

[54] **PROCESS FOR FOLDING SHEET
MATERIAL AND PACKAGED
DISPENSERS THEREFOR**

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[51] Int. Cl. B411 1/32

[58] Field of Search.....270/86, 93, 94, 41, 66, 39

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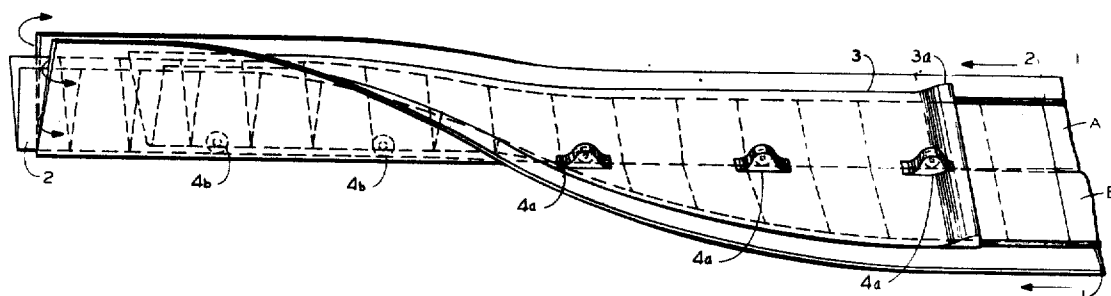
Assistant Examiner—L. R. Oremland

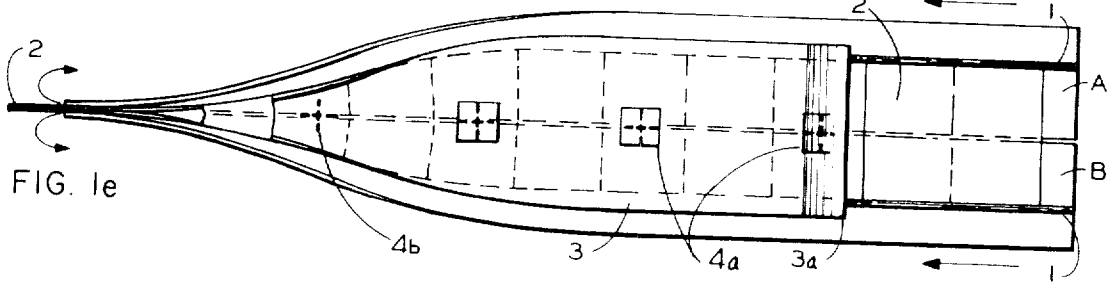
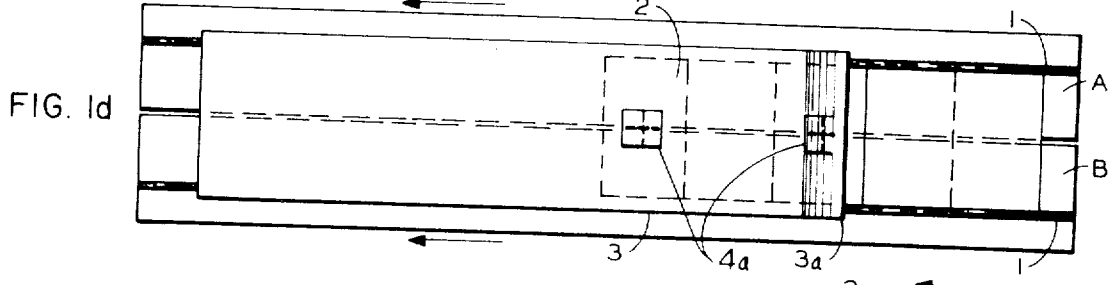
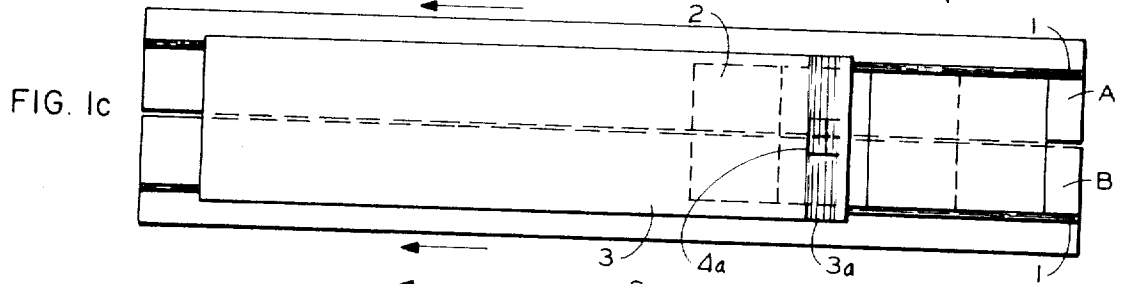
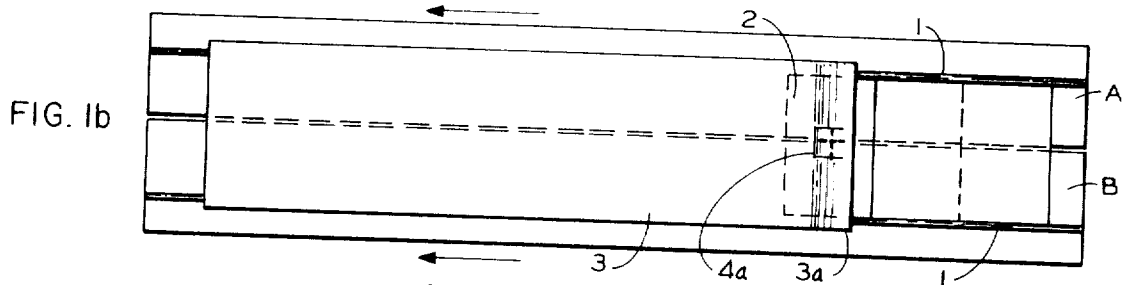
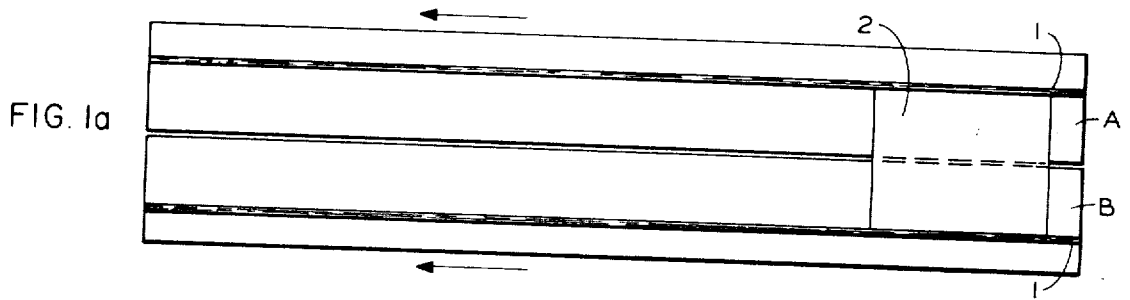
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[57] **ABSTRACT**

