

Aug. 6, 1946.

W. W. ROWE

2,405,521

WEB OF STRETCHABLE MATERIAL AND BAG MADE THEREFROM

Original Filed Jan. 25, 1937

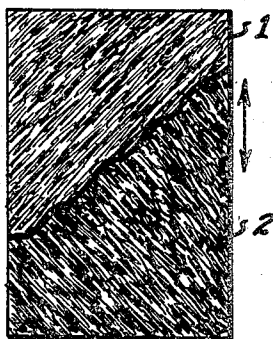


FIG. 1.

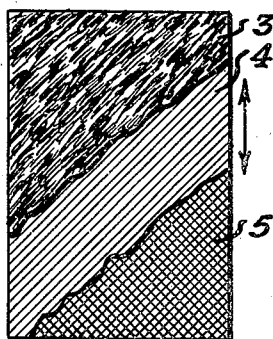


FIG. 2.

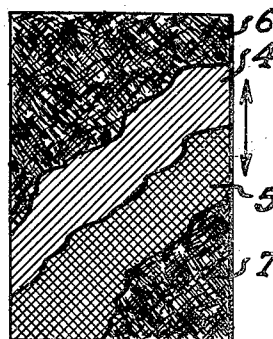


FIG. 3.

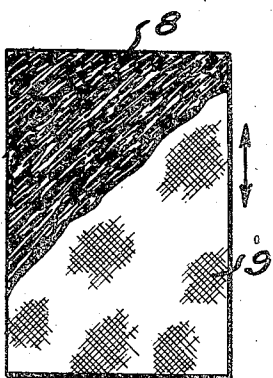


FIG. 4.

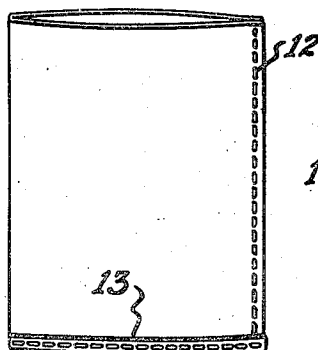


FIG. 6.

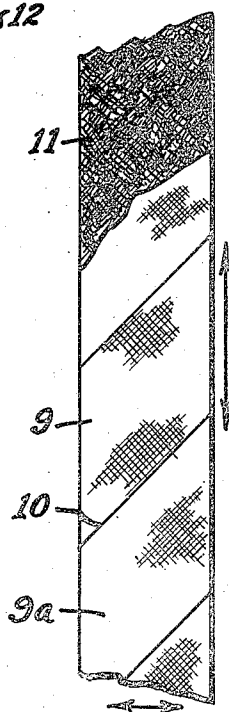


FIG. 5.

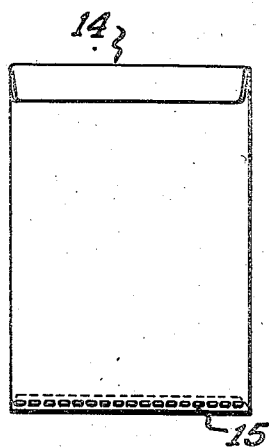


FIG. 7.

INVENTOR.
WILLIAM WALLACE ROWE.
BY *Allen & Allen*
ATTORNEYS.

UNITED STATES PATENT OFFICE

2,405,521

WEB OF STRETCHABLE MATERIAL AND
BAG MADE THEREFROMWilliam Wallace Rowe, Cincinnati, Ohio, assignor
to Cincinnati Industries, Inc.Original application January 25, 1937, Serial No.
122,172. Divided and this application August
3, 1940, Serial No. 350,947

14 Claims. (Cl. 229—55)

1

This is a division of my copending application Serial No. 122,172, filed January 25, 1937, and entitled Processes of making stretchable materials, now Patent 2,213,290.

My invention relates especially to webs of material and to articles made of such webs, for example, bags, bag tubes, blanks for bags, binding strips and the like, which webs and articles have stretchability in one or more directions, particularly allocated to the various uses to which the articles of webs are to be put.

In an application copending with the parent case of which this case is a division, Serial No. 664,377, filed April 4, 1933, now Patent 2,071,362, I have described and claimed certain bags for heavy duty embodying a new principle. These bags do not rely upon the ultimate bursting strength of the materials employed in them for their serviceability. On the contrary, their extraordinary serviceability is derived from the ability of the materials of which the bags are made to absorb the shocks and strains of use by a stretching or distortion of the body materials. By way of example, such bags, as described in that case, may be made of a plurality of layers of universally stretchable paper cemented together. When such bags are filled with suitable contents and are subjected to the shocks and strains of use, such as dropping them while loaded, the shocks are absorbed by distortions of the bag walls, and the resistance of the bags to such shocks is surprising and extraordinary.

