

[54] METHOD FOR APPLYING ATTACHING TAPES TO PADS

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[57] ABSTRACT

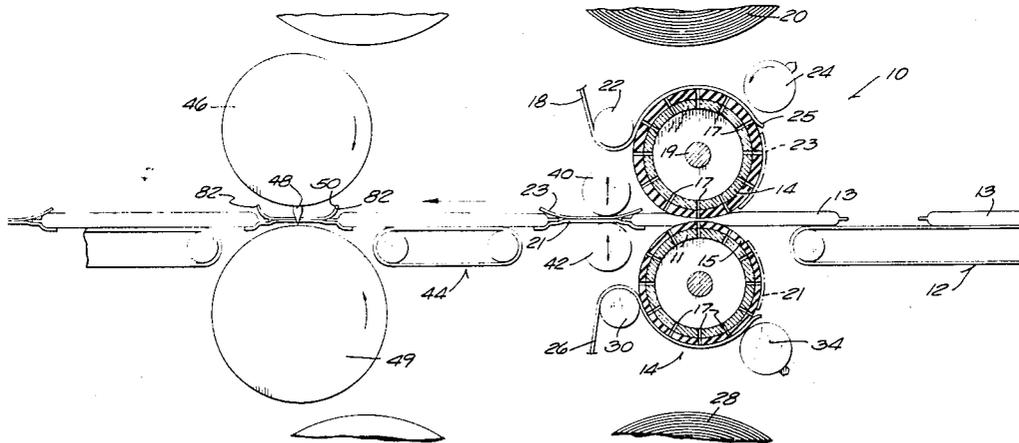
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- [58] Field of Search 156/250, 263-265, 156/521, 568, 510

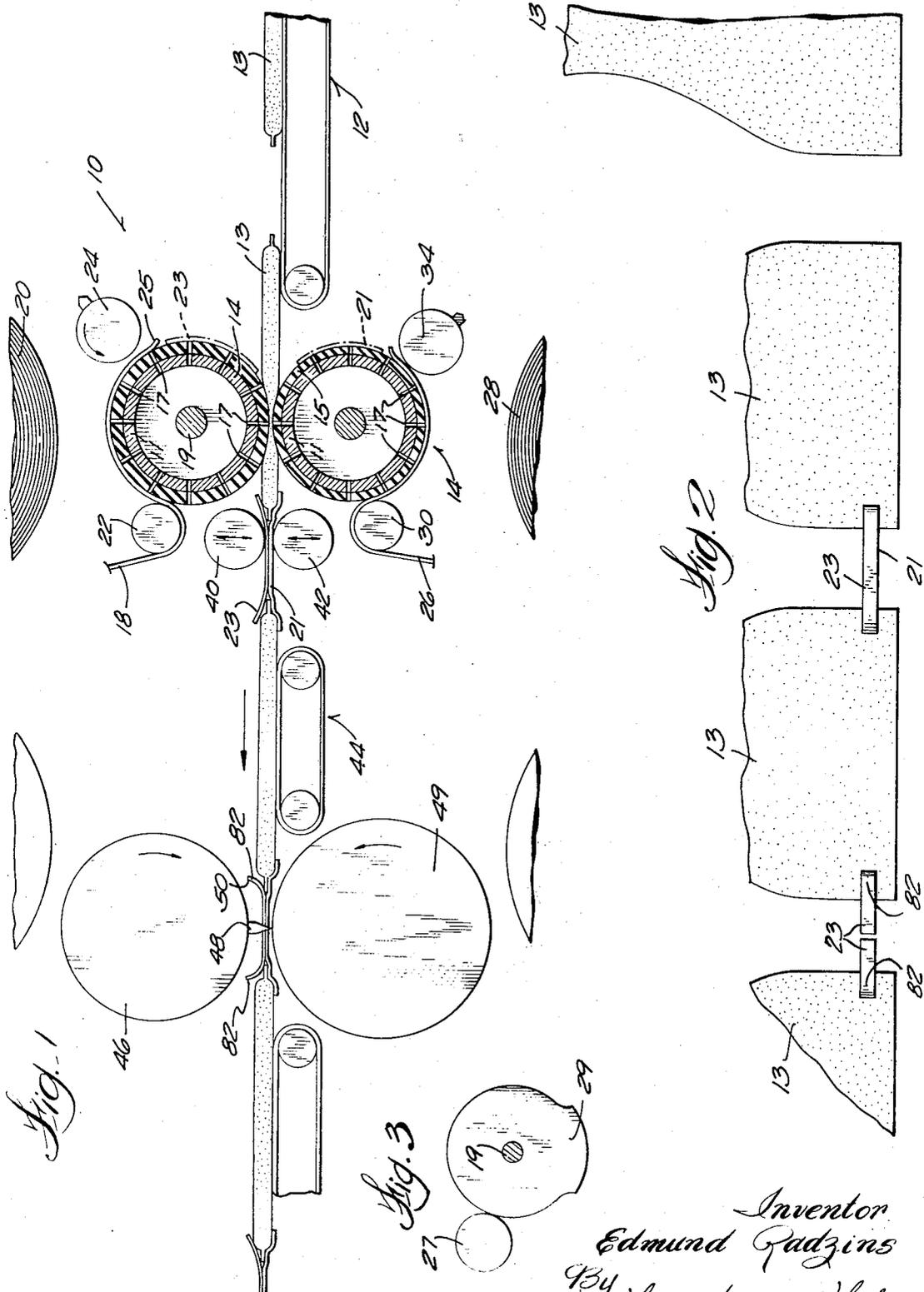
Attaching tapes and tape backing or liner are applied to pads such as disposable diapers as they are advanced past a vacuum roller where strips of tape and tape backing are applied to successive pads to interconnect adjacent pad ends. The connected pads are advanced to a cut-off knife which cuts the tape and tape backing to separate the pads and leave each pad with a lined tape adhered thereto.

