it is believed the invention will be better understood from the following description in which:

FIGURE 1 is a fragmentary longitudinal elevation, partially in cross section, taken on the line 1—1 of FIGURE 2 illustrating the turnaround elements together with the carrier chains and tracks for moving the turnaround elements in a circuitous path.

FIGURE 2 is a fragmentary transverse elevation in cross section taken on the line 2—2 of FIGURE 1 showing a turnaround element and associated structure.

FIGURE 3 is a vertical cross section showing the structural details of one turnaround element.

FIGURE 4 is a plan view of the turnaround element shown in FIGURE 3.

FIGURE 5 is a fragmentary plan view partially in cross section taken on the line 5—5 of FIGURE 1 showing the cam elements and several turnaround elements on the bottom stretch of their circuitous path.

FIGURE 6 is a schematic plan view showing a turnaround element when first contacting a pad and several subsequent positions of the turnaround element moving through the turning cam.

Referring now to the structure of the device as illustrated more particularly in FIGURES 1 and 2, a frame 11 is provided which consists of side plates 12 and 13, channel members 14 and 15 and a plurality of cross supports 16. A highly polished dead plate 17 rests upon and is secured to several of the cross supports 16 illustrated in FIGURE 1.

Forwarding belts 18 and 19 (see also FIGURE 5) are suitably supported by conventional pulleys and are driven in unison. The pulleys 20 and 21 support the delivery belt 18 and the pulleys 22 and 23 support the delivery belt 19. A wide lower delivery belt 24 supported at one end by the pulley 25 cooperates with the belts 18 and 19 to carry forward the pads 26 in single file order and deliver same in slightly spaced relation to the dead plate 17.

At the other end of the frame, a take-away conveyor is provided. The take-away conveyor is composed of a lower carrier belt 27 supported at one end and driven by the pulley 28 and running over an idler pulley 29 and a dead plate 29a. As illustrated in FIGURES 1 and 5, upper take-away conveyor belts 30 and 31 are driven substantially at the same speed as the carrier belt 27 to receive the pads 26 from the turnaround device and to convey them wherever desired.

The turnaround device itself will be best understood by reference to FIGURES 1 and 2. The tie rods 34 and 35 support a pair of hanger plates 36 and 37 in suspended relation over the dead plate 17 as best illustrated in FIGURE 2. Endless carrier chains 38 and 39 are appropriately supported in slightly vertically offset relationship for continuous movement in a circuitous path by mechanism which will now be described.

Referring first to FIGURE 1, the carrier chain 39 has at the ends of its circuit, sprockets 40 and 41 which are appropriately supported from the hanger plate 37. FIGURE 2 illustrates a stud shaft 41a which supports the sprocket 41. The sprocket 40 is similarly supported. Idler sprockets 42 and 43 act as guides to establish the path of the chain 39 between sprockets 40 and 41. These are mounted in a manner similar to the mounting of the sprocket 41. Thus, a stud shaft 44 supporting the sprocket 43 is illustrated in FIGURE 2. An equivalent support (not shown) is provided for sprocket 42. An upper track 45 supported by the tie rods 45a supports the upper flight of the chain 39. The lower flight is supported between two opposed tracks 46 and 47 suitably supported by the tie rods 48 and 49.

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Similarly, the carrier chain 38 travels over the end sprockets 50 and 51 as well as the idler sprockets 52 and 53 which, for clarity of illustration, have all been shown in phantom in FIGURE 1. The sprockets are each mounted on separate stud shafts; the shaft 54 for the sprocket 51 and the shaft 55 for the sprocket 53 being illustrated in FIGURE 2. An upper track 56 is provided for the chain 38 and is supported by the tie rods 57. Lower tracks 58 and 59 are provided and are similarly supported by tie rods 60 and 61.

