

Feb. 13, 1962

P. H. PUKIS ETAL

3,020,599

MANUFACTURE OF CELLULOSIC PRODUCT

Filed March 31, 1958

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Fig. 4

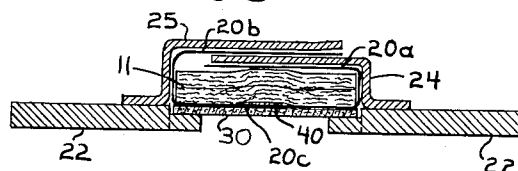


Fig. 5

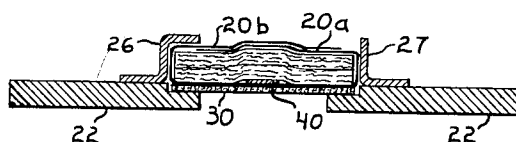


Fig. 6.

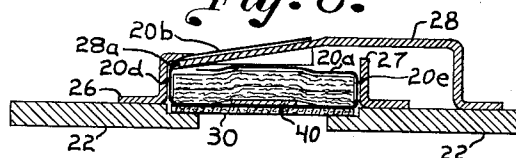
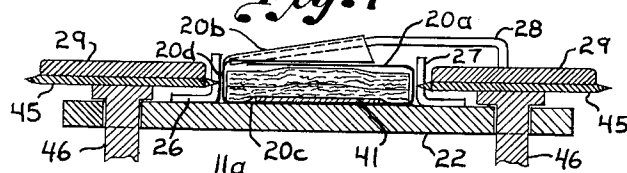


Fig. 7



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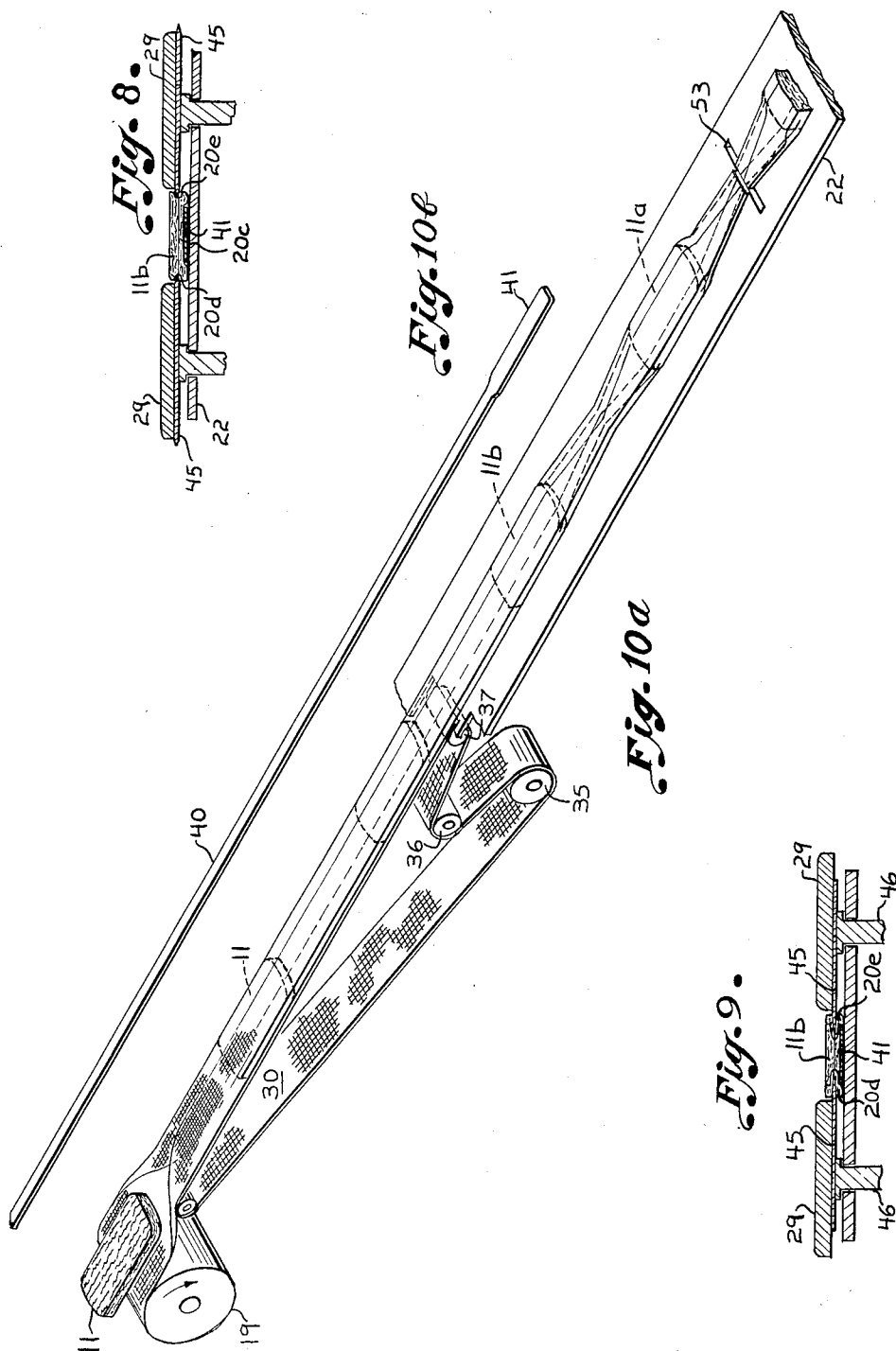
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Fig. 11