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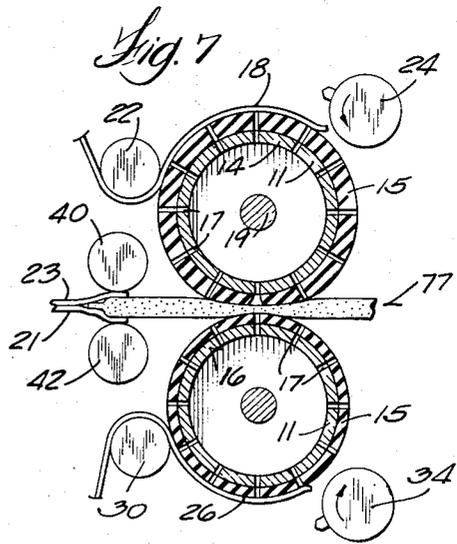
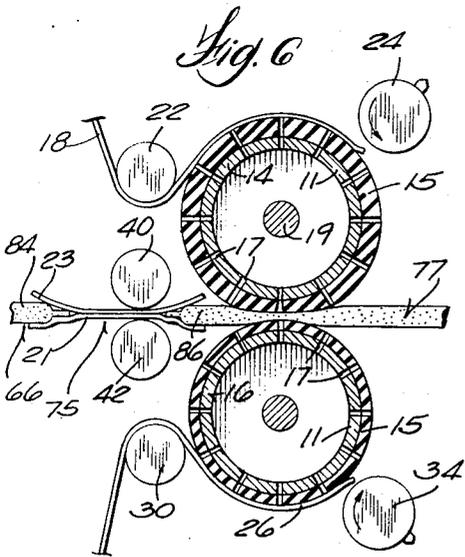
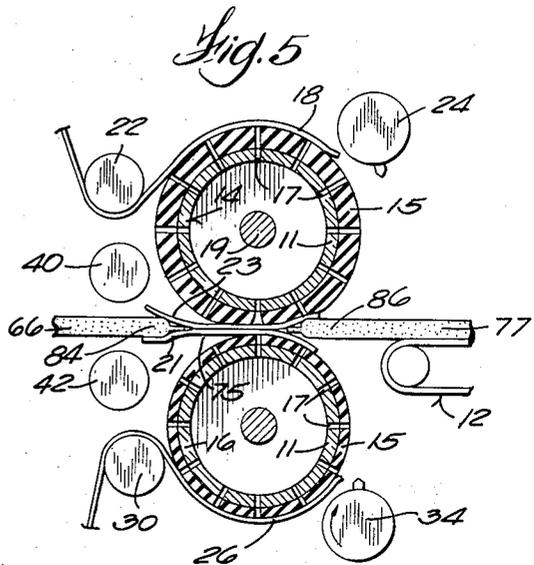
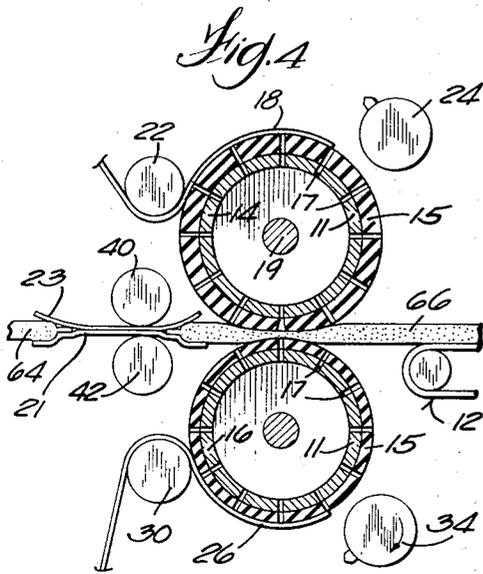
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11 Claims, 12 Drawing Figures

