

Aug. 10, 1971

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3,598,680

TANDEM AIR FORMER

Filed April 18, 1968

3 Sheets-Sheet 1

FIG. 1

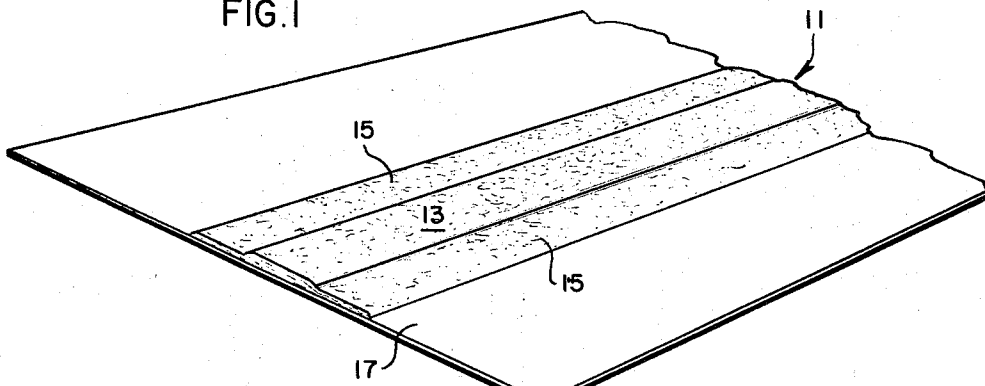


FIG. 2

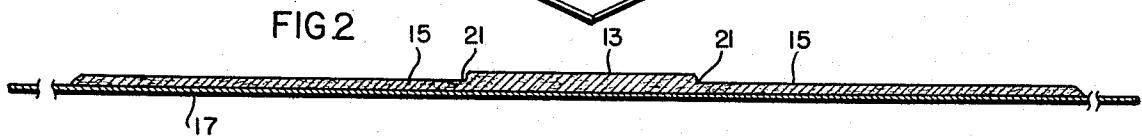
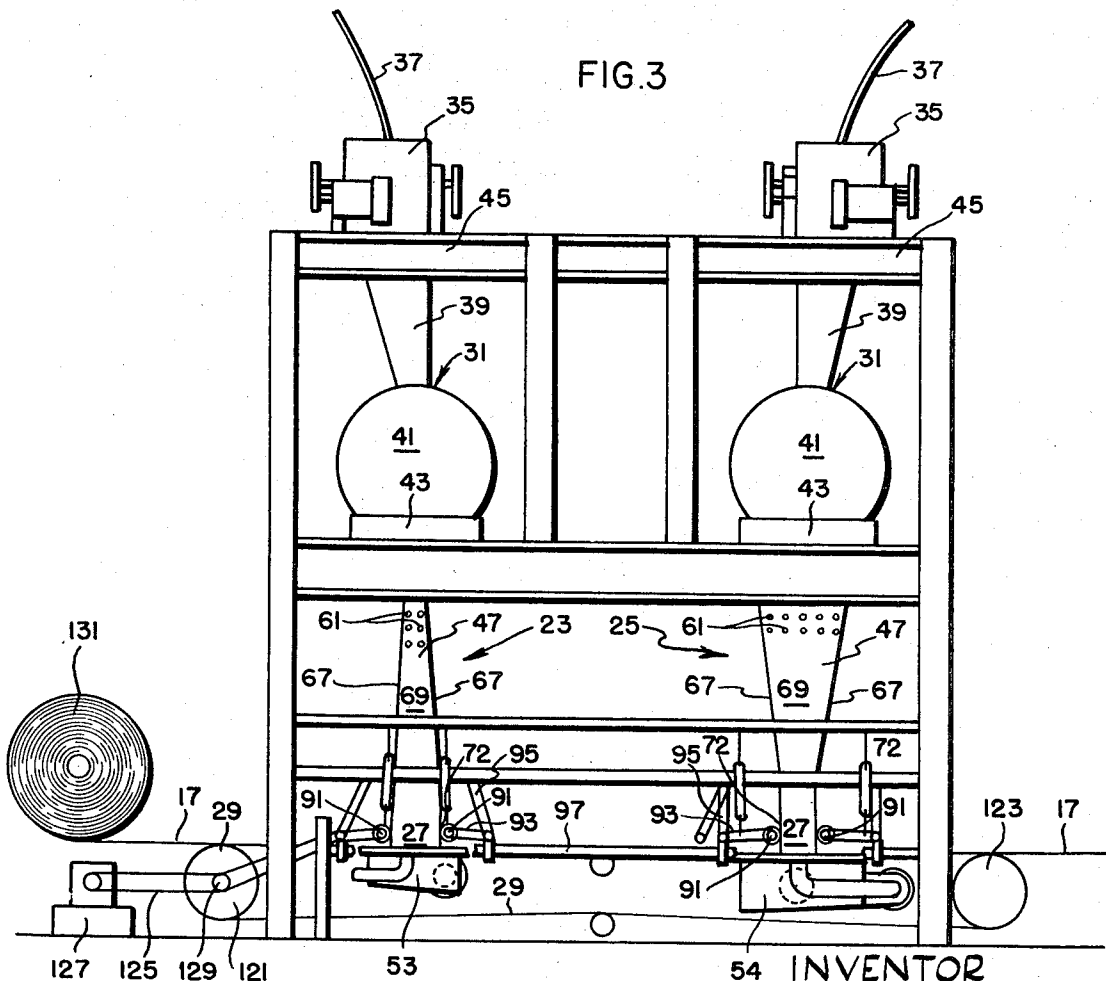