I have found that in bags, for example, the fundamental necessity is lateral stretchability as respects the bag, and in some instances longitudinal stretchability also. Universal stretchability, i. e. the ability to expand or distort in every direction is not in many instances required. Therefore, in accordance with the teachings of the present invention, I am enabled by means, a structure and a method herein-after set forth, to make webs and bags and other articles out of materials which have a major or primary stretchability in but one direction and still gain the desired effect. I am also enabled to use reinforcements, the elements of which are not in themselves essentially stretchable, and gain the desired effects by a suitable placement of the reinforcing elements, in conjunction with the use of universally stretchable webs or combinations of webs which have but one direction of major or primary stretchability.

Taking creped paper as an example of a stretchable web, it will be understood that the

2

paper is stretchable to the greatest extent in a direction perpendicular to the lines of creping therein. This is what I mean by the terms "major or primary stretchability," as distinguished, of course, from that restricted stretchability which can be had along lines transverse to but not perpendicular to the lines of creping, and as distinguished from that substantial lack of stretchability which is found in single creped papers parallel to or along the lines of the creping. What has been said of creped papers, of course, will apply also to paper webs or other webs characterized by other sets of gatherings or rugosities which impart a certain stretchability to the webs, and will apply also to inherently stretchable webs.

The general objects of my invention will be apparent from the above or will be clear to one skilled in the art upon reading the following specifications. I accomplish these objects in those certain webs of material, bags or other articles made therefrom, and by the particular processes of making webs, bags or articles, of which I shall now describe certain preferred embodiments.

In the drawing:

Figures 1 to 5 inclusive, are illustrative of webs, bag or container blanks or materials from which such blanks may be made. In these figures the arrows indicate the longitudinal and lateral axes of the webs and also directions of stretchability in the webs. In these illustrations the webs have been separated into layers to show their construction.

Figures 6 and 7 are plan views of completed bags before filling.

Taking bags as exemplary articles formed in accordance with my invention, I have found, as indicated, that lateral and longitudinal stretchability or distortability of the articles are the primary requisites. In use, bags are frequently subjected to end drops, and such drops for a given or constant height are the most severe, because of the relatively tall vertical column of material. On side drops there is less relative strain because the contents of the bag do not have a great head, i. e. the depth of the contents is not great in the vertical direction. Stretchability or distortability in these two directions, however, is important; and it may be attained in bags otherwise similar in spirit to the bags of my patent above referred to. William C. Kemp, in his application Ser. No. 558,884, filed August 24, 1931, copending with the parent case hereof, and now Patent 2,071,347, has dis-

closed a web of paper and a process of making it whereby the paper is creped along lines not conforming with either axis of the web but lying at an angle to both. Such paper, when creped in but one direction, has essentially one major or primary direction of stretch as hereinabove defined; but by reason of the fact that the lines of creping lie aslant to the axes of the web, there is a considerable degree of stretchability along the lateral and longitudinal axes of the web. A bag or liner made of such single-diagonally creped paper has an effective stretchability, therefore, both laterally and longitudinally; but if used without other support, there is a tendency for the bag or liner to twist as strain is applied to it, in such a way as to remove the stretchability. I have found, however, that a very serviceable bag having the characteristics of bags described in my copending application above referred to, can be made if two sheets of single-diagonally creped paper are used together in such a way that the diagonal lines of creping in one sheet are arranged in a direction substantially opposite to the direction of the lines of creping in the other sheet. This is illustrated in Fig. 1 where I have shown a sheet or web 1, of single-diagonally creped paper superposed upon another sheet or web 2, of the same character of paper, the webs, however, being so superposed that the lines of creping cross each other. A bag, container or article made in the usual way from such a composite fabric has stretchability along both the lateral and longitudinal axes, and is capable of stretching or distorting under the strains of use but without any tendency toward twisting, as set forth above. It will be clear that the tendency of one sheet to cause the article to twist will be counteracted by the opposite tendency of the other sheet. Both sheets can stretch together along the lateral and longitudinal axes of the web (which are the directions indicated by the arrows in the drawing) without disruption of either web.

