

Aug. 23, 1960

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2,949,954

CRINKLED PAPER PRODUCT AND MEANS AND METHOD OF FORMING SAME

Filed June 14, 1955

2 Sheets-Sheet 1

FIG 1

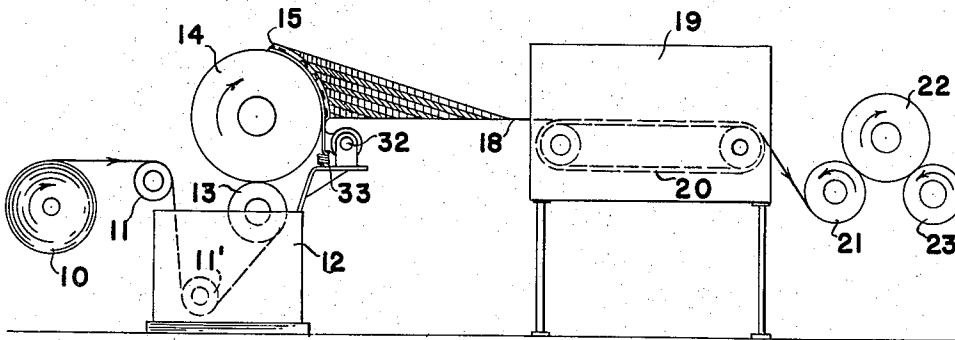


FIG 2

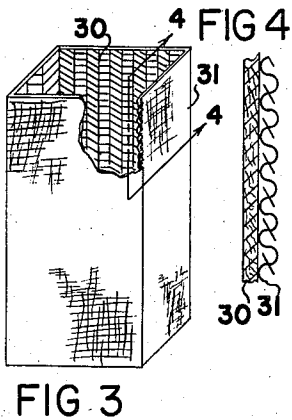
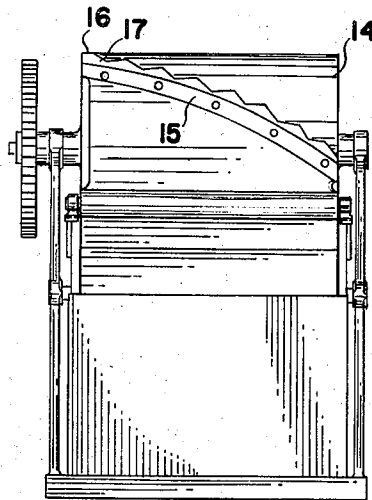


FIG 3

FIG 7

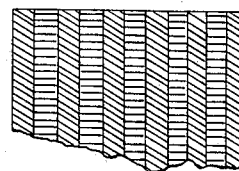


FIG 5

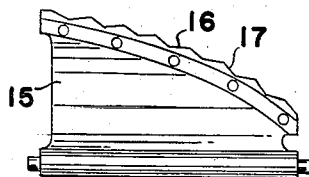
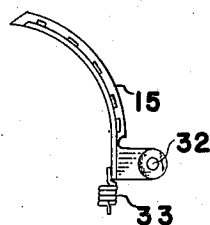


