March 24, 1936. J. P. REMINGTON 2,034,771

METHOD OF FOLDING TOWELS

Original Filed Jan. 21, 1931 3 Sheets-Sheet 1

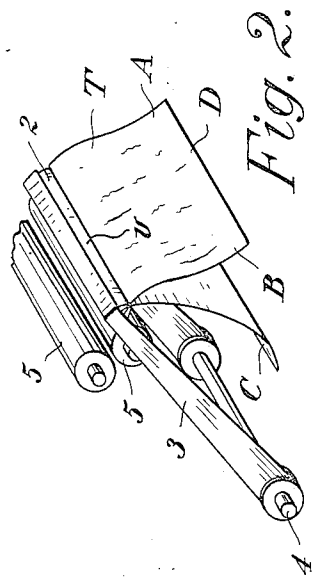


Fig. 2.

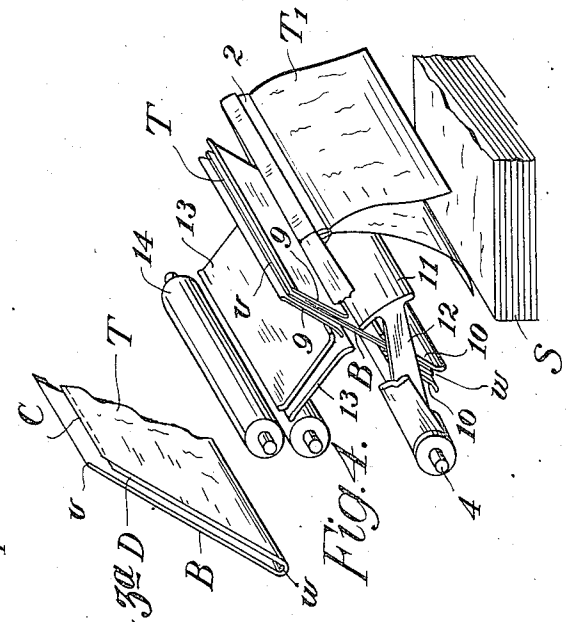


Fig. 4.



Fig. 3a

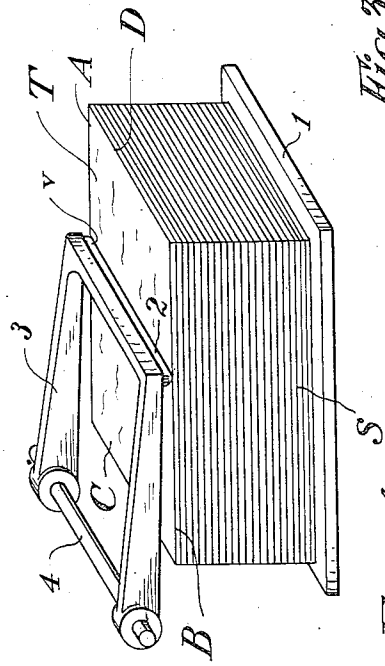


Fig. 1.

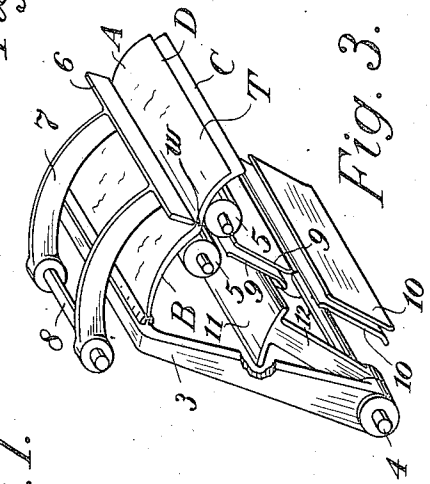


Fig. 3.

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METHOD OF FOLDING TOWELS

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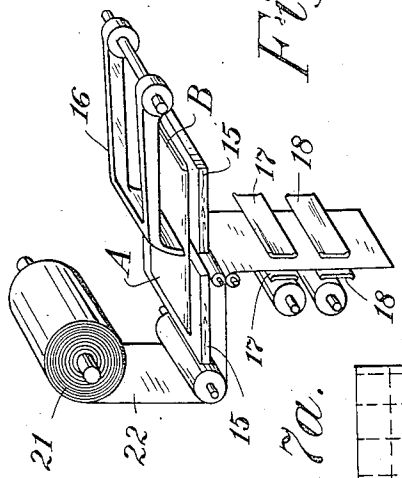


Fig. 6.