In application Serial No. 668,106, filed April 26, 1933, now matured into Patent No. 2,069,778, issued February 9, 1937, which was copending with the parent case of which this application is a division, I have shown that when two or more non-conjointly creped sheets are cemented together, the composite fabric offers very much more resistance to the removal of stretch than if the sheets are uncemented. I explain this by pointing out that, upon stretching the composite fabric, the interposed adhesive, between the crinkles in the opposed sheets, is subjected at places to tensional stresses and in other places to compression stresses transverse to the sheets. In resisting these stresses the adhesive effectively acts to resist the removal of stretch.

I have found that when two sheets of diagonally gathered materials in the relationship shown in Figure 1 are cemented together, there is inherent in the structure much more resistance to the removal of stretch along lines where stretching is possible than is present in two sheets of universally stretchable paper cemented together. This surprising property arises, I believe, from the action of the crinkles or gatherings in producing an additional distortion of the interposed adhesive. The lines of creping during sidewise or lengthwise stretching of the composite web tend to shift their angular positions with a sort of scissors action, or an action very much like the shifting of the relative directions of the warp and

woof threads of a woven fabric when the woven fabric is stretched along the bias.

Both sheets have some degree of stretchability in all directions excepting a direction parallel to the lines of creping therein, so that within the limits of this stretchability there is no tendency to split or tear the webs which make up the composite fabric. In a bag made of such a fabric in which the lateral and longitudinal axes of the bag coincide with the lateral and longitudinal axes of the web, there would be no tendency to split either sheet under normal stresses, unless such stresses were applied diagonally of the bag and along the line of creping in one of the sheets. Even then, however, the other sheet would have stretchability in the direction of the stress and the bag would continue to be serviceable.

In bags in which serviceability arises from ability to absorb shocks and stresses by stretching or distortion, the greater the resistance to the removal of stretch, the better and more serviceable the bag, providing of course, the resistance to the removal of stretch is less than the ultimate strength of the bag walls.

For simplicity in the drawing I have omitted showing the adhesive, if used, as a separate layer. The adhesive used may be any desired. It may be an adhesive which has some resident plasticity at normal temperatures, like asphalt. It may be a resilient adhesive, like rubber. Even adhesives like silicate of soda or vegetable pastes, which tend to set to a rigid condition, will usually disintegrate or split when the web is stretched, thus permitting stretchability. When I speak of stretching, in composite fabrics or articles like those here under discussion, I include both stretching by permanent distortion and elastic or resilient stretching. It will be understood that a very little linear give in a small area of the composite web is multiplied many fold over the whole extent of the web.

In connection with my description of a product, bag or article such as is indicated by the showing of Fig. 1, I am not, of course, limited to creped paper but may employ paper characterized by other types of rugosities or gatherings such as corrugations, pleats, folds or the like. Also, as will be evident, the number of layers of paper in the composite fabric may be multiplied to any desired.

I have further found that with a fabric such as that illustrated in Fig. 1, where the web or the article made therefrom has inherent stretchability, universal stretchability or lateral and longitudinal stretchability, I can use a reinforcement, the elements of which are not in themselves substantially stretchable, by so arranging the reinforcing elements that the directions of desired stretchability in the web are not along the lines of the reinforcing elements. In Fig. 2 I have shown a composite fabric which may comprise a piece of creped paper 3, illustrated, for purposes of an exemplary disclosure, as a sheet of single-creped paper with the lines of creping running aslant both to the longitudinal and lateral axes of the web. I can impose on this web reinforcement members indicated at 4. These may, for example be long, strong, tough fibers, such as fibers of sisal, or cords, threads or filaments. The diagonally disposed direction of these reinforcements leaves them free to move with reference to each other along the lateral and longitudinal axes of the web; therefore the reinforcing elements 4 do not interrupt the stretchability of the web in these directions. In view of these con-

5

siderations, it is entirely possible and desirable in most instances to add another set of diagonally disposed reinforcing elements 5, crossing the first set but likewise disposed so as to permit stretchability along the longitudinal and lateral axes of the web.

The reinforcements may be applied to the paper in any desired way. Methods have been proposed in the past by treating a web of paper with diagonally disposed reinforcements; but unless the web of paper is stretchable in the same directions as the combined reinforcing structure is stretchable, a bag or similar article made of such a product would be subject to disruption of the paper web and therefore practically a failure in use, due to siftage and the like. However, it is not necessary that the direction of any set of reinforcements coincide exactly with the directions of the crinkles in the paper. It is desirable that there be a relatively small angular discrepancy between the two directions so that the paper will have a residue of stretchability in a direction along the line of a set of reinforcements such that the paper is somewhat more stretchable in this direction than the reinforcement elements themselves. Thus splitting of the paper may easily be avoided.