FIG 6



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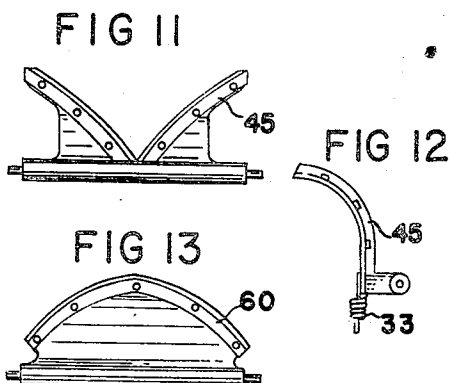
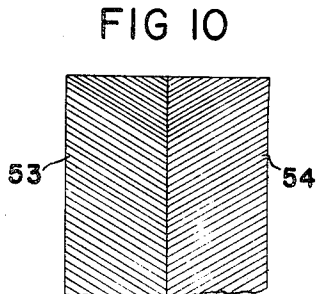
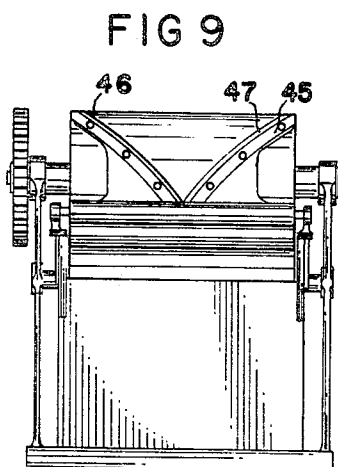
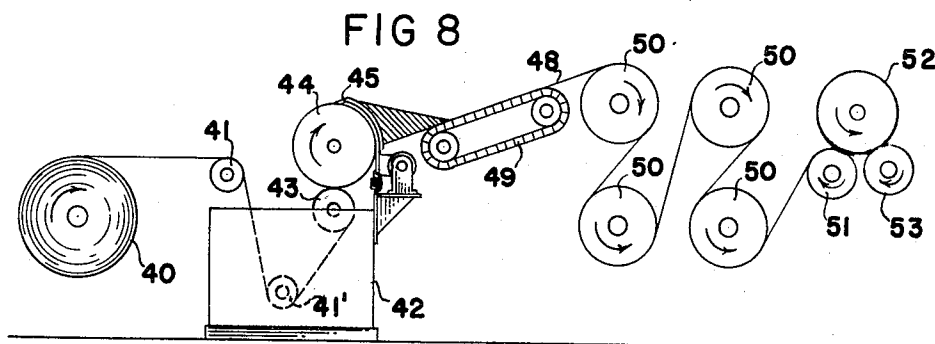
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CRINKLED PAPER PRODUCT AND MEANS AND METHOD OF FORMING SAME

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2 Sheets-Sheet 2



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CRINKLED PAPER PRODUCT AND MEANS AND METHOD OF FORMING SAME

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7 Claims. (Cl. 154—30)

This invention relates to paper, paper products and methods of forming same, and is particularly concerned with the manufacture of crinkled paper and the product achieved thereby. The invention is more particularly concerned with crinkled paper, the crinkles of which provide components which lie in the directions both longitudinal and transverse of the paper whereby the product is yieldable in both such directions, and to methods of obtaining such crinkles and products utilizing such paper.

Heretofore, crinkled paper has been manufactured and widely used particularly as a liner for fabric bags. Such paper has been advantageous in providing against rupture by stretch of the web due to the fact that the crinkling thereof permits expansion of the paper. Such paper has been crinkled by the formation of uneven and irregular deformations lying in substantially but one general direction and thus yieldable only in a direction generally normal thereto. While such paper has been advantageously used it is obvious that the limitations are inherent due to the single direction of yieldability or the stretch of such paper. Efforts have heretofore been made to provide yieldability and stretch in plural directions by corrugating the paper before or after crinkling along lines normal to the directions of the crinkle. While such means are effective in producing a stretch of the paper in two directions it will be seen that the corrugation of the paper vastly increases its total thickness and has further the objection of precluding the flat disposition and securement thereof over other surfaces such as fabric and the corrugations limit the points of contact whereby the paper may be adhesively joined thereto.

It is therefore among the primary objects of the present invention to provide a novel and improved stretchable paper in which stretch may be accomplished in directions angularly related one with respect to the other.

Another object of the present invention is to provide a crinkled paper in which the crinkling thereof is provided in a plurality of angularly related directions so as to permit a two way stretch of the paper thus crinkled.

A further object of the present invention is to provide a crinkled paper in which crinkling is provided in angularly directed directions throughout a single area so as to provide for total stretch of the material in a plurality of directions.

It is also an object of the present invention to provide a crinkled paper in which a single crinkling operation provides crinkle components in angularly related directions with positive and negative slope whereby a stretch is permissible in all directions without danger of rupture.

The invention also provides a method of and an apparatus for crinkling paper in the manner aforesaid.

The provision of a composite paper and fabric article such as a bag amenable to plural directional stretch is also among the objects of the present invention.

Numerous other objects, features and advantages of the present invention are apparent from consideration of the following specification taken in conjunction with the accompanying drawings, in which:

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Fig. 1 is a side elevation of apparatus adapted to provide for the crinkling of the paper in the present invention.

Fig. 2 is an end elevation of the apparatus shown in Fig. 1.

Fig. 3 is a perspective view partly in cross-section of a composite paper and fabric bag utilizing the paper formed by the apparatus of Figs. 1 and 2.

Fig. 4 is an enlarged cross-sectional view taken on the line 4—4 in Fig. 3.

Fig. 5 is a side elevation of the doctor blade of the apparatus of Figs. 1 and 2.

Fig. 6 is an end elevation of the doctor blade of Fig. 5.