Turnaround elements 62 are swivelably suspended from the carrier chains 38 and 39 at spaced intervals therealong. As illustrated in FIGURE 3, each turnaround element 62 is composed of a sleeve-like body 63 having integral ears 64 and 65 (see also FIGURE 4). Adjustable stop screws 66 and 67 are threaded in openings through the ears 64 and 65. A bearing 68 is fitted into the body 63 and a shaft 69 is rotatable in the bearing 68. An upper collar 70 and a lower flanged collar 71 are attached to the shaft 69 and prevent axial movement thereof in the bearing 68. The upper collar 70 has an arm 72 which strikes against the stop screws 66 and 67 in order to limit the rotative movement of the shaft 69. A cam follower 73 is freely rotatable on the end of the arm 72 and projects upwardly therefrom. The over-center spring 74 is attached at one end 75 to the body 63 and at the other end 76 to the upper collar 70. The spring 74 acts to insure that the arm 72 is firmly seated against one of the stop screws and will remain so until positively rotated beyond dead center in the direction of the other stop screw.

A foot member 77 is held for limited axial movement on the lower end of shaft 69 by means of the guide bolts 80 having their heads countersunk in the bottom face of member 77 and passing through the flange of collar 71 for threadwise engagement with locknuts 80a. The bottom of the foot member 77 is provided with a surface 78 such as a rubber pad having a relatively high coefficient of friction for reasons which will become apparent as the description proceeds. A plurality of compression springs 79 surrounding the guide bolts 80 normally force the foot member 77 downwardly with respect to the shaft 69. However, when the surface 78 is held down against a pad 26, the springs 79 will tend to exert a downward pressure on the foot member 77 thereby, in effect, clamping the pad 26 against the dead plate 17.

Needle bearing journals 81 and 82 are provided in the body 63 to receive the holding pins 83 and 84 (FIGURE 2) projecting from the chains 38 and 39, respectively, to support the turnaround elements 62 on their path of travel. It will be noted that the journals 81 and 82 are vertically displaced. The carrier chains 38 and 39 as well as the sprockets which support them are vertically displaced or staggered by an identical distance. The purpose of this arrangement is to prevent the turnaround elements 62 from rotating on a horizontal axis as they move through their path of travel.

Referring again now to FIGURES 1, 2 and 5, a turning cam 85 is provided and suitably supported by the members 36 and 37. As illustrated in FIGURE 5, the turning cam 85 is provided with a groove 86 which is engaged by the followers 73 as they move through that portion of their path of travel. A reset cam 87 is also provided as best illustrated in FIGURES 1 and 5. The reset cam is similarly supported and has a groove 88 which returns each of the foot members 77 of each turnaround element 62 to its original position so that it is in proper orientation for the next circuit.

The operation of the device will now be described. The diaper pads 26 are moved along in spaced relation by the forwarding belts 18, 19 and 24 and are received on the polished surface of the dead plate 17. Carrier chains 38 and 39 move a turnaround element 62 into the position illustrated at the left end of FIGURE 1 in timed relation to the delivery of each pad. At this point, the high fric-

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tion lower surface 78 of the element 62 engages the pad 26 at its approximate center. The element 62 is moving at about the same speed as the belts 18, 19 and 24, and therefore continues to carry the pad 26 forward after it is released by the belts. The initial position of the turnaround element 62 and the pad 26 is shown at A in FIGURE 6. As the turnaround element 62 continues to move forward, its cam follower 73 enters the groove 86 of the turning cam 85. This causes rotation of the shaft 69 and its associated elements including the high-friction surface 78 thereby turning the pad 26. Positions B and C in FIGURE 6 illustrate several intermediate positions of the pad 26 as it is turned through an arc of about 90° while the turnaround element 62 moves through the turning cam 85. It will be understood that the device can be modified to turn the pad 26 through an arc of more or less than 90° merely by making conventional adjustments in the position of the stop screws 66 and 67.

After the pad 26 has been turned, it is delivered to the lower carrier belt 27 and it held thereon by the belts 30 and 31. The turnaround element 62 is then raised from the pad 26 as the carrier chains 38 and 39 move around the sprockets 53 and 43, respectively. As the turnaround elements 62 continue to move, the cam follower 73 enters the groove 88 of the reset cam 87 (see FIGURE 5). This returns the foot member 77 to its original position so that it is in readiness for the next turning operation.