In Fig. 2 I have illustrated the product as consisting of a sheet of paper 3, and crossing sets of reinforcing filaments, fibers or strands 4 and 5. It will be understood, of course, that an additional layer of paper may be placed over the reinforcing structure so that the reinforcement is sandwiched between layers of paper. Where the paper is single creped and more than one layer is used, it will be advantageous to have the direction of crinkles in the several paper layers disposed opposite to each other as taught in connection with Fig. 1. However, a fabric may be made with the reinforcing structure illustrated in Fig. 2, but with universally stretchable paper in the place of paper having but one direction of major or primary stretchability. Thus in Fig. 3 I have shown a web of paper 6 of universally stretchable character. This may be a double-diagonally creped paper made in accordance with the teachings of the Kemp application hereinabove referred to. On this sheet are laid the crossing layers of diagonally arranged reinforcements 4 and 5 and over the reinforcement is cemented another layer of universally stretchable paper 7.

By the use of reinforcement structures such as I have described, I have provided a bag or like article capable of absorbing shocks and strains by distortion in the useful directions; but at the same time I have been able to increase the ultimate bursting strength of the article, so that I secure, to all intents and purposes, the advantages of the ordinary paper-lined burlap bag in combination with the advantages of a type of bag in which shocks are met by distortion. This advantage cannot be secured in ordinary bags made of cloth because the warp and woof threads of the cloth follow the lateral and longitudinal axes of the bag or other article. If the warp and woof threads, however, could be caused to lie in substantially the same directions as the reinforcing elements 4 and 5 of the web of Figs. 2 and 3, the desired effect would be obtained. This can be done by cutting cloth on the bias, and in Fig. 4 I have indicated a composite fabric in which a sheet of paper 8 is joined to a bias cut web of cloth 9. The product of Fig. 4, of

6

course, can likewise be faced on both sides with paper if desired.

A fabric such as that shown in Fig. 4 can be made without substantial wastage by cutting cloth on the bias across a web so as to secure diamond shaped pieces, and then sewing these pieces together or otherwise joining them, in such a way as to form a new web, the warp and woof threads of which will lie essentially aslant to the lateral and longitudinal axes. I have illustrated this in Fig. 5 where a piece of bias cut cloth 9 is shown seamed as at 10, to another piece of bias cut cloth 9a. When such a web of cloth has been made, it may be surfaced continuously with paper as at 11. The paper may either be single-diagonally creped paper or universally stretchable paper. It will obscure any seams formed in the cloth and give a product having a unitary and continuous appearance.

I have illustrated in Fig. 6 an exemplary form of bag in which a blank is folded over on itself, as shown, and a side and bottom seam formed. In this particular figure the side seam is shown as a plain, stitched seam at 12, and the bottom as a bound and sewn seam as at 13. Other types of seam formation as known in the art, are suitable for use with the fabrics of my invention.

In Fig. 7 I have shown another type of bag having a sealing lip 14 at its ends, the bottom of the bag being shown as closed by a seam 15.

The various bag forms may be made from materials heretofore described, manufactured as sheets or webs.

A fabric such as that shown in Fig. 1 can be made otherwise than by the superposition of separate webs or sheets of paper having diagonal crepes. Thus a length of single-diagonally-creped paper may be folded over on itself lengthwise, and in the superposed layers thus formed the crinkles will be oppositely directed. Also a web of single-diagonally-creped material may be folded over widthwise on itself to gain the same effect; and this may be done continuously. Other materials may be interleaved between the layers, such as reinforcements, cloth, panel materials, insulation materials and the like. The use of two sheets or webs, or a single sheet or web folded over on itself, with a material interleaved therebetween but not coextensive with the sheets or webs, is an excellent way of making a sheathed article with projecting, double-stretch flanges, e. g. an insulation assembly with attachment flanges.

The webs hereinabove described are useful for the manufacture of other articles than bags and in general are useful wherever a web of material is desired having stretchability, both along its longitudinal and lateral axes. Such fabric may be coated with lacquers, resins, cellulosic compounds or the like for the production of artificial leathers and decorative materials; they can be printed or otherwise decorated. They can be embossed. Where the tubing methods described are found to be more convenient or cheaper, but where the resultant material is desired in sheet form, it will be clear that the tubes may be slit and the material rolled up into one or more rolls.