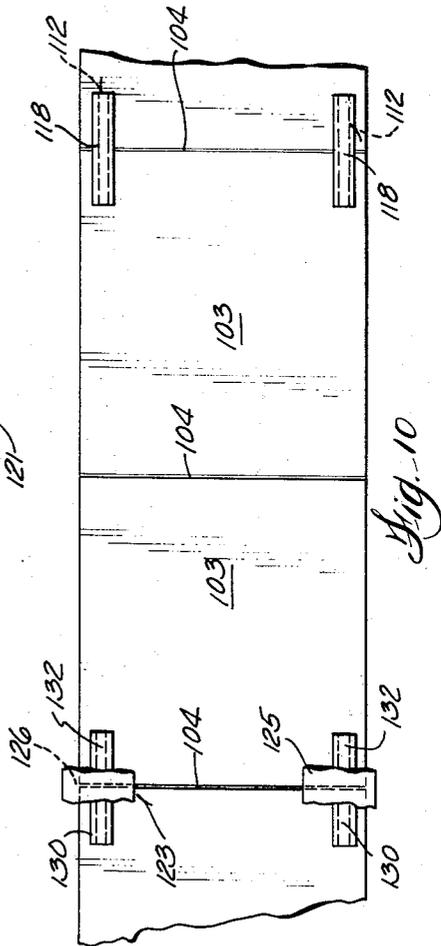
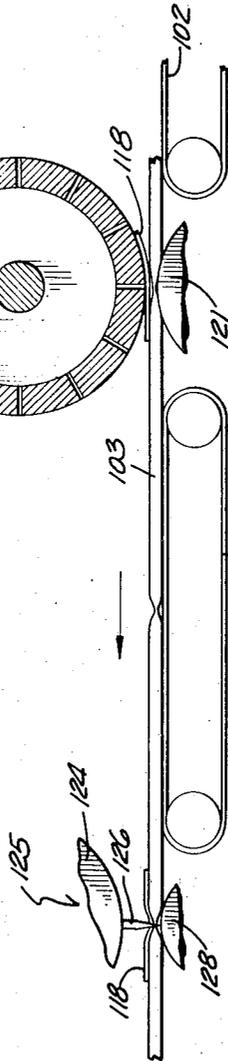
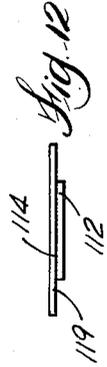
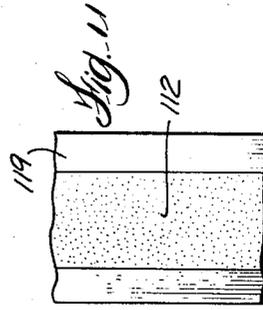
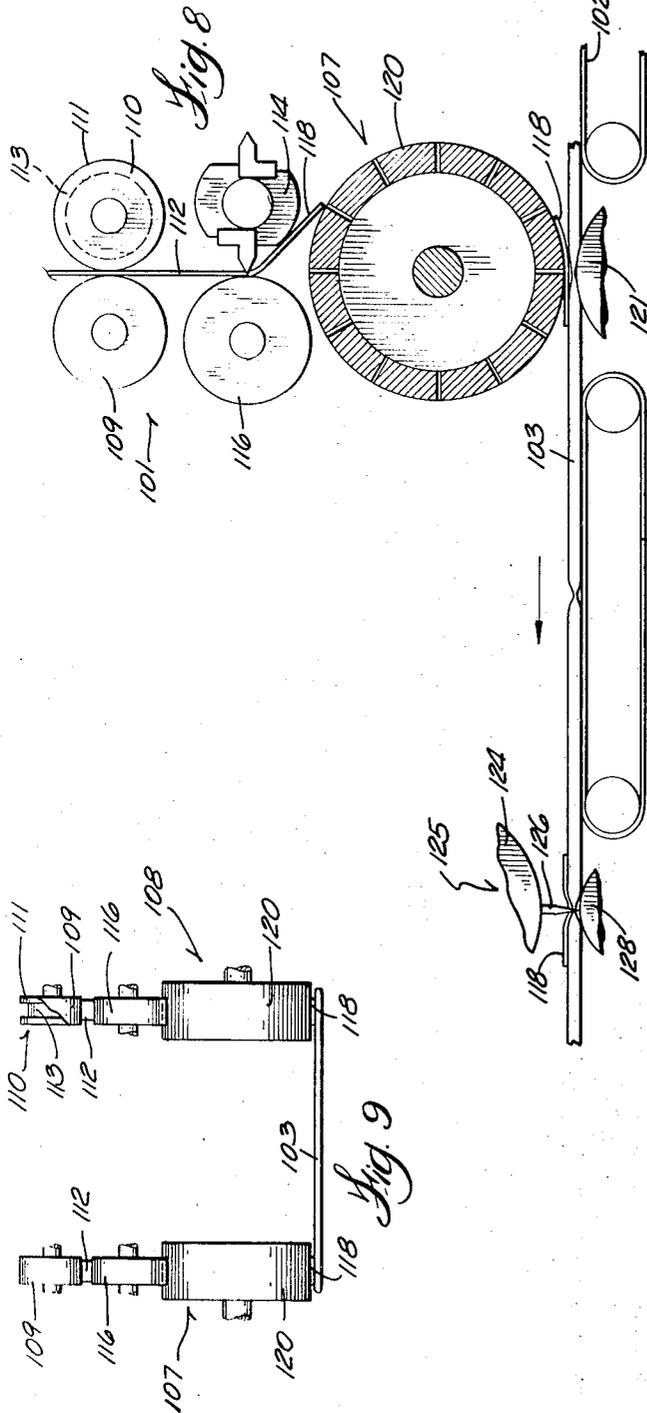