The invention disclosed herein relates to a unique method for folding sheet material for serial extraction from packaged dispensers involving longitudinal folding and a series of transverse folds of superimposed sheets of paper, cloth or other flexible material. Packaged dispensers of various shapes and containing supplies of such folded products for serial extraction thereof through apertures of varying geometrical configuration are provided. An additional embodiment involves a continuous process for folding and rolling sheet material into generally cylindrically-shaped association for packaging and dispensing.

12 Claims, 16 Drawing Figures





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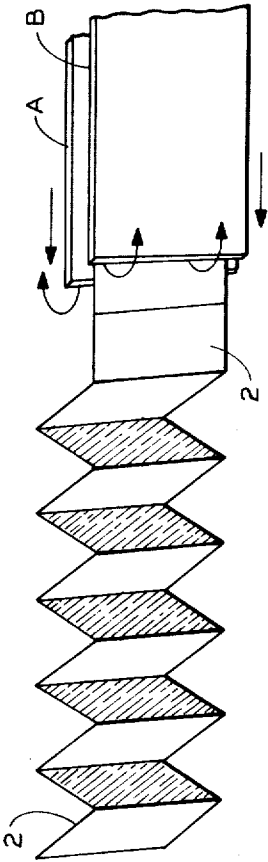
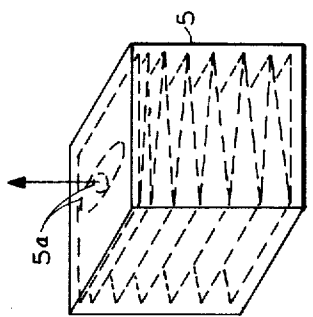
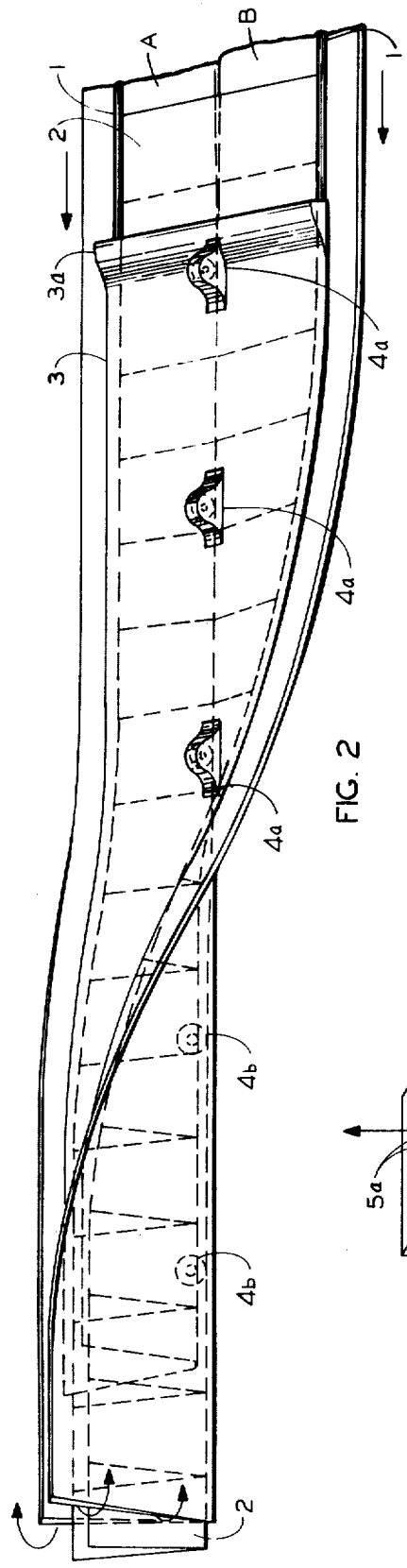