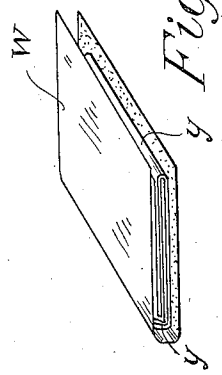


Fig. 8.

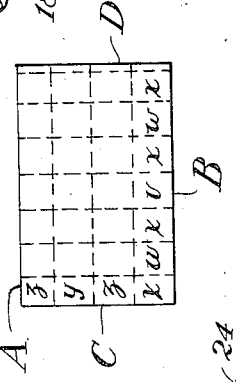


Fig. 7a.

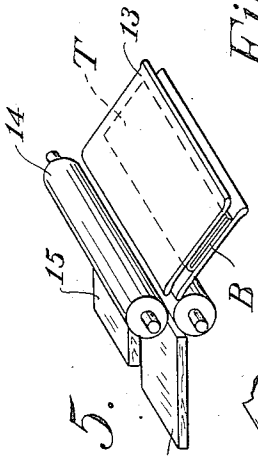


Fig. 5.

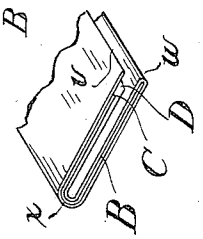


Fig. 4a.

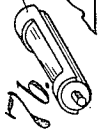


Fig. 7b.

Fig. 7.

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METHOD OF FOLDING TOWELS

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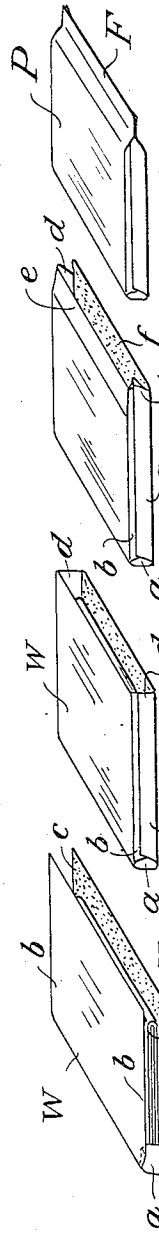


Fig. 9. Fig. 10. Fig. 11. Fig. 12.

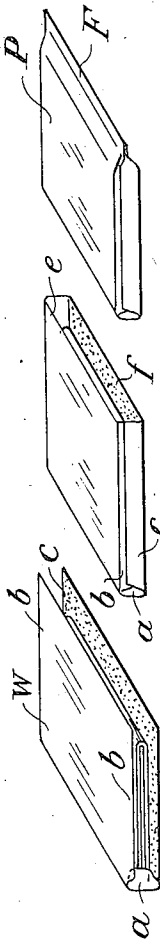


Fig. 13. Fig. 14. Fig. 15.

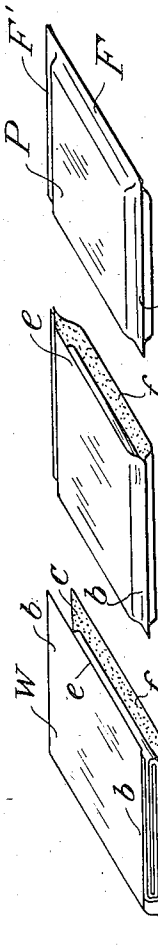


Fig. 16. Fig. 17. Fig. 18.

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UNITED STATES PATENT OFFICE

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METHOD OF FOLDING TOWELS

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Original application January 21, 1931, Serial No. 510,084. Divided and this application December 28, 1931, Serial No. 583,439

9 Claims. (Cl. 270—67)

My invention relates particularly to the folding and wrapping of sheet-like articles of fabric, as cloth; for example towels, napkins, or the like, for brevity herein generically termed "towels".

In accordance with my invention, the towels are removed individually from a stack, preferably by lifting an intermediate portion so that the portions of either side come together by gravity forming a fold, and without substantial delay other folding operations are effected; preferably, before folding of one towel is completed, another towel is removed for folding.

Further in accordance with my invention, the towels are each so folded that though of irregular shape or size in the flat, the folded towel forms a substantially regular body or article suitable for packaging, and more particularly, towels of substantially different dimensions are formed by the same number of folding operations into articles similar in width and length to permit use of a uniform container or wrapper.