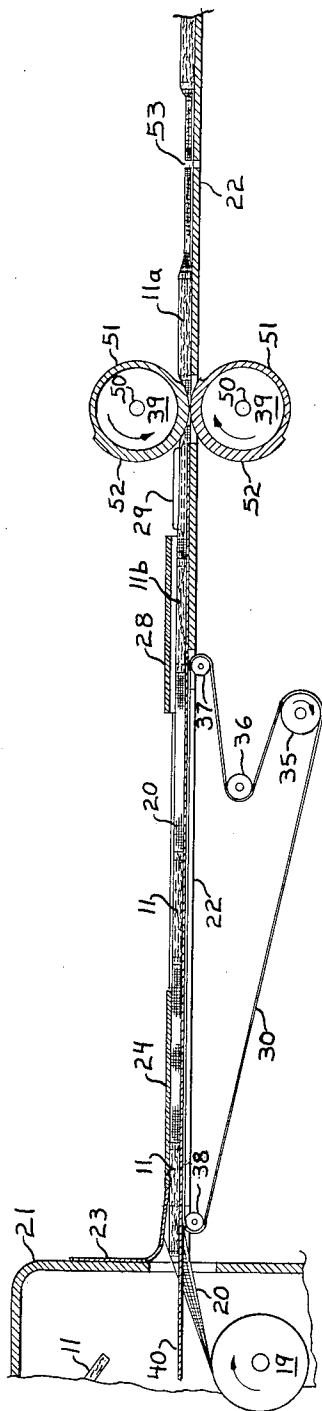


Fig. 12a

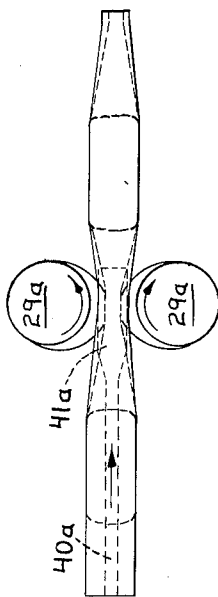


Fig. 12b

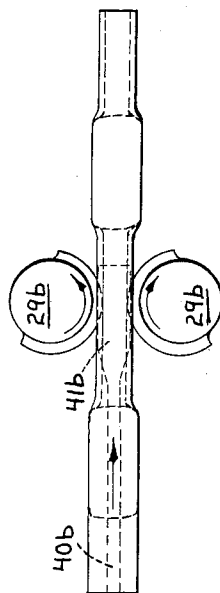
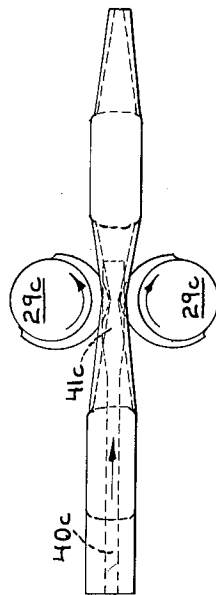


Fig. 12c



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MANUFACTURE OF CELLULOSIC PRODUCT
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3 Claims. (Cl. 19—147)

This invention relates to apparatus for the production of an improved sanitary napkin. More particularly, it relates to a machine for the manufacture of sanitary napkins of the type having an absorbent main body portion, which may include a number of absorbent plies and other elements, supported by a surrounding soft wrapper for attachment of the napkin to the wearer.