FIG. 3



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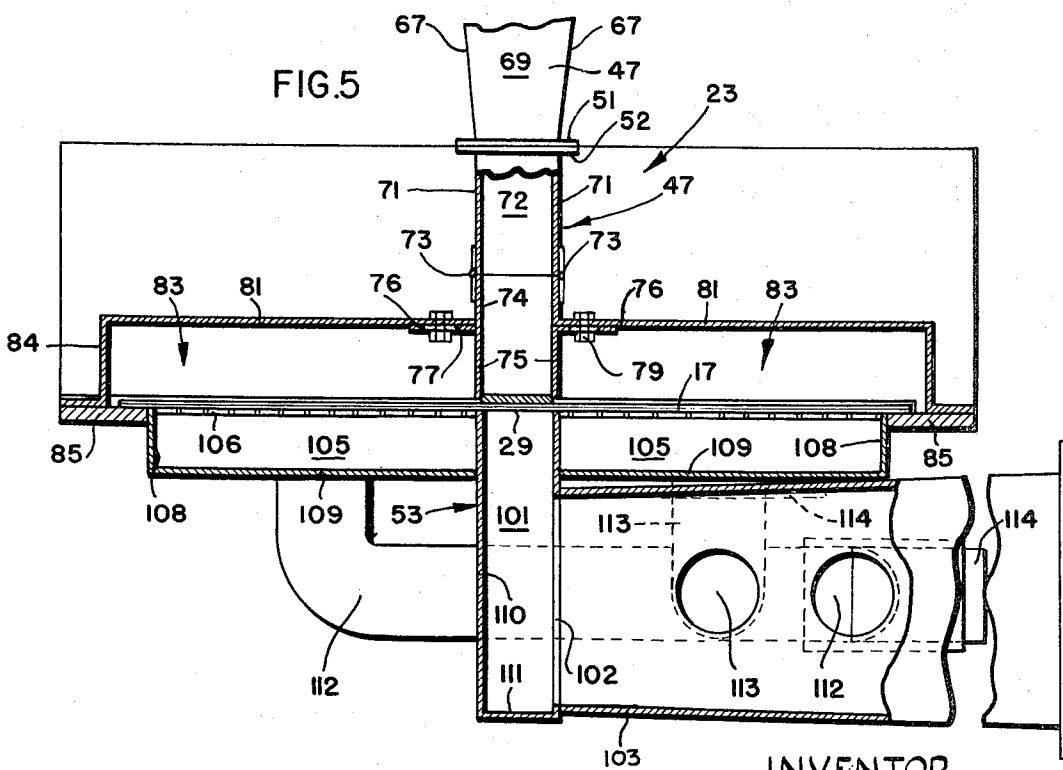
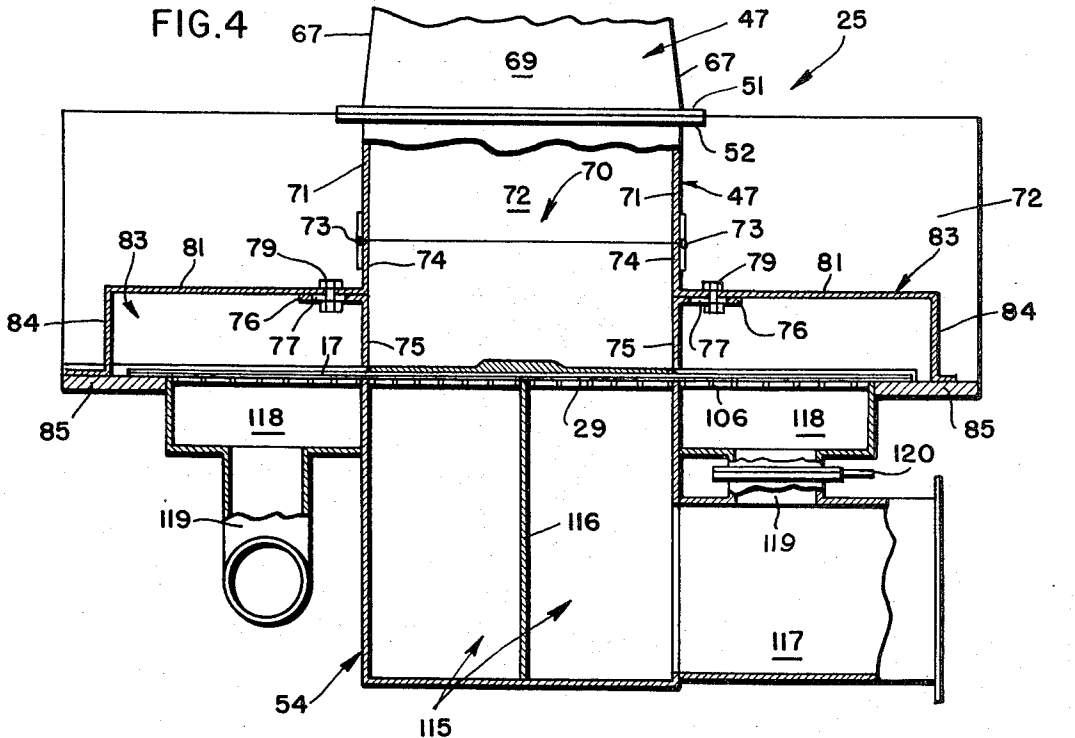
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