Fig. 7 is a plan view of a portion of paper formed by the doctor blade of Figs. 5 and 6.

Fig. 8 is a side elevation of another form of the apparatus adapted for the manufacture of the material of the present invention.

Fig. 9 is an end elevation of the apparatus shown in Fig. 8.

Fig. 10 is a plan view of a portion of paper formed by the apparatus of Figs. 8 and 9.

Fig. 11 is a side elevation of the doctor blade used in the formation of the paper of Fig. 10.

Fig. 12 is an end elevation of the doctor blade shown in Fig. 11.

Fig. 13 is a side elevation of the doctor blade used in formation of arcuate crinkles.

Fig. 14 is a plan view of a portion of paper formed by the doctor blade of Fig. 13.

In the crinkling of paper, the paper is first subjected to a solution of stiffening material, such as starch, and is passed therefrom onto the crinkling drum which is preferably heated to provide for partial drying of the paper as the drum is rotated, and the doctor blade is urged against the crinkling drum to scrape the paper therefrom. As the paper contacts the doctor blade, the formed edge of the doctor blade butts against the paper to press and emboss thereon the irregular indentures constituting the crinkles. From the doctor blade the paper passes through a drying zone to be rolled upon a drum for future use. In general terms, the invention herein presented by way of illustration may be defined as providing a method for the crinkling of paper or like material by passage over a doctor blade suitably formed with a paper engaging surface adapted to form the paper that passes thereover with crinkles having components which lie in angularly related planes, the apparatus therefor and the product thereof.

Referring now more particularly to the drawings, in Fig. 1 the supply of paper is indicated by the numeral 10 as in the form of a roll. The web of paper from the supply 10 first passes about rollers 11, 11', for emersion in a tank 12 of suitable starch or like solution. From the tank 12 the moist paper emerges over roller 13 for passage over the heated crinkling drum 14. The doctor blade is generally indicated by the numeral 15 and in that form of the invention shown in Figs. 1 and 2, the blade 15 is provided with horizontal flights 16 and intermediate inclined angularly related flights 17. The total is disposed in arcuate fashion about a portion of the drum 14 and in downwardly inclined direction from left to right as indicated in Fig. 2. From the doctor blade 15, the web of crinkled paper indicated at 18 is passed through a drying chamber 19 upon which a slotted belt 20 carries the paper subsequently to be rolled over tension rollers 21 and 22 to be deposited upon a final receiving drum 23.

In that form of the doctor plate illustrated in Figs. 2, 5 and 6, it will be seen that as the semi-moist paper on the rotating drum 14 engages the surfaces 16 and 17, such surfaces apply thereto a crinkled configuration in which the horizontal portions 16 provide for a horizontal

crinkle while the divergent angularly related surfaces 17 provide for an angularly related crinkle, the pattern thus formed being indicated in Fig. 7.

In view of the angularly related configuration of the crinkles thus formed, it will be seen that the paper so crinkled will be expansible transversely as well as longitudinally of the web and thus two-way stretch paper is provided. As indicated in Fig. 3, such paper is admirably suited for the lining of bags or the like, the crinkled liner paper of Fig. 3 being indicated by the numeral 30 while the external fabric is depicted by numeral 31.

In the operation of crinkling, it will be understood that the doctor blade is pivotally mounted as indicated at 32, suitable springs being provided as indicated at 33 to tension the blade for pressure against the face of the heated crinkling roller 14. It will be understood that in the operation, a certain amount of compression of the paper results from the contact of the paper with the doctor blade, and hence the scraping of the moist paper from the drum 14 will provide for the successive release of the paper and impression of the doctor blade against the paper so as to effect a crinkling of the paper in the general configuration of the working edge of the blade. In the illustrations of the paper itself, it will be seen that the crinkle is depicted as of regular configuration; however, due to the action of the doctor blade which provides the formation of crinkles in the paper, the outlines of the crinkles are not of such regular outline; and while the crinkling is generally of the character disclosed, the drawings are here presented as illustrative rather than picturesquely depicting the type of paper resulting from the present operation.