FIG. 4

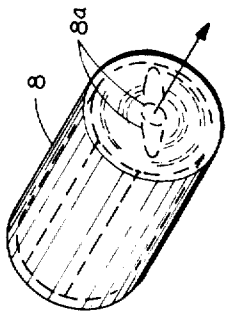


FIG. 7

FIG. 3

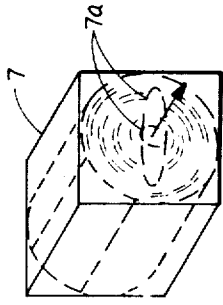


FIG. 6

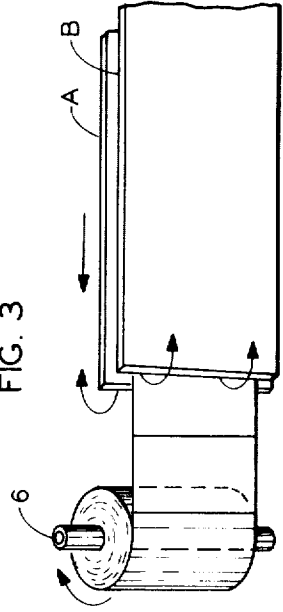


FIG. 5

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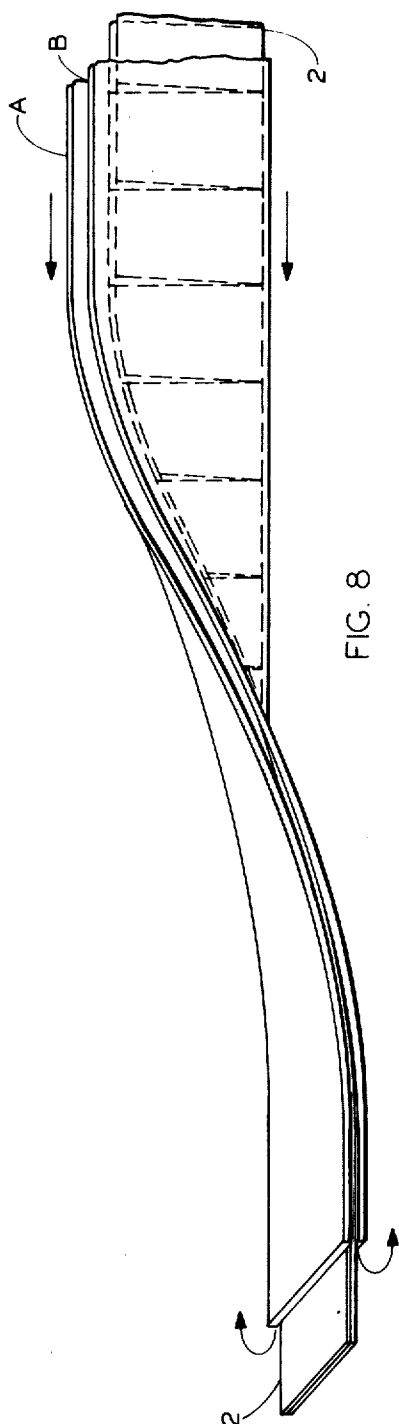


FIG. 8

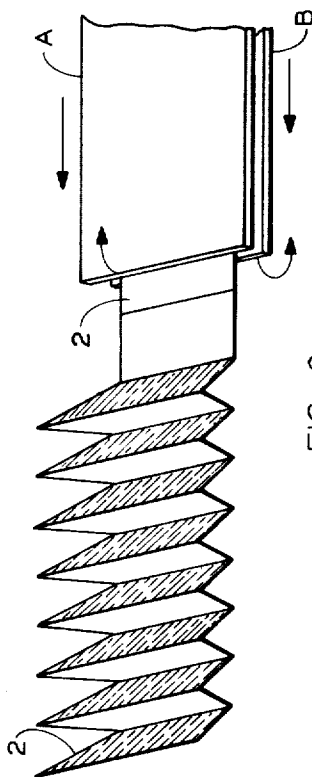


FIG. 9

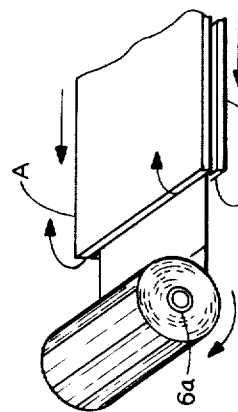


FIG. 10

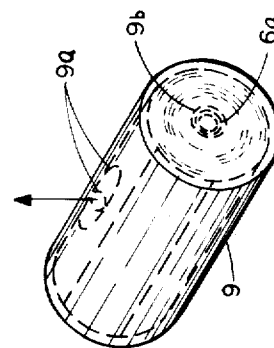


FIG. 11

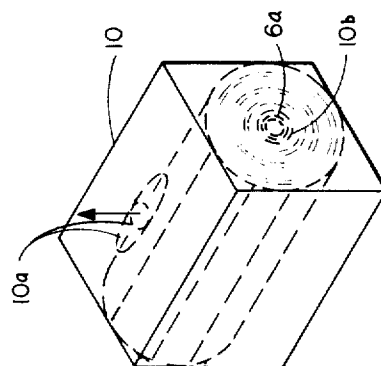


FIG. 12

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PROCESS FOR FOLDING SHEET MATERIAL AND PACKAGED DISPENSERS THEREFOR

BACKGROUND OF THE INVENTION

This invention pertains to the field of sheet material associating by interfolding or by folding and rolling and packaged dispensers for serial extraction of the associated and folded or folded and rolled product.

During the past several years considerable attention has been given to providing dispensers for various folded or rolled sheet products such as linens, pillow cases, etc., and paper products such as facial tissues, napkins, towels and the like. In particular, a variety of package type dispensers have been fabricated to provide extraction of individual or plural sheets of the product, e.g., paper sheet, through, generally, elongated and/or ovular shaped apertures in the top of the dispenser. Among the dispensers found in the prior art are those having slit-type openings adapted primarily for extraction of individual sheets. Other dispensers have relatively large dispensing apertures or openings adapted to the removal of individual sheets or a plurality of sheets as desired. Various modifications of packaged dispensers include the use of spring means to force the sheet supply nearer the dispensing aperture as the supply diminishes; control plates to control frictional engagement between the sheet being dispensed and the next sheet in the packaged stack of sheets and dispensers with apertures having saw-tooth edges for tearing or ripping segmented sheets from continuous rolls thereof. Among dispensers having relatively elongated or ovular apertures, use is made of plastic cover sheets covering the aperture in the dispenser and having its own aperture for extraction of individual sheets or tissues, an object being to reduce contamination of the packaged sheets from atmospheric impurities.

