Dec. 9, 1952 A. W. BOESE 2,620,853

METHOD OF MAKING DECORATIVE TISSUES

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Fig. 1

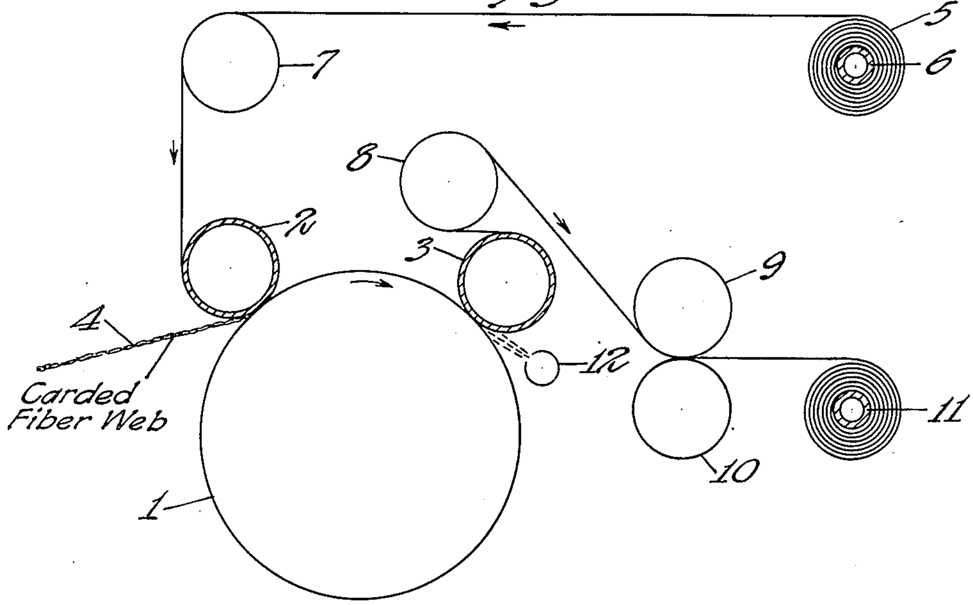
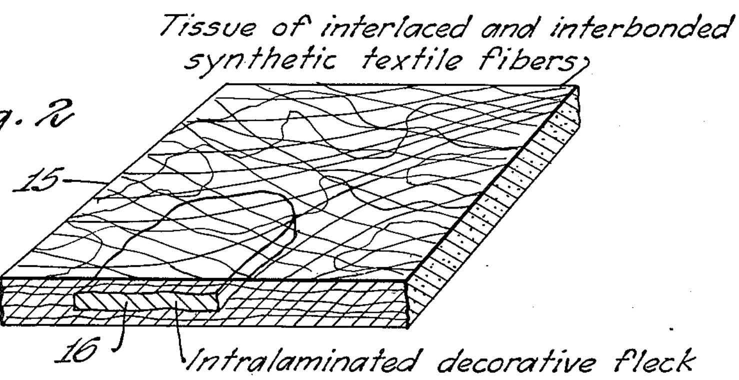


Fig. 2



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METHOD OF MAKING DECORATIVE TISSUES

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4 Claims. (Cl. 154—33)

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This invention relates to decorative tissue sheeting adapted for wrapping gift packages and for other purposes.

More particularly, it relates to decorative tissues formed of carded synthetic textile fibers having a length of at least approximately one inch wherein the fibers are intermeshed and are interbonded at crossing points to provide unification and strength. Within the fiber body of the sheeting there are provided a scattered multiplicity of intralaminated decorative flecks having a color appearance differing from that of the fibrous body. These flecks are thus located within the fiber mesh and are held in place by long fibers which extend over each face of each fleck, as distinguished from flecks adhered to a surface of a tissue. The open mesh arrangement of fibers in the tissue permits the flecks to be readily visible and they make for a variegated appearance.

The flecks may be made from any suitable sheet material adapted to be distintegrated into flecks and thin enough to be contained in the tissue body. The flecks should be large enough in area so that each is imprisoned by a multiplicity of covering fibers.