My invention also resides in the methods hereinafter described and claimed.

This application is a division of my application Serial No. 510,084, filed January 21, 1931.

For an understanding of my invention, reference is made to the accompanying drawings, in which:

Fig. 1 in perspective shows a stack of towels, or analogous articles.

Fig. 2 illustrates the removal of a towel from the stack of Fig. 1.

Fig. 3 illustrates folding of the removed towel.

Fig. 3*a* on enlarged scale shows the appearance of the folded towel after the operation of Fig. 3.

Fig. 4 illustrates a further folding operation, and the simultaneous removal of another towel from the stack of Fig. 1.

Fig. 4*a* on enlarged scale discloses the appearance of the towel after the folding operation of Fig. 4.

Fig. 5 discloses feeding of the folded towel.

Figs. 6 and 7 illustrate further folding operations and the association of the folded towel with strip wrapping material.

Fig. 7*a* is a plan view of a towel in the flat, with all folds indicated by dotted lines.

Fig. 7*b* shows a stencil roll.

Figs. 8 to 12 illustrate the several steps of applying a wrapper to the folded towel to form a sealed package.

Figs. 13 to 15 illustrate wrapping steps resulting in the modified sealed package of Fig. 15.

Figs. 16 to 18 illustrate the wrapping steps for forming the further modified sealed package of Fig. 18.

Referring to Fig. 1, the towels T, napkins, or analagous sheet-like articles of fabric, are arranged in a stack S, as upon a suitable table or support 1. The top or end towel T of the stack is removed therefrom by supporting and lifting it along a line *v*, a suitable distance from the edge C of the towel. The towel T is engaged for example, by the parallel pinching plates 2 at the end of a U yoke 3, mounted upon the oscillating shaft 4. When the yoke is moved to the position shown in Fig. 1, the pinching plates 2 grasp the top towel T, and upon counter-clockwise movement of the yoke 3, the towel supported along the line *v*, between the plates 2, is lifted, the ends C and D of the towel falling towards each other by gravity, to fold the towel along the line *v*. The distance *v*—D is preferably not greater than the distance *v*—C, and may be materially smaller than distance *v*—C, for the number, sequence and direction of the folding steps hereinafter specifically described.

The yoke 3 carries the towel having the single cross-wise fold to another folding station, specifically to the position shown in Fig. 3, over the rolls 5. The folding bar 6 mounted upon the ends of or integral with the arms 7 supported by shaft 8, and oscillating in timed relation to the yoke 3, presses the towel T between the rolls 5 which feed it between the upper guide plates 9, 9, and lower guide plates 10, 10, separated therefrom to suitable extent, to the position or folding station shown in Fig. 4. The towel, twice folded cross-wise, assumes the appearance shown in Fig. 3*a* with the end D inside of the outline of the end of the folded towel. The yoke 3 is so constructed and operated that in the particular example shown, the distance between the cross folds *v* and *w* is approximately one-half of the distance C—*v*.

As shown in Fig. 4, the upper and lower guide plates 9, 10 are spaced, to permit further cross-wise folding of the towel by the plate 11 at the ends of arms 12 supported by shaft 4. During counter-clockwise movement of plate 11, the folded towel is engaged substantially half-way between the folds *v* and *w*, along the line *x*, forced between the guide plates 13 and into engagement with the feed rolls 14 which deliver the towels to the spaced supporting members 15, Fig. 5.

Preferably while one towel is being folded, as by the plate 11, another towel T1 is being removed from the top of the stack S for delivery over the

rollers 5, Fig. 3, so that it will be understood that as one towel is at one folding stage, one or more other towels are at different folding stages, so that although the time of completely folding one towel may be of appreciable duration, the rate of delivery of cmpletely folded towels may be high. The time required to fold and wrap one towel is limited only by the time required for the slowest operation.

After the folding step of Fig. 4, the body or article formed by the folded towel T is, as shown in Fig. 4*a*, of substantial thickness with one side formed by the fold *x* and the opposite side by the folds *v* and *w* substantially parallel, and straight throughout their length, and this is true even though the edges C, D of the towel in the flat, as in the stack S, may not have been parallel, and/or regular.