In extant packaged dispensers, the sheet material is provided in various forms including rolls or webs with segments having transverse perforations at pre-measured intervals along the roll for easy tearing or with unmeasured rolls, segments of which may be ripped off by means of serrated blades. In other packaged dispensers, particularly those in use for facial tissues, napkins or towels, the paper product or sheet material is interwoven, interconnected or interfolded to provide association of the sheets together in a stack within the dispenser so that when one sheet is withdrawn from the package, a portion of the next lower sheet is drawn up in a "pop-up" fashion and protrudes from the aperture in the dispenser ready for use. Customarily, sheet material for these pop-up packaged dispensers are associated by serially folding and interweaving the sheets in alternate and reverse C, S or 4 configurations.

Various problems associated with present sheet-packaged serial dispensers include the use of dispenser openings which are too large for efficient operation of C, S or Z fold-extraction configurations. The interaction of the overlapping folds is not infrequently lost, particularly, when the supply of sheets in the package runs low. Another problem resulting from these too-large dispenser openings is the exposure of the sheet material to dust, dirt and other impurities in the atmosphere. This problem has been minimized to some extent by resort to plastic coverings for the dispenser opening whereby the sheet material is extracted through an opening provided by the plastic material.

This, of course, involves additional materials, operations and cost.

Still another problem in present sheet material dispensers is the general limitation in the external geometry thereof to a longitudinal length of slightly longer than that of the enclosed sheet material and a lateral width commensurate with that of the sheet material subsequent to folding according to the C, S or Z configuration.

An additional limitation on some sheet material dispensing packages is the necessity to restrict the opening for withdrawing individual sheets therefrom the top of the package when laid flat. This imposes a restriction on the use of such packages large to a horizontal position. Such packages or dispensers cannot suitably be mounted in a vertical position where this is desired, e.g., in or on a wall or cabinet in an upright position, unless springs or other means are used in the dispenser to maintain the tissues or other sheet material in a vertical position.

And, so far as known to applicant, apparently all rolled sheet material is produced in a continuous unitary roll from which measured or pre-measured segments must be ripped, sawed, torn, cut or otherwise separated from the roll.

SUMMARY OF THE INVENTION

According to the present invention a unique method is provided for associating and folding and for folding and rolling flexible sheet material such as tissues, napkins and towels. The invention also is directed to dispensers containing sheet material associated and interfolded or folded and rolled in the manner described herein. The sheet material dispensers of this invention are either disposable packages or non-disposable packages which are resupplied with refill packages having disposable containers.

The method of associating and interfolding or folding and rolling sheet material, preferably paper stocks, according to this invention involves longitudinal folding followed by rolling or a series of transverse folds whereby successive sheets are interconnected for serial extraction or dispensing. A detailed description of the steps of this method is set forth in the embodiments below.

It is an object of the present invention to provide a means of associating and folding flexible sheet material by a unique process. An associated object is to provide a process for producing folded and rolled sheet material for serial extraction and use.

It is a further object of this invention to provide dispensers of packaged sheet material associated and folded or rolled according to the embodiments of this invention.

A still further object of this invention is to provide package dispensers of sheet material wherein accessory elements such as springs, control plates, serrated blades and the like are eliminated and the dispensers may be positioned and used in any orientation, for example, vertically, horizontally or upside down.

Yet another object of this invention is to provide package dispensers of sheet material for extraction of individual or plural sheets wherein the shape of the dispenser may be varied without limitation based on the length or width of the individual sheets and wherein

the aperture or apertures of said dispensers for extraction of said sheets may have a variety of geometrical configurations.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1a-1e show plan view of successive steps involved in loading sheet material on parallel moving conveyor belts and initial association and folding of sheet material in one embodiment of the invention.

FIG. 2 shows a perspective view of a system for continuously folding sheet material longitudinally preparatory to either transversely folding or rolling the sheet material for packaging.

FIG. 3 shows a view of the transverse folding on a vertical axis of sheet material exiting the longitudinal folding means shown in FIG. 2.

FIG. 4 is a perspective view of packaged sheet material folded in accordance with the process shown in FIGS. 2 and 3.

FIG. 5 shows a view of the rolling on a vertical axis of sheet material exiting the longitudinal folding means shown in FIG. 2.

FIGS. 6 and 7 show sheet material rolled in accordance with the process shown in FIGS. 2 and 5 and packaged in containers for serial dispensing from the center of the rolled sheet material.

FIG. 8 is a side elevation view of a continuation of the longitudinal folding means shown in FIG. 2 progressing from a vertical to a horizontal position.

FIG. 9 shows a view of the transverse folding on a horizontal axis of sheet material exiting the longitudinal folding means shown in FIGS. 2 and 8.

FIG. 10 shows a view of the rolling on a horizontal axis of sheet material exiting the longitudinal folding means shown in FIGS. 2 and 8.

FIGS. 11 and 12 show rolled sheet material packaged in containers for serial dispensing from the periphery of the rolls which have been rolled in accordance with another embodiment of this invention discussed below.

DESCRIPTION OF PREFERRED EMBODIMENTS

The method of associating and folding or rolling sheet material according to this invention will be exemplified by use of paper tissue as the sheet material.

EXAMPLE 1

One embodiment of this invention is shown in FIGS. 1a-1e and 3, which illustrate a method for associating and folding sheet material for serial dispensing of the packaged material.