Effective use can be made of non-fibrous films adapted to be disintegrated into flecks or flakes, such as cellulosic films (illustrated by cellophane and by cellulose acetate films), and metal foils (illustrated by aluminum foil and tin foil). Use can also be made of papers. A further example is a fibrous tissue of the character of the body tissue, but differing in color appearance, and which has been disintegrated into small bits which have been introduced into the body tissue.

The flecks should have a color appearance different from that of the tissue body in order to provide a variegated effect. Thus, where cellulosic films, papers, or tissues are used in making the flecks, use can be made of those which have been pigmented, dyed or printed to provide the desired color effect. The flecks need not all be of the same color nor made of the same material, the use of different kinds of flecks producing additional variation in appearance. The tissue sheet need not be white, but may itself be colored, as by employing dyed textile fibers; and a mixture of fibers of differing color appearance can be employed. Thus there are endless possibilities for securing novelties.

I have discovered that these decorative flecks can be readily formed, and scattered and positioned within the tissue web, in conjunction with the carding procedure employed in making the carded tissue. The carded tissue is formed by carding synthetic textile fibers in a carding machine. By introducing the fleck-forming sheet material along with the fibers, it is found that the teeth of the carding machine will disintegrate it into appropriate flecks and will cause flecks to be distributed within the fiber mesh as heretofore indicated.

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The fibers of the tissue web can be caused to become interbonded at fiber crossing-points by employing, for example, fibers which have latent adhesive properties adapted to be activated by heat or by a solvent. The fibers need not be entirely of this type, but preferably at least about one-half should be, the remainder in such case being mechanically imprisoned in the web owing to the fact that each fiber crosses over and under a plurality of other fibers. The tissue may be compacted by a pressing so as to have a non-fluffy paper-like finished appearance.

The long synthetic textile fibers result in a paper-like tissue having a very de luxe appearance, quite unlike ordinary tissue papers. The variegated appearance resulting from the colored flecks makes possible gift wrapping sheeting which is not only beautiful in appearance but which has a novel appearance quite unlike anything previously available.

Waterproof textile fibers (such as cellulose acetate fibers) may be employed to produce wrapping tissues having a high intrinsic wet-strength, which is a valuable feature making for effective floral wraps which maintain proper strength even when dampened by moist flowers.

The nature and features of the invention will be further indicated in connection with the following description of the drawings and of an illustrative method of making the novel product. In the accompanying drawings:

Fig. 1 is a diagrammatic elevation view showing the arrangement of rolls in an illustrative apparatus for forming a carded fiber web, containing a scattered multiplicity of decorative flecks, into a unified wrapping tissue. This apparatus provides suitable heating and soft-pressing for a web composed of a mixture of thermoplastic and non-thermoplastic textile fibers.

Fig. 2 is a magnified and diagrammatic cross-sectional and perspective view of a portion of tissue sheeting 15 showing the location of an illustrative intralaminated decorative fleck 16, imprisoned by long intermeshed fibers extending over each face.

In Fig. 1, the carded fiber web is shown entering the apparatus. The carding machine is not shown as it is not special equipment and such machines are well known. By a carding machine is meant not only those which are technically termed carding machines, but also garnett machines which operate to form carded webs. The carding procedure straightens out the fibers and tends to make them roughly parallel and oriented in a direction lengthwise of the fiber web which is formed. The fibers in the carded web are not of course fully straight, fully oriented and fully parallel, but extend diagonally, curl, and pass over and under each other, in a heterogeneous fashion and to an extent which interlaces and intermeshes them and causes each fiber to be crossed by numerous other fibers along its length. I have satisfactorily employed a garnett machine of standard type in which the working rolls have 22 teeth per inch, the finishing cylinder has 24 teeth per inch, and the finishing doffers have 28 teeth per inch.