In the conventional form of sanitary napkin, the wrapper extends substantially beyond the ends of the main body portion of the napkin, these extending ends of the wrapper being collapsed into essentially flat shape at the time of manufacture. For certain applications, it has been found desirable that these wrapper extensions be tapered inwardly from the side margins of the napkin, particularly to provide a more attractive appearance and an increase in number of wrapper plies at the point where attachment of the wrapper is made to a belt or other device for retention of the napkin in its position of use. It is highly desirable that this tapering of the extended ends of the wrapper be accomplished in the most attractive and sanitary manner possible, particularly since the item is a sanitary product in which neatness and cleanliness of appearance is both esthetically and practically essential. Also, in order that the napkins may be made available to the broad range of potential consumers, manufacturing equipment and operations must be maintained on a simple and economical plane.

Accordingly, it is the purpose of this invention to provide a simple and economical apparatus for the manufacture of sanitary napkins presenting to the highest possible degree a neat and sanitary appearance and strength of construction. The particular objects and advantages of the invention will be clear from the following description and appended drawings, in which:

FIGURE 1 is a perspective view, partially cut away, of a conventional sanitary napkin,

FIGURE 2 is a perspective view, partially cut away, of a preferred form of the invention,

FIGURE 3 is an enlarged cross-sectional view, partially cut away, taken along the line 3—3 of FIGURE 2.

FIGURE 4 is an enlarged cross-sectional view taken along the line 4—4 of FIGURE 2,

FIGURE 5 is an enlarged cross-sectional view taken along the line 5—5 of FIGURE 2,

FIGURE 6 is an enlarged cross-sectional view taken along the line 6—6 of FIGURE 2,

FIGURE 7 is an enlarged cross-sectional view, partially cut away, taken along the line 7—7 of FIGURE 2,

FIGURE 8 is a reduced cross-sectional view, similar to FIGURE 7, but showing an initial stage in the formation of the tapered napkin ends,

FIGURE 9 is a cross-sectional view similar to FIGURE 8, showing a further stage in the formation of the tapered napkin ends,

FIGURE 10a is a perspective view similar to FIGURE 2, but with most of the machine elements cut away, showing the successive operations of the machine upon the product,

FIGURE 10b is a perspective view, partially cut away, of the mandrel forming a part of the invention,

FIGURE 11 is a cross-sectional view, partially cut away, of the preferred form of the invention, taken along the line 11—11 of FIGURE 2, and

FIGURES 12a, 12b and 12c are schematic top views

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of particular tapered napkin end configurations which can conveniently be produced by this invention, and of the corresponding apparatus.

Referring first to FIGURE 1, it is seen that the conventional asitary napkin includes a main absorbent body portion 11, which may include two or more plies, such as 12 and 13, and other conventional elements, including central and side baffles, side strips and the like not shown, held together by a surrounding soft wrapper 14. Wrapper 14 has end portions 15 and 16 extending beyond the ends of body portion 11, by which the napkin may be pinned or otherwise attached to a sanitary belt or the like for positioning on the body of the wearer. It will be observed that wrapper extensions 15 and 16 are merely pressed into a flat condition, with result that they have a lateral dimension somewhat greater than that of the napkin or body portion 11 about which wrapper 14 is closely wrapped, and extensions 15 and 16 are of but two-ply thickness except in the area of the overlapping seam 17 of the wrapper.

Particular strength and neatness characteristics, especially desirable in certain applications, will result if the lateral margins 18 of extensions 15 and 16 are pleated inwardly at least so that the lateral dimensions of the extensions will not exceed that of the main body portion of the napkin. Of course, the degree of pleating or infolding of these lateral margins of extensions 15 and 16 can be varied within a wide range to provide the desired appearance.