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METHOD FOR APPLYING ATTACHING TAPES TO PADS

BACKGROUND OF INVENTION

The present invention relates to methods and apparatus for automated application of pressure sensitive attaching tapes to pads. Pressure sensitive tapes have been employed with disposable diapers to eliminate the need for diaper pins. The problems encountered in applying the tapes and tape backing include proper transfer and positioning of tapes on the pads, registry of the backing on the tape and imposing appropriate adhering pressure on the tape as it is pressed against the pad.

SUMMARY OF INVENTION

These problems are solved by the methods and apparatus disclosed herein. In one embodiment the method includes the steps of advancing pads separated by a constant interval or gap which is twice the distance of the desired tape length, simultaneously superposing separate strips of tape and tape backing at opposite sides of the path of pad travel and across the gap in overlapping relation on the adjoining pad ends to interconnect the pads, pressing the tape against the tape backing in the gaps to form a firm bond and cutting the tape and tape backing with a transverse cut in the center of the gaps to separate the pads and form attaching tapes of equal length.

In such embodiment, the apparatus employed to practice the invention moves the pads sideways and continuously between a pair of spaced vacuum rollers which apply corresponding lengths of adhesive tape and tape backing across the gaps to connect adjoining pad ends. The vacuum rollers desirably have a soft rubber peripheral band which yields as the pads move between the rollers. Retractable compression rollers move together when the gaps are registered between the rollers to bond the tape and backing and retract prior to movement of the pad between the rollers to prevent compression of the pad.

The simultaneous application of two attaching tapes with the continuous advancement of pads provide a high production rate at a low cost as well as precise positioning of attaching tape of a uniform length.

In another embodiment the pads are moved lengthwise in abutting end to end relationship and laterally spaced strips of pre-adhered tape and tape backing (extended liner tape) are simultaneously applied to the adjoining pad ends of every other joint of the pads by two sets of laterally spaced tape cut-off and tape applying units. Final cut-off knives subsequently sever the tapes in the joints leaving two attaching extended liner tapes on each pad located within the outline of the pad.

Further objects and advantages of the invention will become apparent from the following disclosure.