FIG.6

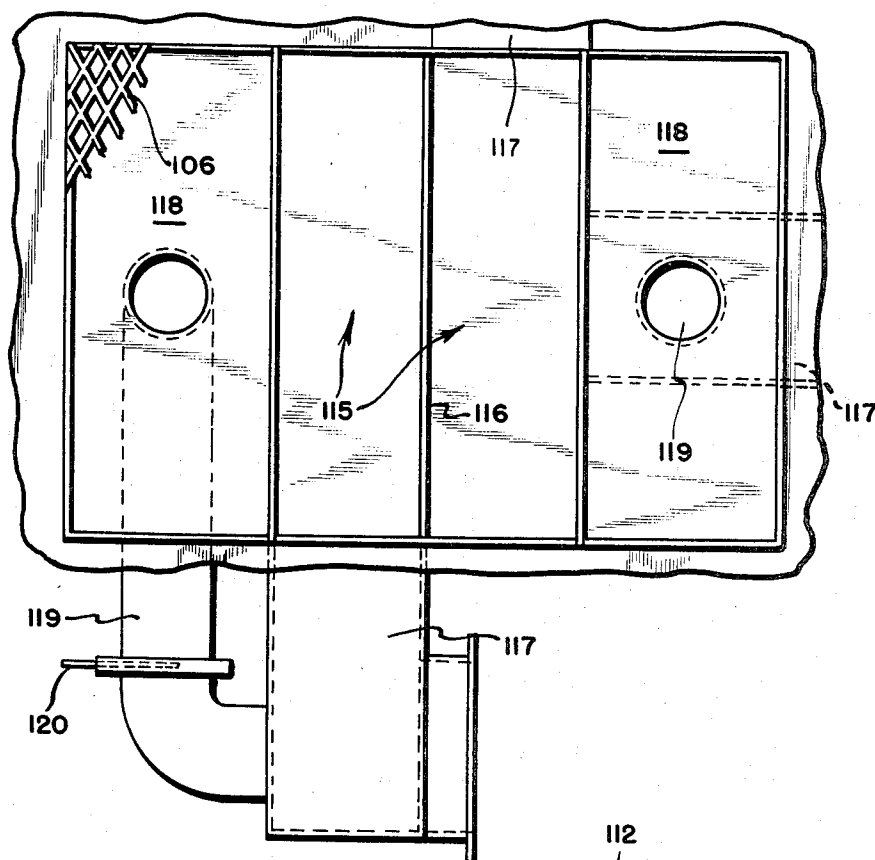
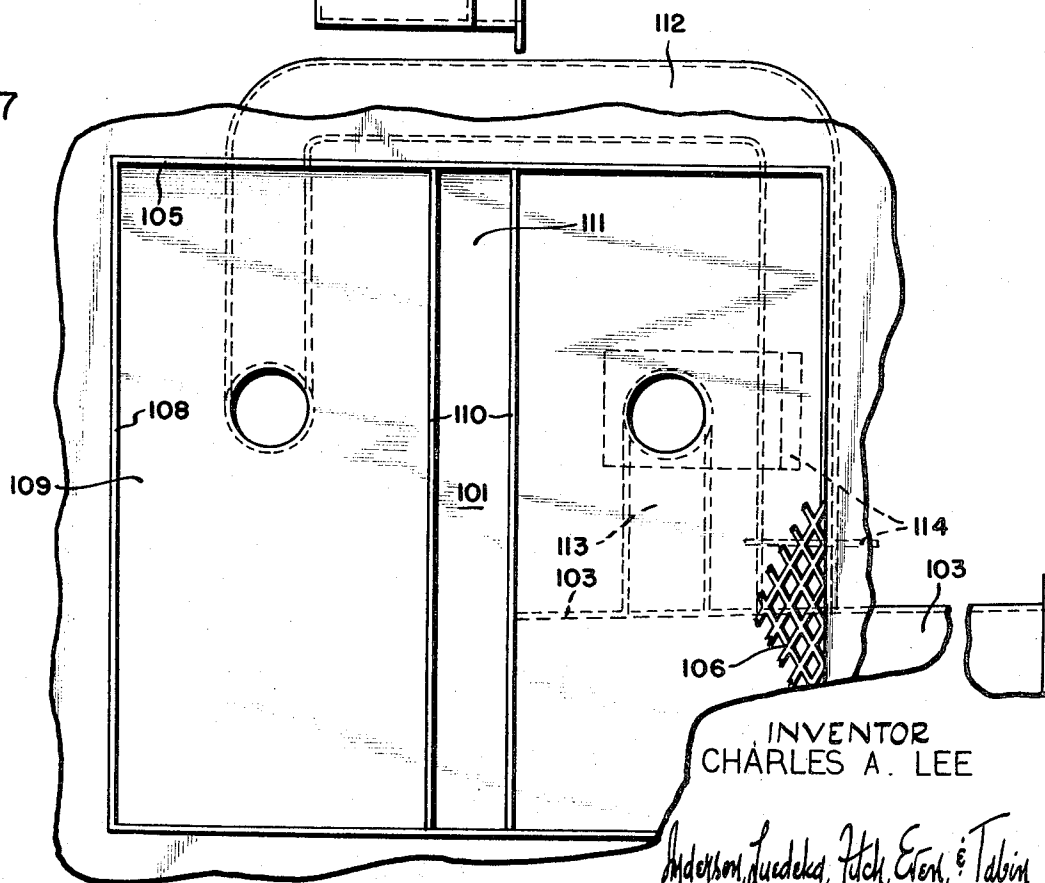