FIGURE 2 is a perspective view of the main elements of a machine incorporating the present invention for the enclosing of the main body portion 11 of the succession of sanitary napkins in a wrapper supplied from a continuous roll 19 of wrapper material 20.

The apparatus includes vertical and horizontal main frame members 21 and 22 upon which various operating elements of the apparatus are mounted. Operating elements fixed on the frame include a presser foot 23, wrapper plows 24 and 25, guide rails 26 and 27, and upper mandrel 28. Also mounted on frame 22 is a pair of opposed eccentric pleating wheels 29, which act to pleat the extended ends of the wrapper 14 in a manner to be described in detail later herein. A conveyor belt 30, to assist in passage of the material through the apparatus, is mounted on a series of driving and idler rolls 35, 36, 37 and 38 (see also FIGURE 11), and may be driven by any conventional means not here disclosed. Eccentric presser rolls 39, only one of which is shown in FIGURE 2, are mounted for rotation immediately beyond wheels 29.

Referring also to FIGURES 10a, 10b and 11, the apparatus includes a forming tongue or mandrel 40, preferably having an enlarged end 41, which at its leftward end as seen in FIGURE 2 is fixedly mounted in any conventional manner not shown here in detail.

With particular reference to FIGURES 2, 10a and 11, the method of operation of the apparatus will now be described. Wrapper material 20 is continuously fed from a roll 19 thereof onto the main frame member 22 of the machine, the wrapper material passing between mandrel 40 and frame member 22. As the wrapper material proceeds through the machine a succession of napkin main body portions 11 is fed onto the wrapper, the body portions 11 overlying relatively narrow mandrel 40 with substantial side margins extending beyond the side edges of the mandrel and lying in immediate contact with wrapper material 20. The contact between the napkin body portion and the wrapper material is sufficient so that the material will carry the body portion through the machine, initiation of this contact being assured by presser foot 23 which firmly presses successive body portions 11 into engagement with wrapper material 20.

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As the wrapper material and body portions spaced thereon pass beyond presser foot 23, the side marginal portions 20a and 20b of the material are successively engaged by plows 24 and 25, which fold first marginal portion 20a and then the opposite marginal portion 20b over the upper surface of successive body portions 11. Of course, in the space between adjacent body portions 11 this folding operation results in a hollow tube of wrapper material. Details of this plowing or folding action are disclosed in FIGURES 3 and 4, where the relationship of the various elements previously noted is more clearly indicated, particularly the overlapping of marginal portions 20a and 20b of the wrapper, the position of mandrel 40 between body portion 11 and the bottom portion 20c of wrapper 20, and the location of wrapper portion 20c between mandrel 40 and the conveyor belt 30.

As the wrapper, with successive napkin body portions 11 spacedly carried therein is conveyed beyond plows 24 and 25 by belt 30, side rails 26 and 27 engage the respective side edges 20d and 20e (see also FIGURE 6) of the tube of material 20 which has been formed, to maintain the conformation established by the plows 24 and 25. An auxiliary mandrel 28 is positioned beyond the plows, and is adapted to ride between marginal portions 20a and 20b of the wrapper, with the extended edge 28a of the mandrel positioned immediately adjacent side edge 20d to provide a supporting action to be described in detail later herein. Eccentric pleating wheels 25 are mounted immediately beyond auxiliary mandrel 28.

Referring particularly to FIGURES 2, 7, 8 and 9, each of wheels 29 includes a relatively sharp-edged cam-like portion 45 extending beyond only a portion of the circumference of the main body of the wheel, to provide the eccentricity. Wheels 29 are mounted upon shafts 46 which are powered by conventional means not shown to provide counter rotation of the two wheels. As will be clear from FIGURE 2, the wheels 29 rotate so that adjacent the material passing the apparatus the linear velocity of the wheels is in the same direction as the travel of the material and at approximately the same speed.

The main bodies of wheels 29 are spaced apart by a distance at least equal to the width of the tube of material 20 as it passes between the wheels, while the eccentric cam portions 45 reduce this spacing to a predetermined degree in accordance with the requirements to achieve the desired degree of pleating. Eccentric portions 45 are spaced above frame 22 by a distance which provides for their engagement with the tube of material along a predetermined line which is preferably equidistant between the top and bottom surfaces of the tube.