It will also be understood that any number of turnaround elements 62 can be secured to the carrier chains 38 and 39 depending upon the needs of any particular operation. While seven have been illustrated in FIGURE 1 this number can be increased or decreased to any desired value without changing the operation of the invention.

While particular embodiments of the invention have been illustrated and described it will be obvious to those skilled in the art that various changes and modifications can be made without departing from the spirit and scope of the invention and it is intended to cover the appended claims all such changes and modifications that are within the scope of this invention.

What is claimed as new is:

1. Apparatus for turning a moving sheet received from a delivery conveyor comprising a polished dead plate onto which said sheets are delivered, a turnaround member mounted on a conveyor, said conveyor moving the bottom surface of said turnaround member into contact with a sheet delivered to said dead plate from said delivery conveyor, the lower surface of said turnaround member having a relatively high coefficient of friction, said conveyor moving said turnaround member and sheet forward over the polished dead plate, means for rotating the said lower surface of said moving turnaround member a limited number of degrees on an axis substantially perpendicular to said dead plate while over said dead plate whereby said sheet is rotated through a predetermined arc for delivery to a take-away conveyor, and means associated with said conveyor to maintain the rotative axis of said turnaround member substantially vertical throughout its path of travel.

2. Apparatus for turning a moving sheet received from a delivery conveyor comprising a polished dead plate onto which said sheets are delivered, a turnaround member mounted on a conveyor, said conveyor moving the bottom surface of said turnaround member into contact with a sheet delivered to said dead plate from said delivery conveyor, the lower surface of said turnaround member having a relatively high coefficient of friction, said conveyor moving said turnaround member and sheet forward over the polished dead plate, means for rotating the said lower surface of said moving turnaround member a limited number of degrees on an axis substantially perpendicular to said dead plate while over said dead plate whereby said sheet is rotated through a predetermined arc for delivery to a take-away conveyor, said conveyor having said turnaround member mounted thereon comprising a

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pair of vertically staggered chain members and connective means between said chain members and said turnaround member to maintain the rotative axis of said turnaround member substantially vertical throughout its path of travel.

3. Apparatus for turning moving sheets received in single file order from a delivery conveyor comprising a plurality of turnaround members mounted on a conveyor for movement in a circuitous path, the bottom surface of each of said turnaround members having a relatively high coefficient of friction, a stationary polished dead plate onto which said sheets are delivered, said dead plate being mounted beneath said conveyor, conveyor guide means for bringing the bottom surface of one such turnaround member into contact with successive sheets received from said delivery conveyor thereby forwarding said sheets over the polished dead plate, means for rotating the bottom surface of each of said turnaround members a limited number of degrees on its vertical axis as it moves over said dead plate thereby rotating said sheets through a predetermined arc prior to delivery to a take-away conveyor, and means associated with said conveyor supporting said plurality of turnaround members to maintain the rotative axis of said turnaround members substantially vertical through the path of travel of said turnaround members.

4. Apparatus for turning a moving sheet received from a delivery conveyor comprising means for receiving said sheets from a delivery conveyor, a turnaround member mounted on a conveyor, said last mentioned conveyor moving the bottom surface of said turnaround member

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into contact with a sheet delivered to said sheet receiving means from said delivery conveyor, the lower surface of said turnaround member having a relatively high coefficient of friction, said conveyor which supports said turnaround member moving said turnaround member and sheet forward over said sheet receiving means, means for rotating the said lower surface of the moving turnaround member a limited number of degrees on an axis substantially perpendicular to said sheet receiving means while over said sheet receiving means whereby said sheet is rotated through a predetermined arc prior to being delivered to a take-away conveyor, and means associated with said conveyor having said turnaround member mounted thereon to maintain the rotative axis of said turnaround member substantially vertical throughout its path of travel.

5. Apparatus as claimed in claim 4 wherein said means for maintaining the rotative axis of said turnaround member substantially vertical throughout its path of travel includes a pair of vertically staggered chain members and connective means between said chain members and said turnaround member.

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