FIG.7



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TANDEM AIR FORMER

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Int. Cl. B29j 5/08; B32b 17/04; D21f 11/04

U.S. Cl. 156—377

8 Claims

ABSTRACT OF THE DISCLOSURE

A fibrous web of non-uniform, cross-sectional thickness is formed in a continuous manner by air laying fibrous material at a first station and then air laying additional fibrous material at a second station downstream from the first to overlap at least partially the fibrous material deposited at the first station. To provide and maintain a precise configuration for the thicker portion of the web, a pressure differential is maintained across the web being formed to cause the air to flow through the thicker portion of the web as well as the thinner portions of the web at the substantially same rate as it approaches the web.

This invention relates to an apparatus for producing, at relatively high rates of production, a continuous pad or web of loose fibrous material of a non-uniform cross-sectional thickness.

One manner of producing such webs is by a process known as air laying in which a quantity of loose fibrous material is continuously deposited or laid on a moving carrier or screen by a stream of air flowing through the carrier. The loose fibrous material is delivered from a feeding unit into the air stream which moves the air-fiber mixture through ducts to an air laying chamber at which the fibrous material is filtered from the air by the screen and the air is drawn through the screen by a vacuum box.

The present invention is directed to air laying fibrous material, such as wood pulp fibers, at relatively high production rates, e.g., 1200 lbs./hr., and in a relatively precise contour and is of particular importance in forming absorbent pads used in sanitary products such as disposable diapers. The invention is described in connection with, but is not limited to the formation of an absorbent pad which is to be incorporated into a disposable diaper. The pad is soft and highly absorbent and functions in the diaper to absorb body fluids discharged by the wearer. The effectiveness of the pad in absorbing fluid is increased substantially, if the center portion of the pad is of greater thickness than adjacent longitudinally extending edge portions, since in use the center portion of the pad is in position for directly receiving the body fluids.

In the past, a pad with a thick center portion has been made by air laying two separate pads or layers of different widths on respective carrier webs or creped tissue and then bringing them together with suitable equipment to form the composite pad. As the composite pad had a creped tissue web at the interface of the joined layers, there was a tendency for the layers to separate and to allow fluid to flow along the interface. Subsequently, a single integral web of loose fibrous material was formed by providing a velocity distribution of the air-fiber mixture in which the center portion of the stream had a greater velocity than the side portions. In this manner, more fibers were deposited at the center of the pad than along the edges of the web.

The method of making a single integral web by distribution of the velocity of the air stream was generally satisfactory, but it was difficult to control precisely the density of one portion of the web without affecting another portion of the web, since changing of parameters on one portion of the fiber carrying air stream had a direct effect

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on the other portion of the air stream. Further such equipment, although large, had limited capacity.

Accordingly, a general object of the invention is to provide a simple and efficient apparatus for producing an integral web of loose fibrous material having a non-uniform cross-sectional thickness and for producing such webs at a faster rate than has heretofore been achieved.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings in which:

FIG. 1 is a fragmentary perspective view of a pad on a carrier web;

FIG. 2 is a cross-sectional view of the pad shown in FIG. 1, taken along the line 2—2 of FIG. 1;

FIG. 3 is an elevational view of an apparatus for making the pad of FIG. 1;

FIGS. 4 and 5 are cross-sectional views of air laying chambers and vacuum boxes shown in FIG. 3, taken along lines 4—4 and 5—5, respectively, of FIG. 3; and

FIGS. 6 and 7 are plan views of the vacuum boxes shown in FIGS. 4 and 5, respectively.

As shown in the drawings for purposes of illustration, the invention is embodied in an air laying apparatus for making a web or pad 11 of fibrous material with a predetermined non-uniform thickness. The illustrated pad is considerably thicker at its center portion 13 than at longitudinal flanking edge portions 15. For instance, the center portion 13 may be about twice as thick as the side portions 15. In this instance, the pad is disposed on a carrier or web 17 which comprises a thin sheet of creped tissue having a width approximately three times that of the pad 11.

The pad is preferably formed of individual fibers of wood pulp, or as close thereto as possible, resulting from divelication of webs of felted wood pulp. The disclosed apparatus is capable of divelicating felted wood pulp at rates as high as 1,200 pounds per hour and depositing the resulting fibers on the traveling carrier web 17 in a precise, relatively thin cross section. Specifically, the illustrated pad has a center portion 13 which is three inches wide and ¼ inch deep and flanking side portions 15 each of which is 5½ inches wide and about ⅛ inch deep. To provide a pad with good moisture distribution qualities, lumps or clumps of fibers should be eliminated and areas of little or no fiber deposition are to be avoided. Also, the contour of the pad is carefully controlled so that center portion 13 is maintained precisely at its desired width, in this instance, three inches and has relatively sharp right angle junctures or corners 21 (FIG. 2) between the center portion 13 and the adjacent edges of the flanking portions 15.

When the pads are formed by distributing the velocity of the air stream, the air stream does not provide a sharp break in velocities in adjacent portions of the air stream, and it has been difficult to prevent lateral motion tending to move the fibers after they have been laid and indeed rolling up portions of the formed pad. Also, considerable difficulties are experienced with previous equipment in divelicating, conveying and depositing large quantities of fibrous material. Production rates have been increased by higher air stream velocities and/or higher fiber concentrations, but this gives rise to agglomeration and difficulties in depositing the fibers in a uniform manner. There is a need for an apparatus for forming an integral, contoured pad at high rates of production.