Referring to FIGS. 1a-1e there is shown in sequence, a method for associating and longitudinally folding paper sheet stock material in a vertical orientation. In performing this operation, a preferred means comprises a pair of endless conveyor belts, A and B, moving horizontally and parallel to each other at identical rates of speed on separate sets of rollers (not shown) for each belt. Belts A and B are slightly separated from each other, e.g., by one-eighth to one-half inch, and each has a raised portion or ridge, 1, running longitudinally the length of the belts. These ridges are spaced apart from each other by a distance defining essentially the width of generally rectangular paper sheet material, 2, loaded onto the conveyor belts. The function of

ridges 1 is to facilitate the positioning of the sheet material on the belts and prevent sidewise or angular movement of the material as the belts move forward. In general, ridges 1 will be slightly higher than the thickness of the sheet material used and, if necessary or desirable, the ridges may be separately structured to form a tongue and groove union when belts A and B are brought together in a vertical position as described herein. The first step in associating and folding sheet material in this embodiment involves passing belts A and B under a sheet material loading station where the sheet material is individually loaded onto the moving belts in such manner and at such rate that the leading one-half of successive sheets are placed on the trailing one-half of the preceding sheet as shown in steps a-d. Since the sheet material, e.g., paper of facial tissue or toilet tissue grade variety, may be blown off the moving belts or otherwise disordered by air currents as the tissues are carried along by the belts, means must be provided to prevent such from happening. Accordingly, a fixed housing, 3, is positioned above and parallel to belts A and B. The housing opening, 3a, is located at a position generally adjacent to the leading edge of the first-placed tissue on the belts as shown in FIGS. 1b-1e and is somewhat enlarged to facilitate and guide the entry of the moving sheet material under the housing. The upper portion of the housing itself is in closely-spaced proximity to the underlying sheet material to keep the edges generally flat. The width of the housing is at least the width of the sheet material, but generally wider, e.g., extending to the outer edges of ridges 1. In one suitable embodiment, the spaced relationship of the housing to belts A and B is such that the generally concave-shaped ridges 1 move through generally convex-shaped grooves in the underside portion of the housing near the outer edges forming, in effect, an enclosed area between the belts carrying the sheet material, the under surface of the housing and the ridges. Movement of the belts may cause some contact of the ridges on the belts with the housing grooves through which the ridges move, but such contact is without effect or significance. In fact, the outer edges of the housing may have wheels attached and which ride upon the belts outside of ridges 1 and give at least partial support to the housing if desired or otherwise minimize frictional contact between belts and housing.

As the tissue-loaded belts A and B move forward away from the loading station and under the housing 3, the tissues come in contact with means attached to the housing for effecting a crease in the tissues and which facilitate the longitudinal folding of the tissues. In the present embodiment, said means comprises wheel means, 4a and 4b, attached to housing 3 as shown in FIGS. 1b-1e, and which depress the tissues along a longitudinally central line thereof, i.e., into the space between belts A and B, thus, forming a crease. Since the contour of the housing is designed to parallel the changing contour of the belts, as discussed below, the means of fixing the wheels to the housing of varied geometry may vary along the housing length. Thus, at the housing entrance 3a, and for a short distance therefrom the conveyor belts are in a substantially horizontal plane; suitably at these portions of the housing, the wheels may be attached to wheel housings which are attached to or built into housing 3. Further

along the housing which later assumes a generally V-shaped configuration, the wheel housing may be dispensed with and the wheels journaled on shafts between and supported by the upraised inner sides of housing 3. An alternative means of effecting said crease in the tissues preparatory to making a longitudinal fold, comprises a stiff continuous wire suspended from and attached to the underside of housing 3. This wire extends rearwardly from near the housing entrance 3a and contacts the tissues passing thereunder at a very shallow or small angle to avoid disordering or stoppage of the tissues on the moving belts. The wire suitably extends the entire length of housing 3, i.e., to a point just prior to the closing together of the two halves of the longitudinally folded tissues or even to a point near where the folded tissues exit from the forwardmost point of belts A and B (discussed below). Still another means of effecting said crease in the tissues comprises a keel-like ridge or protrusion of or attachment to the center line on the underside of housing 3 making contact with and depressing a crease into said tissues in the above-mentioned manner of wheel means or wire means.

As belts A and B loaded with tissues 2 move forward under housing 3, and on rollers under each belt, the belts come into contact with a succession of fixed rollers inclined upwardly at their outer ends, the angle of inclination of each successive roller being greater than that of the preceding roller until finally belts A and B are smoothly folded up vertically in face to face contact with tissues 2 folded therebetween. The belts are positioned and guided on the rollers by ridges circling the rollers near the ends thereof; hence, when the belts are raised to the vertical position, they are prevented from slipping or falling off the rollers by the combined action of the lower ridges and by the tension of the belts on the rollers. The folding action of belts A and B from a horizontal to a near-vertical orientation is shown in FIG. 2. After the belts have reached a vertical position, thus completing the longitudinal fold of the tissues, they are returned via a series of rollers (not shown) to their original horizontal position prior to picking up more tissues at the tissue loading station.

After tissues 2 have been folded as shown in FIG. 2, and belts A and B begin their return cycle, the tissues are thrust forward by the forward motion of the belts and are immediately engaged by folding means (not shown) for making transverse folds on a vertical axis of tissues 2 in a zig-zag fashion as shown in FIG. 3. In this manner, the longitudinally folded leading halves of the first tissue are folded transversely in either direction over the longitudinally folded trailing halves of the first tissue, between which is situated the longitudinally folded leading halves of the second tissue; the longitudinally folded trailing halves of the first tissue and the leading halves of the second tissue are then folded transversely in a direction opposite to that of the first transverse fold over the longitudinally folded trailing halves of the second tissue between which is situated the longitudinally folded leading halves of the third tissue; the next and following transverse folds repeat the first and second transverse folds, respectively, at a rate synchronized with the rate that the tissues exit from between belts A and B. When the desired number of tissues, determined, e.g., by automatic counting means,

have been folded as described above, the stack of folded tissues, one-fourth the area of the original unfolded tissues, is then packaged in containers, e.g., in square or rectangular containers as shown in FIG. 4; in this embodiment, the tissue stack is placed in the package, 5, in such manner that the first-folded tissue is nearest the aperture, 5a, through which the tissues are extracted serially in "pop-up" fashion, hence, is the first tissue pulled from the container. The extraction aperture may be of a variety of shapes; in FIG. 4, the aperture is generally ovalar or, alternatively, may be circular.