Referring to Fig. 6, in which the supporting members 15 are at right angles to the position of Fig. 5, the thrice cross-wise folded towel is engaged intermediate the edges A and B by the folding bar 16 to fold it along the line *y* lengthwise of the towel. The towel so folded is passed between another set of spaced guide plates 17 and 18 to the position shown in Fig. 7. The towel is again folded lengthwise, as along line *z*, which is approximately half the distance between the line *y* and edge B, for example, by the reciprocating plate 19 which forces the towel between the rolls 23.

The lengthwise folds *y* and *z* insure that the width of the article or body formed by the complete folding of the towel is of a predetermined desired value, i. e., the width of one of the small rectangles formed by the folds, see Fig. 7*a*, while as previously explained the length of the body or article is substantially equal to the length of one of the same rectangles. The length and width of the final article is substantially the same for a wide variation in the length or width, or both, of the towels or equivalent, and the sides of the body are substantially regular, with opposite sides parallel despite irregularities in the dimensions or shape of the towels. Increasing the length or width of the towels effects only change in the average thickness of the final article with no appreciable change in the other dimensions. It is therefore possible to enclose the individual folded towels in containers of uniform size to form individual packages for dispensing or distributing the folded towels. For example, towels after being laundered, may be stacked upon a table 1, and the towels individually folded and packaged for delivery.

It will be understood that these folding operations may all be manually performed, though preferably the folding steps are performed by suitable mechanism.

The folding and wrapping of the individual towels is preferably a continuous process, with no substantial interval between the folding and wrapping steps as applied to an individual towel. Preferably as shown in Figs. 6 and 7, sheet-wrapping material, as paper, is removed from a roll 21, and the strip 22 thereof fed between the guide plates 17, 18, associated with the final folding, so that when the folded towel is fed between the guide plates, the paper is between the towel and the upper and lower guide plate nearest the rolls 23. The strip 22 is then severed, as by suitable knives 24 to form an individual wrapper W for the towel. The width of strip 22, and the length cut by the knives is such that the wrapper projects to substantial or suitable extent beyond the edges of the towel, as shown in Fig. 7.

During the final folding operation of the towel along line *z*, as effected by movement of plate 19, the wrapper W is also folded, Fig. 8, with portions of the wrapper projecting beyond the towel. These projecting portions may be in any suitable manner rendered adhesive and folded over one another to form a sealed package. For example, suitable adhesive, as glue, may be applied or if the paper is previously treated, the adhesive thereon may be moistened; if paraffin paper is utilized, heat may be applied to cause the projecting portions to adhere to one another, or other materials such as "Cellophane", may be utilized for wrapping and suitable adhesive or solvents applied to effect adhesion between the projecting wrapper portions.

Specifically, as illustrated in Fig. 7, during reciprocation of the plate 19, adhesive is transferred from the roll 24*a* coated with adhesive transferred by roll 25 from the reservoir 26, to the under surface of the U-shaped plate 27 reciprocable with plate 19. During the final towel folding operation by plate 19, the U-shaped plate 27 rests upon portions of the wrapper W projecting from the sides and front of the folded towel body, to transfer adhesive thereto as indicated by the stippling in Fig. 8.

Instead of applying adhesive during folding of the wrapper adhesive may be applied to the wrapper strip 21 as it is fed toward the station at which it engages the towel; for example, a stencil roll 27*a* as shown in Fig. 7*b*, may apply glue to the wrapper strip. Preferably, the stencil, whether a roll or plate, is cut so that there is applied a strip of glue extending across the wrapper and strips of glue extending forwardly therefrom in the direction of feed, and along the edges of the wrapper. In this case, the glue is on the under side of the top projecting portions *b*, *b* and *e* of the folded wrapper instead of the upper surface of the lower projecting wrapper portions *c*, *c* and *f*.

Figs. 9 to 12 illustrate successive steps of forming one type of package. First, the vertical portions *a* of the wrapper adjacent the fold *z* of the towel, are folded in against the sides of the towel and thereafter the upper or uncoated projecting portions *b* of the wrapper are folded downwardly against the sides of the towel body. The lower or coated side projecting portions *c* are then folded upwardly over the folded portions *a* and *b*, the partially completed package then assuming the appearance of Fig. 10. The portions *d* of the wrapper projecting beyond the edge of the towel body formed by the folds *v*, *w*, and ends C, D are then folded inwardly toward each other as indicated in Fig. 11 to bring the upper and lower projecting ends *e* and *f* of the wrapper flush with each other, and by a final wrapping operation which presses the ends of these projecting portions together, the completed sealed package P is formed. The projecting portion F formed by the attached ends *e* and *f* of the wrapper forms a tearing flap. One wishing to open the package may readily do so by tearing off the flap F which permits ready removal of the towel.