The material is likewise useful for binding strips and the like, particularly for binding around corners, etc., and in connection with sealing strips for bags, it will be clear that a bag may be formed with wall portions of which some at least are not stretchable laterally and longitudinally, but portions of which are stretchable in these directions. Such a bag will have some degree of re-

sistance to stresses of use due to the distortability of the stretchable portions.

In a copending application, Serial No. 135,295, filed April 6, 1937, I have disclosed the inclusion, in bags or other flexible containers made of composite webs, of films such as films of cellulosic compositions, rubber derivatives and the like. It will be understood that these teachings are applicable to the webs and articles made therefrom which are herein described, and also that films may be employed in the tubing methods and with the apparatus set forth in this disclosure.

Finally it may be noted that in containers of the expansible type the precautions ordinarily necessary in seam formation are not required. Where in ordinary paper-lined burlap, for example, cemented seams are to be made, the seam should have a strength equal to the ultimate strength of the container walls, if premature seam failure is not to occur, wherefore it has been necessary to adopt a seam construction which permitted the cementing of cloth directly to cloth. This is not necessary in my expansible containers, since, so long as there is resident expansibility in the container walls, the strain is not localized at the seam construction. Thus excellent containers may be made by lapping and cementing the fabric, though this result in a paper-to-paper bond or a paper-to-cloth bond.

Modifications may be made in my invention without departing from the spirit of it.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A web of material stretchable on its longitudinal and lateral axes and comprising a plurality of layers of stretchable paper, said paper characterized by a single set of lines of rugosities imparting the stretchability thereto, said lines being located aslant to said axes, and the said lines being oppositely disposed in at least two of said layers.

2. A bag or like container having stretchability on its lateral and longitudinal axes and having walls comprising a plurality of layers of paper, each layer having a single set of rugosities imparting the stretchability and diagonally disposed to said axes, the rugosities being disposed oppositely to each other as respects at least two of said layers of paper.

3. The product of claim 1 having in combination therewith a reenforcing element also stretchable along the lateral and longitudinal axes of the web.

4. A composite fabric comprising bias cut cloth pieces joined together to give a web in which the warp and woof threads lie aslant to the lateral and longitudinal axes of the web, and a surfacing for said web covering the juncture of said pieces in a continuous manner, said surfacing comprising a layer of stretchable paper.

5. A tube structure comprising a tube of paper

stretchable along the longitudinal and lateral axes of said tube, and a winding thereof of reenforcing strands lying aslant to said axes.

6. In a bag at least one layer of paper stretchable upon the lateral and longitudinal axes of said bag, and a layer of strand-like reenforcing elements extending diagonally of the longitudinal and lateral axes of said bag, and common, in part at least, to two sides thereof.

7. A web of material stretchable on its longitudinal and lateral axes and formed by folding over upon itself a web of paper characterized by a set of rugosities imparting stretchability thereto and disposed aslant to said axes, said folding forming a fabric comprising two layers in which the rugosities are respectively oppositely disposed, the said layers being adhesively secured to each other.

8. The product of claim 7 further characterized by the interposition between the said layers of diagonally arranged reenforcing strands.

9. The product of claim 7 further characterized by the interposition between the said layers of cloth which has been cut on the bias and joined to make a web such that the warp and woof threads thereof lie aslant to the axes of said web.

10. A fabric comprising a plurality of layers of universally stretchable paper in adhesive union and a layer of cloth cut upon the bias and joined together so as to produce a web in which the warp and woof threads lie aslant to the axes thereof.

11. A bag comprising at least one layer of stretchable paper and one layer of cloth, the said layer of paper being characterized by a set of rugosities imparting stretchability thereto and disposed diagonally of the axes of the bag and said cloth being so disposed in the bag that the warp and woof threads thereof lie aslant to the axes of the bag.

12. A fabric for bags, bindings and the like, being a web of indefinite length and having a body formed of cloth cut on the bias and joined together so as to give a web in which the warp and woof threads lie aslant to the axes of the web, said web of cloth being covered on one side at least with a layer of paper which is stretchable along the lines of the axes of the combined web, said paper being a continuous web and covering the seams in the cloth web.

13. A bag made of the web of claim 12 in such a way that the axes of the bag are substantially parallel to the axes of the web from which it was made whereby the bag is stretchable laterally and longitudinally.

14. A bag comprising a layer of cloth and at least one layer of paper in adhesive union, said cloth constituting a web helically disposed with reference to the longitudinal axes of the bag, said paper constituting a diagonally creped web having axes parallel to the axes of the bag.

WILLIAM WALLACE ROWE.