FIGURE 7, as will be clear from reference to FIGURE 2, indicates the position of wheels 29 as a particular napkin body 11a is just completing passage between the wheels. At this point, wheels 29, being precisely timed and indexed to passing of the material through the apparatus, are ready to initiate a pleating operation upon the tube of material 20 between body portion 11a and the next succeeding body portion.

FIGURE 8 shows an initial step in the pleating operation, the pleating portions 45 of wheels 29 having just engaged the respective adjacent edge portions 20d and 20e of the wrapper to commence the pleating of those edges intermediate napkin body portions 11a and the next succeeding body portion 11b (see also FIGURES 10a and 11). FIGURE 9 shows a further step in the pleating operation, at or near the maximum extent of pleating by cams or wheel portions 45.

With reference also to FIGURE 10b, it will be observed that at the stations shown in FIGURES 3, 4 and 5 mandrel 40 is quite narrow, so that only to a small extent does it eliminate the contact between napkin body portions 11 and bottom surface 20c of the wrapper material, which contact is essential to conveyance of the body portions through the apparatus. However, as is clear from FIG-

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URE 6, as the material approaches the pleating station, mandrel 40 becomes wider, and at the pleating station as shown in FIGURE 7 the mandrel has an enlarged portion 41 which FIGURE 9 shows to be of width substantially equal to the pleated width of the tube of material 20 between successive napkin body portions. Immediately beyond the pleating station, mandrel 40 terminates.

Mandrels 28 and 40 function to guide and conform the tube of napkin material 20 during the pleating operation so that a uniform and neat appearing pleated napkin wrapper extension, of predetermined dimensions, is achieved. Mandrel 40, at enlarged portion 41, is of a width coordinated with the dimensions of cam portions 45 so that at the maximum pleating stage the lower portion of the pleated tube essentially is formed around the mandrel. Mandrel 28, which terminates at a point ahead of the pleating station, serves to control the pleating of the upper half of the tube of material 20, by the engagement of free edge 28a of the mandrel with the side edge 20d of the tube of material. While there is not shown means corresponding to mandrel 28 to control the upper portion of the side edge 20e of the material during the pleating operation, such means conveniently may be incorporated, such as by reverse extension from the edge 28a of mandrel 28.

Referring also to FIGURE 11, immediately beyond wheels 29 is a pair of opposed presser rolls 39 rotatably mounted on driven shafts 50 for counter rotation in the direction indicated. As seen best in FIGURE 11, rolls 39 have opposed cam surfaces, the reduced-radii portions 51 corresponding to the length of the napkin body portions 11, and the raised cam surfaces 52 corresponding to the spacing between successive napkin bodies. The space between the reduced-radii portions 51 of the roller surfaces, when they are in proximity to each other, is at least equal to the thickness of the wrapper material and enclosed napkin bodies passing therebetween. When the raised cam portions 52 of roller 39 are in proximity to each other the space between the rollers is reduced so that they have a pressing action on the wrapper material 20. The result is that the wrapper material between successive body portions, immediately after being pleated, is pressed in the pleated condition. Rollers 39 are rotated in timed relationship to the passage of the material through the apparatus by conventional means not shown here, and preferably the pressing cam surfaces 52 of the rollers are heated to improve the pressing action.

Beyond the pressing station just described there may be located a cut-off station, such as at 53 (see FIGURES 10a and 11), whereat the tube of material 20 with spaced napkin bodies 11 therein is by conventional means cut or divided into separate and individual sanitary napkins.

FIGURES 12a, 12b and 12c illustrate pleating wheels 29a, 29b and 29c particularly designed to provide various and specific pleating shapes on the wrapper extensions, the mandrels 40a, 40b and 40c designed to cooperate therewith, and the configuration of pleated napkin wrapper extensions resulting therefrom. It will be obvious that a wide variety of wrapper extension configurations, as desired, may be obtained by suitable modification of the pleating wheels or equivalent pleating tongues or the like and mandrel 40 (particularly mandrel end 41), in accordance with the teaching set forth above. Also, different spacings between successive napkin body portions, and various lengths, widths and thicknesses of napkin body portions may be accounted for by obvious modifications and adjustments of the pleating wheels 29, mandrels 28 and 40, and presser rolls 49.