The towel body after the several folding operations, Figs. 1 to 7, is substantial and constitutes a suitable form for shaping of the wrapper. Preferably, however, the plate 19 is retained in position within the folded towel until at least the sides of the package have been formed, Fig. 10.

Another type of package may be formed by

the steps illustrated in Figs. 13 to 15 which is generally the same as that described except that the folding step of Fig. 11 is omitted with the result that the sealed end, or tearing flap F of the package is greater in width than the rest of the package. This difference in width may not be objectionably large for the larger sized towels.

Another and preferred type package is disclosed in Figs. 16 to 17. The edges *b, c* are not folded against the side of the towel but into face to face engagement with one another, and similarly the end edges *e, f* of the towel are pressed into face to face engagement. Any of the flaps F, F' may be torn off to open the package. This method in which there is no folding or overlapping of flaps is particularly suited for wrapping-materials such as paraffined paper, "Cellophane", etc., in which rolls or other clamping surfaces may press the projecting wrapper portions together.

If it is desired simply to fold the towel without wrapping or packaging, the wrapping strip is not supplied to the last folding station, Fig. 7. The completely folded towel is the same as in Fig. 8 except that wrapper W is omitted.

The method of folding and wrapping is claimed in my aforesaid divisional application Serial No. 510,084.

In all cases, it will be understood that the process is preferably continuous. That is, the towels are removed individually and in succession from the stack S, each in succession passes through the several folding steps, and is packaged, and further that several towels may simultaneously be at different stages of the folding and/or packaging operations.

What I claim is:

1. The method which comprises removing a single towel from a stack thereof and simultaneously folding it by applying a lifting force along a line displaced from the center line of the towel to form longer and shorter sides to the fold, further folding the towel by a series of folding operations, each performed by applying the folding force directly at the region of fold to draw the remainder of the towel to folded position, and the direction of folding ensuring that said shorter side of the first fold is internally of the folded towel body, and supporting the towel for folding to prevent its collapse.

2. The method which comprises arranging towels of different dimensions and outline in a stack, lifting them in succession by applying a lifting force displaced from the center line of the stack to form longer and shorter sides to the resulting fold, further folding the towels at distances from said first fold thereof alike for the different towels by applying a force at the region of the desired fold and in such direction as to include the shorter side of the first fold of each internally of the folded body formed thereby, folding each towel at least once at right angles to said first fold, and supporting the towel for folding to prevent its collapse.

3. The method which comprises simultaneously folding and removing a fabric towel from a stack thereof, further folding the towel by subsequent folding operations, each by applying a force at the region of the fold, supporting the towel during each of said folding operations to prevent its collapse, and concurrently with one of said operations simultaneously removing and folding another towel from said stack.

4. The method which comprises pinching an intermediate portion of a fabric towel on the top of a stack thereof, drawing the towel upwardly by the pinched portion so that the portions on either side fall together to fold the towel crosswise as it is lifted from the stack, and without intervening folding, again folding the towel crosswise.

5. The method which comprises pinching an intermediate portion of a fabric towel on the top of a stack thereof, drawing the towel upwardly by the pinched portion so that the portions on either side fall together to fold the towel crosswise as it is lifted from the stack, again folding the towel crosswise, and subsequently folding the towel lengthwise.

6. The method which comprises folding individually limp towels of different dimensions at least thrice lengthwise and at least once crosswise to form regular bodies of substantially similar lengths and widths, and supporting the towels during folding to prevent improper folding or crumpling due to limpness.

7. The method which comprises folding individually limp towels of different dimensions at least thrice in succession in one direction and at least once in another direction to form bodies of substantially similar lengths and widths, and supporting the towels during folding to prevent improper folding or crumpling due to limpness.

8. The method which comprises removing towels in succession from a stack of towels in the flat, folding each of the towels at least twice by applying a force at the region of each fold, supporting the towels during each of the folding operations to prevent collapse, and, before completion of the final folding of each towel, removing another towel from the stack for folding.

9. The method which comprises removing towels in succession from a stack of towels in the flat, folding each of the towels at least twice by applying a force at the region of each fold, supporting the towels during each of the folding operations to prevent collapse, and, before completion of the final folding of each towel, removing another towel from the stack for folding and folding it at least once.

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