In accordance with the present invention, production rates may be increased while precisely controlling the cross section of the pad by air laying a flat fibrous strip on the carrier web 17 at a first station 23 (FIG. 3) of a pair of tandem stations and then air laying a second fibrous strip on the first layer at a second or downstream

station 25. The resulting pad, unlike that formed by an air stream of distributed velocity, is formed with sharp corners 21 between the center and flanking pad portions. The separate air laying stations allow substantially mutually exclusive control over the air laying of the strips as contrasted with a single air stream of distributed velocity. Increased rates of production are possible by having separate means at each station 23 and 25 to divelicate a web of wood pulp into individual fibers, or as close thereto as possible, and then to combine their outputs into a single, integral contoured fibrous pad. The web 17 is carried by an air pervious belt 29 between the stations so that the deposited material at the downstream station may be deposited to overlie the pad previously deposited and form an integral, fibrous pad. As will be explained, the contour of the pad may be more closely controlled and more sharply defined by pulling air through the carrier at the previously formed portion of the pad at the same rate at which it arrives at the carrier.

Proceeding now with a detailed description of the invention, each of the air laying stations 23 and 25 is preferably constructed so that the air-fiber mixture travels along a very short, gravity assisted path between an overhead fiber producing unit 31 and an underlying forming chamber 27. Each fiber producing unit in this instance includes a conventional shredder 35 which receives a felted web of wood pulp 37. The webs of wood pulp are continuously fed into appropriate power driven cutters (not shown) in the shredder, and the webs are reduced to pieces of postage stamp size or smaller. From each shredder 35, the pieces of felted web fall through a vertically disposed chute 39 to the inlet side of a refiner or mill 41 which is supported on a platform 43 beneath a platform 45 supporting the shredder. The refiners 41 may be of conventional construction and may include a pair of closely spaced discs (not shown), which are rotated in opposite directions, and between which move the shredded pieces of felted web. The discs break the pulp pieces into individual fibers or as close thereto as possible. Other forms of divelicating equipment may be employed, within the purview of the invention, to defibrate the web in a single operation rather than by the two step shredding and refining operation as illustrated herein.

To convey the fibrous material from each refiner 41 to the carrier web 17, there is provided means in the form of a duct 47 connected at its upper end to the refiner and connected at its lower end to a forming chamber 27 at which fluff is deposited on the carrier web. The ducts for the respective stations 23, 25 are generally similar in that each is rectangular in cross section, is formed of sheet metal, and is relatively air tight, except for the openings necessarily provided therein. At their lower ends, the ducts 47 are each provided with an outwardly extending flange 51 (FIGS. 4 and 5) by which each is connected to a mating flange 52 on the upper end of the respective forming chambers 27.

As best seen in FIGS. 3-5, the forming chambers 27 are in fluid communication with the negative pressure (suction) from an underlying vacuum box 53 and 54 and the ducts 47 are, in turn, in fluid communication with the refiners 41, ducts 39 and the shredders 35. Therefore, negative pressure from the vacuum box pulls ambient air through shredder 35 and ducts 39 into the refiners 41 and through its rotating discs which defibrate the felted pieces of wood pulp. These discs are relatively close together and do not permit a rate of air flow therebetween sufficient to convey the fibers at relatively high velocity to the web 17. To provide more air and to insure good mixing and a uniform distribution of loose fibrous material throughout the conveying air stream, staggered rows of circular openings 61 are provided in at least one of the upper walls of each duct 47 to allow ambient air to flow into the duct and join the air and fibers coming down from the refiner discs. The ambient air comes into the duct 47 in the form of small individual

jets or streams intersecting the descending stream in the duct and causing turbulence as the jets mix with the air and fibrous material. Usually, several of the openings 61 are covered and the number and pattern of uncovered openings is varied depending upon the amount of fibrous material being generated, the desired density for the pad and the speed of web travel. Usually, a transparent window is provided in one of the duct walls so that the air-fiber mixture can be observed and the pattern and amount of air varied to eliminate conglomerating and to improve fiber-air mixing. The desired air-fiber mixture is a uniform distribution of individual fibers in and throughout the air stream.

The inner wall surface of the ducts 47 are smooth and generally vertical in this preferred embodiment of the invention to prevent fiber accumulations in the duct. Long passages, sharply curved passages or projections in the duct passages catch fibers and accumulate them into balls which, when released, are deposited unevenly on the pad. This adversely affects the diaper conformability and ability to absorb and spread fluids. Gravity and the short vertical drop for fibers to the generally horizontally disposed web 17 facilitates fiber-air flow and thereby allows high capacity operation.

Each duct is formed with a central vertical passageway through which the air-fiber mixture flows to the carrier web 17 and the pervious belt 29 supporting the web. The duct is defined by a first pair of opposed, parallel vertical walls 67 which abut a second set of parallel opposed end walls 69, the latter extending transversely of the carrier web 17. As will be explained, the lower end of the duct is tapered, at the first station 23 to only about three inches in the direction transverse of the web but is quite long in the longitudinal direction of the web. On the other hand, the lower end of the duct at the second station 25 is about fourteen inches in the direction transverse to the web and in the longitudinal direction is shorter than the duct at the station 23.