EXAMPLE 2

A second embodiment of this invention illustrates a method for associating and rolling sheet material for serial dispensing from packaged containers. In this embodiment, the procedure described in Example 1 and illustrated in FIGS. 1a-1e and 2 is repeated. However, rather than transversely folding the longitudinally folded tissues exiting from belts A and B, the tissues are rolled on a vertical axis as shown in FIG. 5. In this operation, as the first tissue exits from between the belts it is engaged by clamping, slit or other detachable means to spindle 6, which rotates on a vertical axis in either clockwise or counter-clockwise direction (clockwise in this embodiment) at a rate equivalent to that at which the longitudinally folded tissues exit from the belts. In this manner, the desired number of tissues are rolled onto spindle 6, which is then removed from the roll; the spindle suitably may be spring-collapsible for easy removal. Thereafter, the rolled tissues are packaged into containers, e.g., square or rectangular containers, 7, as shown in FIG. 6 or cylindrical containers, 8, as shown in FIG. 7, for serial extraction of tissues from the center of the rolls through apertures 7a and 8a, respectively, which may be generally ovalar or, alternatively, circular in shape. Suitably, the packaged tissues may be set on flat surfaces for side-pulling of tissues therefrom (in such case, the cylindrically shaped container of FIG. 7 will have a slightly flattened side or ridged protrusions for stability), or the containers may be set on their ends with the extraction openings up for top-pulling of the tissues.

Example 3

A third embodiment of this invention illustrates a method for associating and folding tissues on a horizontal axis. In this embodiment, the procedure described in Example 1 and illustrated in FIGS. 1a-1e and 2 is repeated. However, in this embodiment, the vertically oriented belts A and B with the folded tissues, 2, therebetween, continue forward through a parallel series of rollers which guide the belts in a turn-down direction from a vertical to a horizontal orientation as shown in FIG. 8. As the tissues exit from between belts A and B at a point where the belts begin their return cycle, folding means (not shown) adapted to make transverse folds on a horizontal axis immediately engage the tissues and perform the zig-zag folding operation described in Example 1 and shown in FIG. 9. Thus folded, a stack of tissues of the desired number is packaged for serial extraction in containers as shown, e.g., in FIG. 4.

Example 4

A fourth embodiment of this invention illustrates a method for associating and rolling sheet material on a horizontal axis. In this embodiment, the procedure described in Example 3 is repeated up to the point of the horizontal transverse folding operation. Here, the tissues are rolled onto a spindle in the manner described in Example 2, but in the orientation shown in FIG. 10. After the spindle is removed from the roll, the latter is packaged into containers of the type also described in Example 2 and shown in FIGS. 6 and 7. With further reference to the spindle, it may be rotated by motor, belts or other conventional rotating means for spindles, shafts and the like.

Example 5

This example describes a modification of the invention for producing associated and folded or folded and rolled sheet material and packaged products as illustrated in FIGS. 4, 11 and 12.

In the embodiments described in this example, the procedures described in the preceding examples are followed, except that a preliminary operation involving use of an additional conveyor belt must first be performed. The purpose of this preliminary operation is to effect an inversion of the sheet material e.g., paper tissue, loaded on belts A and B prior to the above-described longitudinal folding operation. In order to perform this operation, a first endless conveyor belt suitably of the general width of the combined widths of belts A and B is passed under a loading station where the tissues are loaded onto said first belt (in the manner described above for loading belts A and B as shown in FIGS. 1a-1d). Belts A and B are placed in an inverted position, (i.e., with respect to their position in FIG. 1a-d) above and in face-to-face contact with said first belt at a location relative thereto similar to the location of housing 3 in FIGS. 1b-1d. In operation, said first belt is passed on rollers under the tissue loading station where the tissues are individually loaded onto said first belt (also longitudinally ridged as are belts A and B to position and guide the tissues) in the loading manner described in Example 1. As the tissue-loaded belt moves forward, rather than pass under housing, it passes under inverted belts A and B which are moving on their independent sets of rollers in the same direction and at the same rate of speed as said first belt. In this manner, belts A and B, in effect, serve a similar function as housing 3 in FIGS. 1a-1d, and additionally and more pertinently, the loaded tissues on said first belt are guided into the necessary position under belts A and B for the longitudinal folding operation which is to follow.

As the said first belt and inverted belts A and B move forward on a horizontal plane with the loaded tissues between them, the belts come in contact with rollers so positioned as to cause the three belts to gradually turn up from one side, proceed through a longitudinally vertical plane and on over to a horizontal plane, thus describing a 180° turnover of the belts with the tissues therebetween. The result of this turnover of the belts is that previously inverted belts A and B have reverted to their original position, i.e., the position and orientation of belts A and B as shown in FIGS. 1a-1d. After the

belts-turnover operation, said first belt is situated above belts A and B and the tissues ride forward on the latter belts. The now top belt (said first belt) is removed from contact with the tissues on belts A and B and is returned by roller to its original position to continue the cycle. At the point where the top belt is removed, the system becomes identical to that shown in FIGS. 1b-1e, where the tissues, 2, and belts A and B pass under housing 3 and continue through the longitudinal folding operation as described in Example 1 having further reference to FIG. 2. The tissues may then be folded transversely or rolled on a vertical axis as described in Examples 1 and 2 and as shown in FIGS. 3 and 5, respectively, or alternatively, may be folded transversely or rolled on a horizontal axis as described in Examples 3 and 4 and as shown in FIGS. 8, 9 and 10, respectively.