DRAWINGS

FIG. 1 is a fragmentary diagrammatic side elevational view of one embodiment of apparatus employed to practice the invention.

FIG. 2 is a fragmentary diagrammatic plan view showing the orientation of the pads in FIG. 1.

FIG. 3 is a diagrammatic view of the vacuum roller cams.

FIGS. 4, 5, 6, and 7 are fragmentary diagrammatic views similar to portions of FIG. 1 and showing the progress of pads between the vacuum rollers and the

positions of the cut-off knives and compression rollers at the various stages of pad advancement.

FIG. 8 is a fragmentary diagrammatic side elevational view of apparatus employed in another embodiment of the invention.

FIG. 9 is an end view on a reduced scale of the apparatus shown in FIG. 8.

FIG. 10 is a fragmentary diagrammatic plan view showing the orientation of the pads in FIG. 8.

FIG. 11 is a plan view of a short strip of extended liner tape used in the embodiment of FIGS. 8-10.

FIG. 12 is an end view of the tape of FIG. 11.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Although the disclosure hereof is detailed and exact to enable those skilled in the art to practice the invention, the physical embodiments herein disclosed merely exemplify the invention which may be embodied in other specific structure. The scope of the invention is defined in the claims appended hereto.

In the embodiment of FIGS. 1-7 inclusive, the tape applying apparatus 10 includes a belt feed conveyor 12 which continuously advances the pads 13 at uniform intervals to a pair of spaced hollow drum rotors or vacuum rollers 14 and 16. Rotors 14, 16 have foraminous metal shells 11 and mating foraminous soft rubber or elastomeric peripheral sleeves or bands 15. The respective shells 11 and sleeves 15 have aligned through holes 17 subject to a constant vacuum within the hollow interiors of the rotors 14, 16.

The bands 15 have a low durometer and are easily compressed thus to enable movement of the pads between the rollers 14 and 16 as the bands 15 deform. Absent a pad between the rotors 14, 16 their respective bands 15 will touch one another. The contact of the bands 15 on each roller 14 and 16 insures pressure engagement of the tape strip 21 and tape backing strip 23 as they are concurrently applied to the pads as presently described. The vacuum rollers 14, 16 rotate continuously and have the same surface speed as the advancing pads 13 on conveyor 12.

The uppermost vacuum roller 14 cooperates with an idler feed roller 22 to sequentially clamp and unclamp the strip or web 18 of tape backing or liner therebetween. When the rolls 14, 22 are clamped on the web 18, they will withdraw the web 18 of tape backing from a supply roll 20 and carry the free end 25 of the web to a rotating backing strip cut-off knife 24. The feed roller 22 has an axis movable in a horizontal plane for engagement and disengagement with the vacuum roller 14 under influence of a cam 29 (FIG. 3) on the shaft 19 of vacuum roller 14. Cam 29 engages a cam follower 27 on the feed roller 22.

An appropriate length or strip 23 of tape backing is cut from the end 24 of the web 18 by the rotating cut-off knife 24, which intercepts the backing web 18 on the surface of the vacuum roller 14 in timed sequence with pad advancement so that the strip 23 of backing will be applied across the gap and in overlapping relation to the adjoining pad ends as subsequently described.

The lowermost vacuum roller 16 withdraws an adhesive tape web 26 from a supply roll 28 of single faced pressure sensitive tape. The feed of the tape web 26 is controlled by a tape idler feed roller 30 which has a surface nonadherent to the pressure sensitive face of tape

web 26, thus to minimize tape adhesion. Roller 30 has an axis movable in a horizontal plane to engage and disengage the roller 30 with the vacuum roller 16. The adhesive side of the tape 26 is on the outside when the tape web is trained around the roller 16. A cam 29 on the shaft 19 of vacuum roller 16, similar to cam 29 on vacuum roller 14, cooperates with a cam follower 27 on the idler roller 30 to cause tape feed to a tape cut-off knife 34 to cut off a tape strip 21 during the same interval that the backing web 18 is fed to the cut-off knife 24. Thus, equal lengths of adhesive tape 21 and tape backing or liner 23 are cut from the webs and carried in concurrent timed relation by the suction of the vacuum rollers for co-joint application across the gaps between the advancing pads.