As the fiber bearing air stream flows from a duct 47, it enters an aligned air laying passageway 70 in the air laying chamber and flows to the carrier web 17. The fibers are deposited on the web 17 while the air moves through the web and into the vacuum box 53 or 54. The respective air laying passageways have approximately the same rectangular cross-sectional configuration and dimension as the lower ends of the respective ducts 47. That is, at the first air laying station 23 the air fiber stream leaving the lower end of the duct 47 moves through an air laying passageway 70 which is approximately three inches in width, i.e., in a direction transverse of the web, and approximately thirty inches in length. At the second air laying station 25 (FIG. 4), the air fiber stream flows through an air laying passageway which is approximately fourteen inches wide and twenty-two inches in length. By making the first station longer, the cross-sectional areas of the carrier web 17 receiving fibers at the respective air laying stations are made more nearly equal. To this end, a given length of the web traveling through the first air laying station 23 remains within the first air forming chamber for a greater period of time than it remains in the second air laying chamber. Therefore, when the air-fiber mixtures in the respective air fiber laying chambers have relatively equal densities, the amounts of fiber being deposited at the respective stations are more nearly equal than would be the case if the air laying passageways 70 were of the same length.

The air laying passageways 70 are defined by a first set of opposed parallel sidewalls 71 which extend generally parallel to the longitudinal direction of the web 17 to abut, at their opposite ends, respective end walls 72 which are disposed generally normal to the direction of web movement. The longitudinally extending sidewalls 71 are divided into several portions including an upper stationary portion extending downwardly from the flange 52 to a hinge 73 which carries an aligned lower wall por-

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tion 74. The hinges 73 permit outward and upward pivotal movement of the lower wall portions 74 to permit inspection of the interior of the passageway 70.

Aligned with and extending downwardly from each lower wall portion 74 is a deckle plate 75 which is adjustably mounted for shifting transversely of the web 17, that is, either toward or away from the opposite deckle plate to vary the width of the air stream passing between them and thereby the width of the pad being deposited on the web 17. To mount the deckle plates 75 for adjustable movement, they are provided with upper outwardly extending flanges 76 with elongated slots 77 therein through which project a shank of a bolt 79 by which the deckle plate is fastened in position to an overhead wall 81. The lower ends of the deckle plates 75 extend closely adjacent the top surface of the carrier web 17 moving beneath the deckle plates.

Because the carrier web 17 slides beneath the lower ends of the deckle plates 75, the latter do not have a tight air seal with the web. To prevent ambient air from going under the deckle plates and reaching the air laying passageway 70, a set of balancing chambers 83 are disposed on opposite sides of the deckle plates 75 and are connected to a vacuum box to have a reduced pressure therein. Top walls 81 of the respective balancing chambers 83 are attached to the hinged lower wall portions 74 and to outer depending sidewalls 84 which are normally in sealed engagement with a flange 85 of the vacuum box. These balancing chamber walls 81 and 84 extend longitudinally relative the sides of the web 17 to abut the lower portions of plates 72 which cover the ends of the balancing chambers 83.

These transversely extending plates 72 defining the opposite end walls for the balancing chambers 83 and also for the air laying passageways 70 extend across the full extent of the carrier web 17 and serve to cooperate with rotatable seal rolls 81 (FIG. 3), as will be explained, to prevent leakage of ambient air into the air laying passageways 70 or the balancing chambers 83 as both the carrier web 17 and the belt 29 pass through slots formed at the bottom of these plates 72 adjacent the flange 85 of the underlying vacuum box.

The rotatable seal rolls 91 (FIG. 3) extend transversely across the web 17 and are mounted adjacent the respective end plates 72 to close the slots formed thereby and are rotated to roll on the upper surfaces of the carrier web 17 and/or pad 11. The peripheries of the respective seal rolls are formed with grooves (not shown) corresponding to the shape of the strips or pad moving beneath the roll, except for the first or leftmost seal roll, which has no groove as it engages the web 17 prior to forming the first strip for the pad 11 at the first station 23. The right hand seal roll for the first station 23 has a central groove of about three inches in width and one-eighth inch deep to engage and slightly compact the first strip of the pad. The left hand seal roll for the second station 25 also has a three inch groove while the right hand seal roll has a fourteen inch wide groove of one-eighth inch depth and a central groove of three inch width and one-fourth inch depth. The formation of the sharp, right angle corners provides a mating fit for the seal rolls which are formed with relatively sharp shoulders at and between the pad receiving grooves. The seal rolls 91 are journaled for rotation in the bracket arms 93 (FIG. 3) which are pivotally mounted on brackets 95. The seal rolls are rotated by a drive shaft 97 at a speed at which their tangential velocities are equal to the linear travel speed of the web 17. A detailed description of the seal rolls 91 and their manner of operation are the subject matter of copending application Ser. No. 672,477 filed Oct. 3, 1967 now U.S. Pat. 3,509,604, the disclosure of which is hereby incorporated by reference as if fully reproduced herein.

As previously explained, the vacuum boxes 53 and 54 are disposed beneath the respective air forming chambers 27 and draw the air through the web 17 and screen 29.

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The vacuum box 53 at the first station 23 includes a central compartment 101 (FIGS. 5 and 7) aligned beneath the air laying passageway 70 carrying the air-fiber mixture. At its lower end, the central compartment 101 has a port 102 through which air passes into a large circular duct 103 which, in turn, is connected to a suitable suction device (not shown). The suction device has sufficient capacity to pull the air of the air-fiber stream directly through the carrier web 17 and carrier 29 at the same rate as the air impinges against them so that there is no lateral deflection of air or fibers which would result in an undesirable cross section for the pad.