Referring now to Fig. 8 of the drawing, it will be carried out in a slightly different apparatus in which the paper supply 40 passes over roller 41 and beneath roller 41' in the starch tank 42, thence over roller 43 to the heated crinkling roller 44. In this form of the invention, the doctor blade 45 is formed with angularly related inclined straight half portions 46 and 47 so as to provide a large herringbone pattern of crinkles as indicated by the illustration of Fig. 10. From the doctor blade 45, the web of crinkled paper 48 passes over conveyor 49 and thence over heated drums 50 wherein the final drying of the paper is effected, and thence between tension rollers 51 and 52 to be deposited on the final receiving drum 53.

A further form of crinkle which in plural directions will likewise provide for expansion and stretch of the material may be provided by the curved doctor blade 60 of Fig. 13. As before, the blade 60 is arcuate to conform to the curvature of the drum 44, in addition to the curve provided from side to side. In this case, the movement of the paper over the doctor blade 60 will effect therein arcuate crinkles 61, as shown in Fig. 14, wherein components of the crinkle are disposed in both longitudinal and transverse relation with respect to the paper so as to achieve a multiple way stretch thereof in the manner and for the purpose aforesaid.

From the foregoing, it will be understood that the present invention provides a novel, simple and improved mechanism for imparting a multiple type crinkle to paper wherein such paper has crinkle characteristics in angularly disposed relation so as to permit stretch of the material both longitudinally and transversely with respect to the web of paper as set forth. It will be understood of course that this invention is not limited to the various specific types of doctor blades herein presented nor to the general characteristics of the mechanism presented by Figs. 1 and 8. Numerous other types of equipment may be resorted to in practicing the invention, and the specific configuration of the various doctor blades may be widely varied in order to achieve the same type of angularly related crinkles by which the finished product has incorporated therein the ability to expand in a plurality of directions. Thus it may be seen that the present invention is not confined to the specific illustrative presentations 75

thereof here made and that numerous changes, modifications and the full use of equivalents may be resorted to in the practice of the invention without departing from the spirit or scope thereof as defined by the appended claims.

I claim:

1. The method of forming crinkled paper stretchable in a plurality of angularly related directions which includes the steps of causing said paper to adhere to the uniformly flat curved surface of a cylinder and drawing the paper across the edge of a doctor blade of irregular edge configuration including straight angularly related portions as all points of said blade are contacting said cylinder.

2. The method of forming crinkled paper stretchable in a plurality of angularly related directions which includes the steps of causing said paper to adhere to the smooth uniformly flat curved surface of a uniform radius cylinder and drawing the paper across the edge of a doctor blade of irregular edge configuration including spaced parallel straight sections and intermediate angularly related straight sections.

3. The method of forming crinkle paper stretchable in a plurality of angularly related directions which includes the step of drawing the paper across the edge of a doctor blade of irregular edge configuration defined by one half of its edge lying at an angle to the other half thereof.

4. A device for forming a multi-directional stretch crinkled paper including a drum and a helical doctor blade for removing paper from said drum, said blade having an edge of irregular outline characterized by straight angularly related surfaces contacting said drum at all times, said surfaces being so directed along said drum as to urge respective portions of said paper toward each other at different angles.

5. A device for forming a multi-directional stretch crinkled paper including a drum with a flat curved periphery and an arcuate helical doctor blade for removing paper from said drum, said blade having an edge of irregular outline characterized by spaced parallel surfaces and intervening parallel surfaces angularly related thereto, all of said surfaces contacting said drum at all times.

6. The process of forming a crinkled essentially flat paper comprising the steps of causing a web of paper to adhere to a smooth uniform surface, and scraping said paper from said surface by urging a blade progressively along said surface to urge transverse portions of said paper toward each other, certain areas of said web being urged by said blade in a direction longitudinally of said web and certain other areas of said web being simultaneously urged at a slight angle to the longitudinal direction, the blade uniformly contacting said web along straight lines.

7. An apparatus of the class described comprising a smooth surfaced drum of uniform radius, a doctor blade pivotally mounted adjacent said drum for movement toward and away from the periphery of said drum, and spring means urging said doctor blade against said drum, at least a portion of said doctor blade being curved in a helix about a portion of the periphery of said drum, said blade being provided with a plurality of staggered blade surfaces arranged parallel to each other and axially with respect to said drum, there being provided diagonal blade surfaces angularly disposed between said staggered blade surfaces, said diagonal blade surfaces being parallel to each other and joining adjacent ends of said staggered blade surfaces to thereby provide a continuous blade surface in which there are alternately an axially disposed blade surface and an angularly disposed blade surface, said doctor blade being adapted to contact the periphery of said drum throughout the entire length of said continuous blade surface.

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