With respect to the tissue rolling embodiments of this example, a preferred further modification to obtain the products shown in FIGS. 11 and 12 involves use of a hollow, circular, cylindrical support member 6a, alone, in place of spindle 6 (shown in FIG. 5), or an expandable spindle may be inserted inside said support member for rolling tissues and removed after rolling. This support member, 6a in FIGS. 11 and 12, typically will be inexpensive cardboard material, as commonly used in rolls of toilet tissue, and gives support and maintains the rolled shape of the packaged product. The cardboard may have an adhesive on its surface to which the first tissue exiting from belts A and B adheres and facilitates or aids initiation of the rolling operation. The packaged rolled tissues of this embodiment may be adapted in size for use in standard fixtures for toilet tissue or used in wall cabinets or elsewhere, with or without spindles through the packages. When used with fixture spindles in a horizontal orientation, it may be desirable or necessary to provide means for increasing stability of the roll to prevent the package from swinging to and fro on the spindle when tissues are extracted therefrom. For the most part, the weight of the package accomplishes the necessary stability, but additional stability can be achieved by use of packages whose spindle holes (perforations therefore indicated by 9b and 10b in FIGS. 11 and 12, respectively), are slightly off-set upwardly from the roll support member opening, or by heavier packaging material at the bottom of the package. A further modification (not shown) of the embodiment shown in FIG. 12 is to provide a container having the tissue extraction aperture on one side; the container has a false bottom sloping downwardly from the side opposite the aperture to the bottom of the aperture-side of the container; in this orientation, tissues are extracted from the bottom periphery of the roll in the container through the aperture. This modification has particular benefit when the tissue supply on the roll is low.

With respect to packaging folded tissue products of this Example 5, it is necessary that the tissue stacks be placed in the containers in such manner that the last-folded tissues are nearest the tissue extraction apertures in order to provide products such as shown in FIG. 4.

In connection with the conveyor belts used in this invention, they can, of course, be made of any material flexible enough and substantial enough to perform the

described function. Preferably, the surfaces of the belts may be felted, ridged, gritted or otherwise fabricated to provide a non-slip surface for the tissues or other sheet material carried thereon. In connection with said housing and tissue-creasing means, these too can be constructed of any material, e.g., metal, plastic, wood, etc., rigid enough to suit the stated purpose.

Although in the preceding embodiments, in loading tissues on the belts, successively placed tissues were positioned in such manner that their lateral edges largely bisected and were themselves bisected by the lateral edges of underlying tissues, it is within the purview of and, hence, a part of this invention to place successive tissues so that their lateral edges are off center, either to the right or left, of the mid-lines of underlying tissues. Moreover, while the above examples, a single longitudinal fold and lateral folds half the length of the tissues are exemplified, it is within the purview of this invention to make a plurality of longitudinal and lateral fold at these steps of the process.

As indicated above, upon completion of the tissue associating and folding or rolling process, the stacks or rolls of the desired number of tissues are packaged in dispensers therefor. The dispensers herein may constitute box-like or cylindrical receptacles which may be of disposable material such as flexible plastic or cardboard or, optionally and additionally, receptacles made of wood, metal, ceramic or other material adapted for permanent usage and structured to receive refill packages of sheet material associated and folded or rolled as described in the above embodiments and packaged in disposable material. In either case, the dispensers provided herein may have a variety of configurations both externally and internally and the extraction apertures thereof may conform to numerous geometrical configurations. In general, the preferred configurations of the dispensers herein for folded tissues are substantially square or rectangular with varying external dimensions according to the number of longitudinal and transverse folds performed in the sheet associating and folding process described above. Dispensers for rolled tissues may be either square, rectangular or cylindrical. Smaller sheet dispensers, such a pocket-size or purse-size dispensers for facial tissue, are readily provided by the process of this invention.

Special forms of sheet material dispensers are also provided by clustering disposable refill packages of, for example, facial tissue together inside of a single, non-disposable, permanent-type dispenser which may be rectangular, ovalar, circular, or other shape and have a plurality of extraction apertures on the top, bottom and/or sides of said permanent-type dispenser. For example, two stacks or rolls of facial tissue associated and folded or rolled according to the process embodiments described above may be placed suitably, but not necessarily in disposable plastic packages, side by side, back to back or end to end, then inserted into either a disposable cardboard or permanent-type metal tissue dispenser oriented in a vertical or horizontal position and having two tissue extraction apertures situated opposite each stack of tissues according to their arrangement inside the metal dispenser. Thus, two stacks or rolls of facial tissue placed back to back inside a metal dispenser oriented vertically or horizontally and pro-

vided with tissue extraction apertures on opposite sides to receive the top or leading tissue from each stack or roll, permits alternate or simultaneous serial dispensing of tissues from two sides of the metal dispenser. This procedure may be repeated with any desired number of stacks or rolls of tissue in any desired arrangement thereof vis-a-vis each other inside of a non-disposable, permanent-type dispenser oriented vertically, horizontally or at any angle. In the case of dispensers which are ovalar, elliptical or circular in external configuration, it may be necessary to provide guidebars or other lateral and end supports for unpackaged sheets of tissues. However, this provision is generally unnecessary when the stacks or rolls of tissue are packaged in disposable wrappers, containers or other enveloping packages.

As mentioned above, the sheet material dispensers according to this invention may have one or a plurality of sheet material extraction or dispensing apertures which may have a variety of geometrical configurations and sizes. It is an advantage of the dispensers packaged with sheet material associated and folded according to the above process embodiments, that the sheet material extraction apertures may be large enough to insert the hand into for extraction of a single sheet or plurality of sheets and still retain the "pop-up" effect without resort to springs, weights, control plates or other means to assure frictional contact and ready accessibility of successive sheets of material, particularly when the supply thereof runs low. Such larger openings in these dispensers may be provided by plastic covering means, as known and practiced in the art, to provide a measure of protection from atmospheric impurities and also assist in supporting protruding sheets for ready grasping. A further advantage of the packaged dispensers according to this invention is the use of sheet material extraction apertures which, for esthetic and/or functional purposes, may conform to or contrast with the external geometry and spacial orientation of the dispenser itself. Thus, the dispensing aperture may be circular, ovalar, elliptical, square, rectangular, sinusoidal or other shape and may vary in size from a small fraction to a sizable portion of the dispenser surface having the dispensing aperture. An ancillary advantage of this flexibility in dispensing aperture sizes in the ability to fashion apertures having esthetic designs such as hearts, flowers, trains, airplanes, animals, ships, etc., having particular appeal to children. A further ancillary advantage accruing from the use of smaller apertures is the ability to "pre-ruffle" sheet material, particularly paper tissues, towels and napkins, where this is desired. In making the dispensing aperture sufficiently small, while yet large enough for comfortable extraction, the process of unfolding and extracting a sheet of tissue against the friction of other interfolded sheets and against the aperture edges pre-ruffles the extracted tissue.