To provide reduced pressure within the balancing chambers 83, the vacuum box 53 includes a pair of outrigger compartments 105 which are disposed immediately beneath and aligned with the balancing chambers 83. A generally open expanded metal screen 106 (FIGS. 5 and 7) extends across the vacuum box and supports the belt 29 and thereby the carrier web 17 as they travel across the compartments 101 and 105 at the first station 23. The screen 106 is relatively flat and disposed substantially horizontally with its upper surface flush with an upper surface of the peripheral flange 85 of the vacuum box 53. This flange 85 supports the side marginal areas of the carrier web 17 and belt 29. The flange 85 is secured in a suitable manner to the end plates 72 of the air forming chamber 47 and supports the vacuum box 53 in its position intermediate the upper and lower runs of the conveyor belt 29.

The outrigger chambers 105 are generally rectangular in cross section and in the form of an open ended box defined by vertical sidewalls 108 attached at their upper edges to the flange 85 and attached at lower edges to a bottom wall 109. The innermost sides of the outrigger chambers 105 are defined by the upper portions of sidewalls 110 defining the central compartment 101. The sidewalls 110 extend downwardly from the screen 85 to a bottom wall 111.

The outrigger compartments 105 are in fluid communication with and are maintained at a reduced pressure by ducts 112 which extend to the large duct 103 connected to the suction device. The cross section of each outrigger duct is considerably less than that of the large duct 103. The rate of air flow through the respective outrigger ducts 112 and balancing chambers 83 is quite small in comparison to the rate of air flow through the central chamber 101 and duct 103. The rate of flow through the outrigger ducts is suitably controlled by valve means in the form of a slideable plate 114 which extends into these ducts and can be manually operated to vary the size of the opening through them at the valve plates. The valve plate 114 slides within a slot between two closely adjacent plates of rectangular shape fixed to the ducts and holding the valve plate for sliding movement.

The vacuum box 54 at the second station 25 is substantially the same as the vacuum box 53 and will be described only briefly. The vacuum box 54 draws air through the web 17 and belt 29 at a central compartment 115 (FIGS. 4 and 6). This central compartment 115, however, is divided by a central partition 116 into two equal portions each of which is in fluid communication with a large duct 117 leading to a suction device (not shown). Each large duct is connected to an outrigger compartment 118 by a smaller cross-sectional outrigger duct 119 which has and is controlled by a valve plate 120. The two large ducts 117 provide a greater capacity for air flow than does the similar duct at the first air laying station. These ducts 117 are connected to suction devices which are able to establish a sufficient pressure differential across the web 17 and the three inch wide fibrous pad thereon that the air in the passageway moves straight through this pad and deposits additional fibers thereon without any substantial deflection of air or fibers away from the vicinity of the pad.

The carrier web 17 is carried along a predetermined path and at a substantially uniform rate by means of the endless mesh carrier belt 29. The endless carrier belt 29 is trained at a first end about a drive roll 121 (FIG. 3) and about idler roll 123 at its other end. The driving roll 121 is driven by a chain 125 extending from a drive unit 127 to a sprocket 129 fixed to the driving roll 121. Preferably, the carrier web 17 is provided in a large supply or parent roll 131 and is stripped therefrom by the carrier belt 29 and the rotating seal rolls 91 to travel across the upper run of the carrier belt. The carrier web 17 and the pad 11 are pulled from the discharge (right) end of the carrier belt 29 by feeding means (not shown) which is part of the diaper making machine.

As an aid to understanding the invention, a brief description of the operation of the preferred apparatus will now be given. The carrier web 17 is usually a web of creped tissue of 10 lbs. basis weight and is unwound from the parent roll 131 at a predetermined speed, for example, 300 feet per minute. The carrier web extends generally horizontally from the supply roll 131 to the upper run of the belt 29 which is continuously driven by its driving roll 121 and motor drive unit 127. The carrier web 17 runs beneath the seal rolls 91 and into and through the respective forming chambers 27 to leave the carrier belt 29 at the idler roll 123.

Webs 37 of felted wood pulp are continuously fed into the shredders 35 and are shredded and moved through the ducts 39 into the refiners at which the pieces of web are broken into individual fibers or as close thereto as possible. Negative air pressure from the suction boxes 53 and 54 pulls the fibers downwardly from the refiners 41 and draws ambient air into the ducts 47 to mix the fibers uniformly within the ducts.

At the first station 23 the duct 47 is tapered to define a narrow passageway leading to a narrow air forming passageway 70 (FIG. 5) which is only three inches in width between the deckle plates 75, this being the width of the first air laid strip which forms the lower half of the central pad portion 13. For larger sizes of diapers, deckle plates 75 are spread apart to increase the width of the strip being formed therebetween.

The air and fiber mixture entering the air laying passageway 75 at this first station 23 moves directly downwardly to impinge against the top surface of the web 17. The air continues to move at substantially the same rate through the creped tissue web, the meshed carrier belt 29 and the support screen 106 into the central chamber 101, suction box 53 and then outwardly through the duct 103 to a suction device. The preferred density of the three inch wide strip laid (FIG. 7) at the first station 23 for the illustrated diaper is .22 gram per square inch, and for a diaper of approximately sixteen inches long, this is approximately 10.75 grams of fibrous material per diaper.