As previously noted, conveyor belt 30, the napkin body supply means (not shown), pleating wheels 29, presser rolls 39, and cut-off means as at 53 (not shown), are by conventional means operated in timed relationship to provide the successive operations in the desired sequence. Conveyance of the material through the apparatus, partly accomplished by conveyor belt 30, may be assisted by

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additional conventional means located beyond presser rolls 39, such as proposed rollers located ahead of cut-off station 53, additional conveying belts, or the like. Pleating wheels 29 and presser rolls 39 should be located in the closest practicable proximity to each other, to reduce the possibility of relaxation of the pleated wrapper material 20 prior to the pressing operation which substantially permanently presses the pleats into the material. Wrapper material 20 may have a thermoplastic or other adhesive incorporated in or applied to it, which will assure maintenance of the pleated condition of the napkin wrapper extensions and of the wrapper seam 17. This may be accomplished with particular convenience by the spot application of a thermoplastic adhesive to the wrapper, which is adhesively actuated by heated presser rolls 39. While of course mandrel portion 41 must terminate ahead of rolls 39, neatness of pleating may be enhanced by extending the mandrel to a point just short of the nip of these rolls.

Various modifications in elements of the described apparatus and process, not involving departure from the spirit of the invention are likely to occur to those skilled in the art. It also is obvious that the invention is particularly adaptable for use in the manufacture of peculiarly shaped sanitary napkins, such as body-conforming napkins as illustrated in Patent No. 2,662,527. Accordingly, it is to be understood that no limitations upon the scope of the invention are intended except in the appended claims.

What is claimed is:

1. Apparatus for the manufacture of sanitary napkins from a travelling web of porous wrapper material and a succession of absorbent napkin body portions successively fed onto said web in spaced relationship, the apparatus including a main frame, folding plows on said frame for folding of first one and then the other side marginal portion of said wrapper material to form a tube thereof with said body portions spacedly contained in said tube, opposed pleating means adapted to pleat the wrapper material between successive napkin body portions by infolding of the side edges of the tube of wrapper material, a mandrel mounted to lie within said tube of material and extending between the opposed pleating means, said mandrel being positioned to lie between said napkin body portions and the wrapper material immediately thereunder and between said pleating means, said mandrel being of a width substantially greater than the minimum spacing between said opposed pleating means, a second mandrel mounted on the main frame immediately ahead of said pleating means and extending between said folded marginal portions of the wrapper material to support the material during pleating, presser means immediately beyond said pleating means adapted to press the pleated tube intermediate said body portions, and means mounted on the main frame for conveyance of said tube and napkin

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body portions therein in timed relation to said pleating and pressing means.

2. Apparatus for the manufacture of sanitary napkins from a web of napkin wrapper material continuously fed into the apparatus and a succession of napkin body portions spacedly fed onto said web, the apparatus comprising a pair of opposed plows for successive overfolding of the side marginal portions of said wrapper material to form a tube of the material having a bottom portion, opposed side edges and a top portion formed of the overlapped side marginal portions of the material, side rails adapted to engage the side edges of the tube to maintain the tube shape, opposed pleating members adapted to intermittently infold the side edges of the tube of wrapper material, a first mandrel fixedly mounted for positioning between the bottom of successive body portions and the contiguous surface of the bottom portion of the tube of material, said mandrel between said pleating members being of width substantially equal to the pleated width of the tube and ahead of said pleating members being of width substantially less than the width of said napkin body portions, a second mandrel mounted ahead of said pleating members and adapted to extend between the overlapped side marginal portions of said wrapper material for support of a side marginal edge of said tube, presser members beyond said pleating members adapted to intermittently press the pleated tube of wrapper material, and conveying means adapted to carry said material and napkin body portions spacedly positioned thereon successively through said plows, side rails, pleating members and presser members in timed relation for pleating and pressing of said tube only intermediate said napkin body portions.

3. The method of forming a sanitary napkin, comprising feeding in spaced relation a succession of napkin body portions onto a continuous travelling web of wrapper material, folding the side marginal portions of said wrapper material over the body portions to form a tube of said wrapper material with the body portions spaced therein, pleating the tube of wrapper material intermediate successive body portions by infolding the side edges of the tube about mandrel means adapted to support the tube during pleating, and pressing the pleated tube intermediate successive napkin body portions.

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