The fleck-forming sheet material (such as aluminum foil) may be fed into the carding machine with the entering fibers at the feed apron, and will be disintegrated into small pieces or flecks in passing through the toothed cylinders and simultaneously will be properly scattered and imprisoned, and in parallel relation to the faces of the web, without crumpling or balling. It is possible to feed in the fleck-forming sheet material at any cylinder of the machine, and the size of the flecks depends upon the number of cylinders utilized. The fleck-forming sheet material may be introduced in the form of individual sheets, or in the form of continuous strips or sheeting unwound from rolls. The quantity of fleck-forming sheet material required, depends upon the ratio of total fleck-area in the product.

An illustrative fiber composition is one consisting (by weight) of 70% plasticized staple cellulose acetate fibers of 3 denier size and 1¼ inch length, and 30% staple viscose fibers of 3 denier size and 1⅞ inch length. The acetate fibers are thermoplastic. Before carding, the fibers are passed through a textile "picker" to blend the mixture and open the fibers.

In the garnett machine which I have employed, the resultant carded fiber web of such a fiber mixture has a ream weight of about 10 pounds (exclusive of the flecks), by which is meant the weight of 320 square yards, and when formed into a single ply finished tissue (as hereinafter described) provides a sheeting having a caliper thickness of about 2.5 mils, a lengthwise tensile strength of about 1.8 pounds per inch width, and a cross-wise tensile strength of about 0.5 pound per inch width. The wet strength is about 65% of the dry strength.

Reference is now made to Fig. 1, and a description will be given of finishing the carded fiber web, containing flecks, of the character above indicated, containing 70% thermoplastic acetate fibers and 30% non-thermoplastic viscose fibers.

Heating of the web is produced by a polished steel drum **1**, rotated about a horizontal axis by an electric motor (not shown). The drum rotates in a clockwise direction in this view. This drum has a diameter of about 16 inches and a length of about 31 inches. It is heated by electric heating elements mounted on a fixed spider or frame (not shown) located within the drum, but may of course be heated in any other suitable manner.

Pressing of the fiber web against the heating drum is produced by the soft rolls **2** and **3** which bear against the drum surface and are free to turn. Roll **2** is located so that it contacts the heating drum near its top, and roll **3** is spaced beyond, about one-fourth of the distance around the drum. These pressing rolls are each made of a light sheet-metal roll having a diameter of 5 inches upon which is wound heavy creped Kraft towelling paper to form a soft and resilient base layer approximately ⅛ inch thick, and upon this is wound four turns of finely woven glass cloth having a smooth type surface, forming a cloth layer approximately ⅛ inch thick. The cloth is wound on in a clockwise direction and the outer end is left free so as to trail through the nip, preventing wrinkling. The turns of cloth hold together so that this end does not flap. The glass cloth provides a flexible surface which will not stick to the cellulose-acetate fiber web.

The pressing rolls are kept in contact with the heating drum by their weight, and the pressure due to the weight of a roll can be increased by adjustable springs at each end (not shown), the total being less than 10 lbs. per inch width of the web. The pressure is adjusted so as to be light enough to produce the type of fiber interbonding herein described. In operation the softness of the roll results in a peripheral contact distance of about ¼ inch. An idea of the softness of the pressing operation can be gained from the fact that a large diameter pencil lead (0.085 inch diameter), mounted by means of adhesive tape on a piece of paper, can be passed through the nip without damage to the lead (the lead being parallel to the axis of the roll). A wooden dowel of 0.160 inch diameter can be passed through the nip. This light-pressure soft-roll pressing action is entirely different from the pressure effect produced by the calenders used in textile mills, which have hard rolls forming the nips through which sheet material is passed.

The carded fiber web **4** is shown coming from a carding or garnett machine to the present apparatus where it is drawn in at the nip between the heating drum **1** and the first pressing roll **2**, where it is subjected to a first pressing to compact the fibers, and to heating in contact with the polished surface of the heating drum. The web travels around on the surface of the rotating heating drum to and through the nip between the heating drum and the second pressing roll **3**, by which time the thermoplastic fibers will all have been softened sufficiently to insure proper interbonding. During the travel interval between the nips, the web is thus subjected to heating under slight tension but without being pressed. This arrangement holds the web in smooth contact with the heating drum surface and prevents wrinkling or distortion during the forming of the tissue product.