The three-inch wide strip leaves the right hand seal roll 91 at the first station 23 and travels rightwardly as viewed in FIG. 3 to the second station 25, at which a fourteen inch wide, upper strip of fibers is laid over the first three inch strip. In this embodiment of the invention, the density for the flanking side portions 15 and for the second strip is 0.6 gram per square inch. For a diaper pad which is sixteen inches long and fourteen inches wide, there is deposited about 13.45 grams per diaper at the second station 25. At the vacuum box 54 for the second operating station 25, the divided central chamber 115 draws the air through the previously deposited three inch wide strip with a pressure differential sufficient to keep the previously laid fibrous material in place and at about the same rate as air flows directly through the carrier web 17 outside the three inch strip. This eliminates lateral movement of air and fibers in a direction transversely of the carrier web. Because the first strip was built with relatively square corners or edges, and since the air was pulled straight through this pad and the web 17 at the

second station, the pad 11 is formed with relatively square corners 21.

The described pad 11 is thus made with slightly less than one-half of its fibers deposited at the first station 23, slightly more than half of its fibers deposited at the station 25. As the air laying stations are mutually exclusive, these proportions and the amount of fiber in either of the center portion 13 or the flanking side portions 15 can be readily varied by defibrating more or less of one of the webs 37 to provide a greater or smaller concentration of fibers in either one or both the air streams. Also, the air flow through the ducts and vacuum box at any one station can be varied independently of the other station. Best results are obtained when the narrow center portion 13 of the pad is deposited at the first station. Satisfactory results have been obtained by first depositing a strip fourteen inches wide at the first station and then the narrow three inch center strip at the second station, but there is a greater tendency for the three inch strip to spread laterally when it is deposited at the second station.

From the foregoing, it will be seen that the apparatus is relatively simple and straight forward in its manner of application of the fibrous material to a carrier which in this instance has been described as a tissue web 17. A number of sizes of diaper pads may be made with the same apparatus, and the amount of material delivered per hour may be changed as the dimensions of the diaper pad are changed or the speed of web travel is changed.

While a preferred embodiment has been shown and described, it will be understood that there is no intent to limit the invention by such disclosure but, rather, it is intended to cover all modifications and alternate constructions falling within the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. An apparatus for forming a contoured continuous pad of fibrous material comprising means defining a continuously moving air pervious carrier movable along a predetermined path, means at a first station for conveying loose fibrous material by a first air stream to said carrier for depositing the fibrous material in a strip of a first predetermined width and cross-sectional thickness, means at said first station for drawing said first air stream through said pervious carrier substantially at the rate said air stream arrives at said carrier, means at a second station for conveying loose fibrous material by a second air stream independent of said first air stream to said carrier at a position downstream from said first station, said means at said second air stream depositing loose fibrous material in a second strip of a second predetermined width differing from said first predetermined width and overlapping at least a portion of said first strip to form a continuous composite pad of non-uniform cross-sectional thickness, and means for drawing said second air stream through said air pervious carrier at substantially the same rate it arrives at said carrier.

2. An apparatus in accordance with claim 1 including means to produce loose fibrous material at a first given rate and to introduce the same into said means for conveying the same to said air pervious carrier at the first station and including means to produce loose fibrous material at a second given rate and to introduce the same into said means for conveying the same to said air pervious carrier whereby fibrous material may be deposited on said carrier at the respective stations at different respective rates.

3. An apparatus in accordance with claim 1 in which said carrier includes a web of permeable material and in which an endless, permeable belt carries said web through said stations to receive said fibrous material on said web.

4. An apparatus in accordance with claim 2 in which the respective means to produce said loose fibrous material and to convey the same to the carrier are disposed above said carrier and deliver said fibrous material to the carrier at well defined areas of different dimensions

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and in which the respective means for drawing said air stream through said carrier are disposed beneath said carrier and are sized to the respective dimensions of the respective areas.

5. An apparatus in accordance with claim 4 in which said means for drawing the air through the carrier also includes outrigger ducts for drawing air through said carrier at locations laterally outward of the sides of said pad.

6. An apparatus in accordance with claim 4 in which the means to produce said fibrous material includes refiners for breaking pieces of wood pulp into individual fibers and said conveying means are vertically disposed ducts.

7. In an apparatus for producing a contoured pad of loose fibrous material on a continuously moving web, means for moving said web along a predetermined path through first and second stations at which fibrous material is deposited on said web, means at said first station for defibrating a web of wood pulp into fibers at a first rate, means including a duct extending downwardly from said defibrating means to said web and confining said fibers to deposit in a first strip of a predetermined width on said web, a suction box disposed beneath said web at said first station and drawing said air through said web, means at said second station to defibrate a second web of wood pulp into individual fibers at a second rate,

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means including a duct extending downwardly from said defibrating means to said web at a position at second station, said last mentioned means confining said fibers to deposit in a strip wider than said first strip and overlapping at least a portion of said first strip and thereby forming a pad of non-uniform cross-sectional thickness, and a suction box at said second station for drawing air through said duct, said web and said first strip and causing deposition of said fibers on said web and said first strip.

8. An apparatus in accordance with claim 7 in which said means for moving said web includes an endless belt of permeable material and in which said suction boxes extend into the space between upper and lower runs for said belt and draw air through the upper belt runs.

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U.S. Cl. X.R.

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