After the tape and tape backing strips are concurrently applied to the adjoining pad ends, as subsequently described in detail, the pads interconnected by the tape bridged therebetween are advanced to a pair of compression rollers 40, 42 which have axes movable in a vertical plane between an operative closely spaced position and a retracted position (by apparatus not shown) which permits movement of the pads between the compression rollers 40, 42 without pad compression or damage. The compression rollers 40 and 42 move into the operative position in timed sequence with pad advancement to engage the tape and tape backing intermediate the ends of the adjoining pads and adhesively unite or bond the tape and tape backing. The rollers 40 and 42 move to their retracted position as the leading end of the following pad approaches the rollers 40 and 42.

A belt conveyor 44 advances the interconnected pads to a final cut-off knife roll 46 with a knife 48 which is timed to apply a transverse cut to the tapes against the platen roller 49 in the center of the gaps between pads to separate the pads. With tape strips and backing strips of overall length of 6 inches and a one inch overlap on the pad ends, the severed attached tapes have a length of 2 inches to bond to the diaper when the diaper is folded about the baby.

The operation of the apparatus and the steps of the method are sequentially illustrated in FIG. 4, 1, 5, 6, and 7. FIG. 4 shows the backing feed roller 22 and the tape feed roller 30 in the engaged positions with the vacuum rollers 14 and 16 to withdraw the webs 18 and 26 from the supply rolls 20, 28 and feed the webs 18 and 26 to the cut-off knives 24, 34 which are approaching the vacuum rollers 14, 16 to cut off strips 21 and 23 of tape and tape backing. The severed strips 21 and 23 are carried by vacuum rollers 14 and 16 (FIG. 1) for application across the next succeeding gap 75 between pad ends 84 and 86. The vacuum rollers 14, 16 apply the strips 23 and 21 of backing and tape in overlapping relation on the ends 84 and 86 of pads 66 and 77. The tape backing strip 23 contacts the strip 21 in the gap 75 under pressure of the rollers 14, 16 whose resilient bands 15 expand. The bond thus formed between the tape and backing strip 23, 21 breaks the suction of vacuum rollers releasing the strips 23, 21 as the pads 66 and 77 move away from the rollers 14, 16. In FIG. 4 the compression rollers 40 and 42 are in the operative position pressing a backing strip 23 against a tape strip 21 which strips were cut and applied in the previous cycle.

In FIG. 5, the gap 75 has advanced between the vacuum rollers 14, 16 where the next pair of strips are applied across the gap 75 and the pad ends 84, 86. FIG.

5 also shows the retraction of compression rollers 40, 42 to permit free passage of pad 66. The backing feed roller 22 and tape feed roller 30 are in the disengaged position and thus the feed of webs 18 and 26 is interrupted. The fresh cut ends of the webs 18 and 26 slip on the surface of the vacuum rollers 14, 16 since the suction of the rollers 14, 16 is not sufficient to withdraw the webs in the absence of engagement of the feed rollers 22 and 30.

As the gap 75 registers between the compression rollers 40 and 42, (FIG. 6) the rollers 40, 42 come together to firmly press the tape backing strip 23 against the tape strip 21. Continued progress of the pads 66 and 77 through the compression rollers 40, 42 is followed by retraction of the compression rollers 40 and 42 as shown in FIG. 7.

The sequence is completed as the pads advance to the final cut-off knife roll 46 where the knife 48 (FIG. 1) severs the tape and tape backing strips in the center of the gap between the pad ends to separate the pads and provide tapes on the adjoining pads of equal lengths. Inasmuch as the tape backing overlaps the ends of the pads, the backing is only united with the tape between the pads and does not adhere to the pad ends, thus the ends 82 (FIG. 1) of the backing strip 23 are free and form release tabs which are easily grasped to separate the backing strip 23 from the tape strip 21 when the pad is to be used.

In FIG. 7 the sequence is recommencing as tape backing and tape feed rollers 22 and 30 engage the vacuum rollers 14, 16 to clamp the strips 18, 26 and commence the feed of backing web and tape web to the cut-off knives 24 and 34 to cut strips of backing and tape for the trailing end of pad 77 and the next succeeding pad.

With the apparatus shown in FIG. 1, the pads are advanced sideways between the vacuum rollers 14, 16 as shown in FIG. 2 with attaching tapes 23 applied to each side edge. The tapes project beyond the pad edges where they are readily accessible for manual manipulation in the course of applying the diaper to the baby.