The drawing shows an arrangement by which the carded web is simultaneously laminated to a previously formed single ply tissue to form a tissue product of double thickness and ream weight (two ply). A roll of previously made single ply tissue **5** is mounted on a freely turning mandrel **6** mounted above and to the back of the heating drum. This tissue is drawn forward and passes down around the freely turning guide roll **7**, which is located directly above the first pressing roll **2**, and then passes vertically downward to and around the roll **2** and enters the nip in contact with the underlying carded fiber web **4**, and travels in contact with the latter. The heating and pressing results in the bottom thermoplastic fibers of tissue **5** interbonding with the top fibers of the carded web **4**, so that the two sheets become laminated together into an integral two-ply tissue. This process can be repeated by using the two-ply tissue to form a three-ply tissue paper by lamination to a fresh carded fiber web, and so on. In this way a relatively thick tissue can be built up. This procedure has the advantage that only a thin carded fiber web is subjected to the initial operation of interbonding the fibers in forming it into a unified tissue, thus gaining the benefit of a more uniform temperature and pressure throughout its thickness during this step. The previously formed tissue is subjected to a desirably lower temperature due to the insulating action of the fiber web which separates it from the heating drum. However, a tissue of several plies thickness can be directly made by feeding in several carded fiber webs at once.

When making a single ply tissue, or when directly forming a multi-ply tissue, the feeding in of a previously formed tissue (as shown in the drawing) will of course be omitted.

The bonded web in heated condition, having passed through the nip of the second pressing roll 3, is drawn up and around the latter roll and is thus separated from the surface of the heating drum. It then passes to and around a freely-turning wood guide roll 8, located above and forwardly of the pressing roll. It then is drawn back to and between the nip of a pair of steel pull rolls 9 and 10, which are driven in synchronism with the rotating heating drum by means of a chain drive (not shown) connected to the motor which drives the heating drum. The upper roll 9 is surfaced with heavy paper so as to exert greater traction on the web. These pull rolls draw the web under tension from the second pressing roll, which results in holding it smooth while cooling down. The fully formed tissue product then goes to the wind-up roll 11 where it is wound on a core. The wind-up roll is driven by the rotating pull rolls through a slip-belt drive (not shown) which keeps it rotating at the correct speed as the tissue is wound up.

Stripping of the bonded web from the heating drum is facilitated by the air-jet 12, which is a horizontal tube having a slit orifice and is located behind the nip between the second pressing roll 3 and the heating drum 1, so as to direct a jet of compressed air toward the nip.

The temperature of the heating drum to be employed will depend on the softening temperature of the thermoplastic fibers of the web, and should be high enough to cause the desired interbonding with the use of only a light pressing action, but not so high as to melt or flatten out these fibers at their crossing points or to cause the non-thermoplastic fibers (if present) to cut into the thermoplastic fibers. In the case of the preferred tissue embodiment, previously described, comprised of plasticized cellulose acetate fibers and viscose fibers, it has been found in practice that the surface temperature of the heating drum should be in the range of about 340–390° F.

The foregoing apparatus has been operated successfully at a speed such that the periphery of the heating drum, and the web, move at a rate of 55 feet per minute, thus producing the tissue product at the rate of 1100 yards per hour in a web 26 inches wide. The rolls of tissue sheeting can be trimmed in a slitting machine to produce finished sheeting having a uniform width of 24 inches, which may be furnished to the trade in rolls of any desired length. This tissue web can be dyed for producing a colored tissue. The tissue web may be converted by slitting into sheeting of narrower width, or may be cut into sheets of desired size.

The size of the decorative flecks may vary considerably, and when formed by the carding procedure heretofore described, will depend in part upon the type of fleck-forming sheet material employed. The latter should be disintegratable by the carding teeth, but should not be friable or brittle. I have found that aluminum foil, of say 1.5 mils thickness, results in very attractive flecks. These have an irregular outline and differ greatly in shape so as to produce a pleasing variety, varying from about $\frac{1}{16}$ inch in longest dimension to about ¼ inch. A hard-finished aluminum foil results in flecks which have a relatively flat surface. A soft-finished foil produces flecks which are flat but have a somewhat crinkled surface.