A still further advantage of the sheet material dispensers of this invention is that because of the particularly secure method of association and folding or rolling the sheet material stock described above, failures to lift up or pop-up succeeding sheets of material into position when one is extracted, as sometimes happens with sheet material associated and folded in the familiar C, S and Z configurations, are essentially eliminated. In general, with products wherein the sheet material is extracted from the top of folded tissues or periphery of

rolled tissues through the aperture, the tissue stock material should be rectangular and pulls better than shorter lengthwise or square tissue stock. And, with rolled products wherein the tissues are pulled from the center of the roll, as exemplified in FIGS. 6 and 7, the tissues should be loosely enough rolled to permit ready extraction from the roll.

While the invention has been shown and described with reference to several embodiments thereof, it is to be understood that the invention is not limited solely to the various arrangements shown and described and that further modifications and variations can be made without departing from the spirit and scope of the invention. In particular, where reference herein is made to horizontal or vertical orientations, it is understood that any operable angular orientation between these, both longitudinal and lateral, is contemplated. Also, whereas the preferred embodiments herein describe use of means to effect longitudinal creasing of the sheet material to facilitate longitudinal folding, said creasing means are not necessary and may be omitted.

What is claimed is:

1. A method for associating paper stock sheet material into packageable arrangements for serial dis-

a. loading a plurality of individual sheets of said material successively onto a pair of horizontally disposed conveyor belts moving in parallel relationship in the same direction at the same rate of speed with said sheets placed on substantially equal portions of said belts and the leading half of each successive sheet placed on the trailing half of the preceding sheet;

b. causing said pair of belts to fold up to a vertical position in face-to-face relationship with said sheets folded between them, and thereafter

c. folding said sheets in zig-zag fashion transversely as they move forward out of contact with said belts.

2. Method according to claim 1 including creasing said sheets prior to the fold up movement of the belts.

3. Method according to claim 2 wherein after said belts are folded to a vertical position with said sheets folded therebetween, said belts continue through a turn-down direction from a vertical to a horizontal orientation after which said sheets are folded transversely as they move forward out of contact with said belts.

4. A method for associating sheet material into packageable arrangements which comprises:

a. loading a plurality of individual sheets of said material successively onto a first moving conveyor belt with the leading half of each successive sheet placed on the trailing half of the preceding sheet;

b. passing said belt loaded with said sheets under a pair of conveyor belts moving in the same direction at the same rate of speed as said first belt;

c. causing said belts to turn-over so that said first belt is situated above said pair of belts upon which said sheets now ride;

d. removing the leading portion of said first belt from contact with said sheets after which said pair of belts are folded up to a vertical position in face-to-face relationship with said sheets folded therebetween, and thereafter

e. folding said sheets in zig-zag fashion transversely as they move forward out of contact with said pair of belts.

5. Method according to claim 4 wherein said pair of belts loaded with said sheets are passed under housing means at a location proximate to where the leading portion of said first belt is removed from contact with said sheets and whereby said sheets are creased along the center line prior to the fold up movement of the belts.

6. Method according to claim 5 wherein after said belts are folded to a vertical position with said sheets folded therebetween, said belts continue through a turn-down direction from a vertical to a horizontal orientation after which said sheets are folded transversely as they move forward out of contact with said belts.

7. A method for associating paper stock sheet material into packageable arrangements for serial disengagement which comprises:

a. loading a plurality of individual sheets of said material successively onto a pair of horizontally disposed conveyor belts moving in parallel relationship in the same direction at the same rate of speed with said sheets placed on substantially equal portions of said belts and the leading half of each successive sheet placed on the trailing half of the preceding sheet;

b. causing said pair of belts to fold up to a vertical position in face-to-face relationship with said sheets folded between them, and thereafter

c. rolling said folded sheets about an axis as they move forward out of contact with said belts.

8. Method according to claim 7 wherein said sheets are creased prior to the fold up movement of the belts.

9. Method according to claim 8 wherein after said belts are folded to a vertical position with said sheets folded therebetween, said belts continue through a turn-down direction from a vertical to a horizontal orientation after which said sheets are rolled about an axis as they move forward out of contact with said belts.

10. A method for associating sheet material into packageable arrangements which comprises:

a. loading a plurality of individual sheets of said material successively onto a first moving conveyor belt with the leading half of each successive sheet placed on the trailing half of the preceding sheet;

b. passing said belt loaded with said sheets under a pair of conveyor belts moving in the same direction at the same rate of speed as said first belt;

c. causing said belts to turn-over so that said first belt is situated above said pair of belts upon which said sheets now ride;

d. removing the leading portion of said first belt from contact with said sheets after which said pair of belts are folded up to a vertical position in face-to-face relationship with said sheets folded therebetween, and thereafter

e. rolling said folded sheets about an axis as they move forward out of contact with said pair of belts.

11. Method according to claim 10 wherein said pair of belts loaded with said sheets are passed under housing means at a location proximate to where the leading portion of said first belt is removed from contact with

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said sheets and whereby said sheets are creased along the center line prior to the fold up movement of the belts.

12. Method according to claim 11 wherein after said belts are folded to a vertical position with said sheets 5 folded therebetween, said belts continue through a

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turn-down direction from a vertical to a horizontal orientation after which said sheets are rolled about an axis as they move forward out of contact with said belts.

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