FIGS. 8, 9 and 10 show apparatus employed in another embodiment of the invention for simultaneously applying two laterally spaced or pairs of attaching tapes 118 to the alternate adjoining ends of continuously moving pads 103 conveyed lengthwise in abutting end to end relationship. The apparatus 101 includes an in-feed belt conveyor 102 which conveys the pads 103 in abutting relationship to a laterally spaced pair of tape cut-off and tape applying units 107 and 108 (FIG. 9). The units 107, 108 each include a tape feed roller 109 which coacts with a feed roller 110 to supply tape webs 112 to a cut-off knife 114 which cuts against a platen roller 116 to sever tape and tape backing strips 118 from the webs 112. The tape 112 employed in the embodiment shown in FIGS. 8, 9, and 10 is known as extended liner tape. The tape strip 112 has adhesive on both sides with a backing or liner strip 114 on one side with backing margins 119 overlapping the edges of the tape as shown in FIGS. 11 and 12. The feed rollers 110 have annular lands or marginal bosses 111 separated by a central groove 113. The lands 111 are spaced to contact only the backing margins 119 so that the adhesive tape is aligned with groove 113 and does not adhere to the roller 110.

The extended liner strips 118 of tape and tape backing are carried by vacuum rollers 120 in each unit 107,

108 for application to alternate abutting pad ends of the pads 103 which meet on joints 104 (FIG. 10). The vacuum rollers 120 have a foraminous surface subject to a constant interval suction and rotate continuously against a spring pressed platen roller 121. The cut-off knife 114 is rotated in sequence with pad movement and is so timed that strips 118 will be cut and applied to every other joint 104 between pads 103 as shown in FIG. 9. The exposed adhesive surface of tape 112 adheres the strip 118 to both the trailing end of one pad 103 and the leading end the next pad 103.

The attached pads 103 are advanced by another conveyor 121 to a pair of laterally spaced cut-off knife units 123 and 125 which include cutting rollers 124 which are timed to apply a transverse cut to the tapes 118 against platen rollers 128 at the juncture of the adjoining pads 103 to separate the tapes 118.

With tape strips 118 having a length of four inches, a medial cut between the adjoining pad ends leaves two tape strips 130, 132, each 2 inches long on adjacent ends of each pad. The strips are positioned within the outline or edges of the pads 103 to provide a neat appearing pad with no projections therefrom. The backing strip 114 is easily peeled off from the combined strip 118 to expose an adhesive coated face of the strip prior to use.

Only every other joint 104 is spanned by the tapes 118. Accordingly, the rotors 120 need operate only one-half as fast as would be required to apply tapes to every joint.

I claim:

1. A method of applying attaching tapes to pads comprising the steps of feeding the pads toward a vacuum rotor, supplying measured lengths of tape to the vacuum rotor for deliver to the pads in sequence with pad movement to apply the tape across proximate ends of successive pads, and cutting the tape between the pads to separate the pads.

2. The method of claim 1 wherein said pads are fed toward said vacuum rotor in abutting end to end relationship.

tionship.

3. The method of claim 1 wherein said pads are fed toward said vacuum rotor in spaced relation.

4. The method of claim 1 wherein two strips of tape are simultaneously applied to the adjacent pad ends.

5. The method of claim 4 wherein the final step of cutting the tape severs both tapes between adjacent pad ends to leave two attaching tapes on each pad located within the periphery of the pads.

6. The method of claim 1 wherein the tape is applied across every other joint of adjacent pad ends.

7. A method of applying attaching tapes to pads comprising the steps of:

- advancing pads separated by substantially uniform gaps,
- applying measured strips of adhesive tape and tape backing in superposed relation on adjoining pad ends and across the gaps,
- pressing the tape and tape backing strips together in the gaps between adjoining pads to adhesively unite the strips and
- cutting through the tape and tape backing strips in the gaps to separate the pads and leave backed attaching tapes extending from the pads.

8. The method of claim 7 wherein the pads are advanced at gaps equal in distance to twice the length of the desired attaching tapes.

9. The method of claim 7 in which the said adhesive strips and backing strips are concurrently advanced in synchronism toward the pads on drum rotors to which the strips are held by vacuum.

10. The method of claim 9 in which the strips are fed to the drum rotors from parent rolls and end pieces are cut-off of the strips while the strips are held by vacuum on the drum rotors just prior to rotor engagement with the pads.

11. The method of claim 7 wherein the tape and tape backing strips are cut in the center of the gaps to form attaching tapes of equal length.

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