A very attractive flecking is produced by employing as the fleck-forming sheeting a tissue of the same type as the product (except for flecking), which has been previously made as described in connection with Fig. 1, having dyed fibers. Thus a single ply tissue formed of green-dyed fibers can be introduced into the carding machine along with non-dyed free fibers, to result in a white tissue containing green fleck areas. Or two or more differently colored tissues can be introduced to result in flecks of differing color (for example, green and red results in an attractive wrapping tissue for Christmas gifts). This type of fleck-forming tissue, being formed of a carded web of long fibers mainly running in the same general direction, tends to be disintegrated into irregular flecks which are relatively long and narrow (for example, about ½ to ¾ inch in length and about $\frac{1}{16}$ inch wide). These become bent and curved in being carded into the tissue web and result in a great variety of flecks, producing an interesting variegated appearance. Foil flecks can be also introduced to still further increase the variegated effect. These tissue flecks become autogeneously interbonded with the body fibers of the tissue, since both sets of fibers include thermoplastic fibers.

In the case of multi-ply tissue sheeting, one of the plies may contain decorative flecks and the remainder need not. Owing to the translucency of each tissue ply, the decorative effect of the flecks will be modified, but not lost, when a flecked ply is covered by a non-flecked ply. Two or more plies which are each flecked in different manners may be combined to form a multi-ply tissue having a novel appearance.

The translucency of the tissue is indicated by the fact that a three-ply tissue of uncolored fibers, having a ream weight of about 30 pounds, can be placed over a typewritten page and the writing can be read without difficulty. The ream weight should not exceed 60 pounds; and a ream weight not exceeding 30 pounds is sufficient and is preferable for most decorative uses of the tissue, and for package wrapping tissues. For general gift wrapping purposes, a two-ply tissue having a ream weight of about 20 pounds is most suitable; although effective use can be made of sheets of single ply tissues, especially when backed by a sheet of regular tissue paper or other wrapping paper.

Attractive tying ribbons for gift packages can be made by slitting two-ply flecked tissue sheeting into narrow widths and winding into rolls of desired length.

The decorative tissue sheeting has proved highly effective for use in decorating store windows and show cases, due to its unusual and attractive appearance, draping qualities, resiliency, and resistance to wrinkling and creasing. These properties are not adversely affected by the flecks. Another use is in making greeting cards. A further use is in decorating women's hats.

Having described various embodiments of my invention, for purposes of illustration rather than limitation, what I claim is as follows:

1. In the making of decorative tissue sheeting, the step of simultaneously carding a combination of free textile fibers, having a length of at least approximately one inch, and decorative fleck-forming sheet material, thereby producing scattered decorative flecks within a single carded fiber web.

2. In a method of making decorative tissue sheeting, the steps of carding together a mixture of decorative fleck-forming sheet material with a mixture of free thermoplastic staple cellulose acetate fibers and staple viscose fibers, said fibers having a length of at least approximately one inch and the proportion of cellulose acetate fibers ranging from about one-half to about 70% of the fiber mixture, thereby forming a carded lamina containing decorative flecks distributed within the body of a fiber mesh of interlaced fibers, and thereafter heating and soft-pressing the carded lamina to compact the fibers and autogeneously interbond the cellulose acetate fibers at their crossing points without loss of continuity, no

extraneous binder or adhesive material being employed, thereby unifying the fiber mesh and imprisoning the intralaminated flecks, said flecks being visible through the overlying fibers.

3. The method of claim 2 wherein fleck-forming metal foil is employed and is disintegrated by the fiber-carding operation to form decorative foil-flecks distributed within the carded fiber lamina.

4. The method of claim 2 wherein fleck-forming tissue sheeting is employed and is disintegrated by the fiber-carding operation to form decorative tissue-flecks distributed within the carded fiber lamina, said tissue sheeting including thermoplastic staple cellulose acetate fibers adapted to autogeneously interbond with the other cellulose acetate fibers of the carded lamina when the latter is subjected to heating and soft-pressing.

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