

Nov. 28, 1961

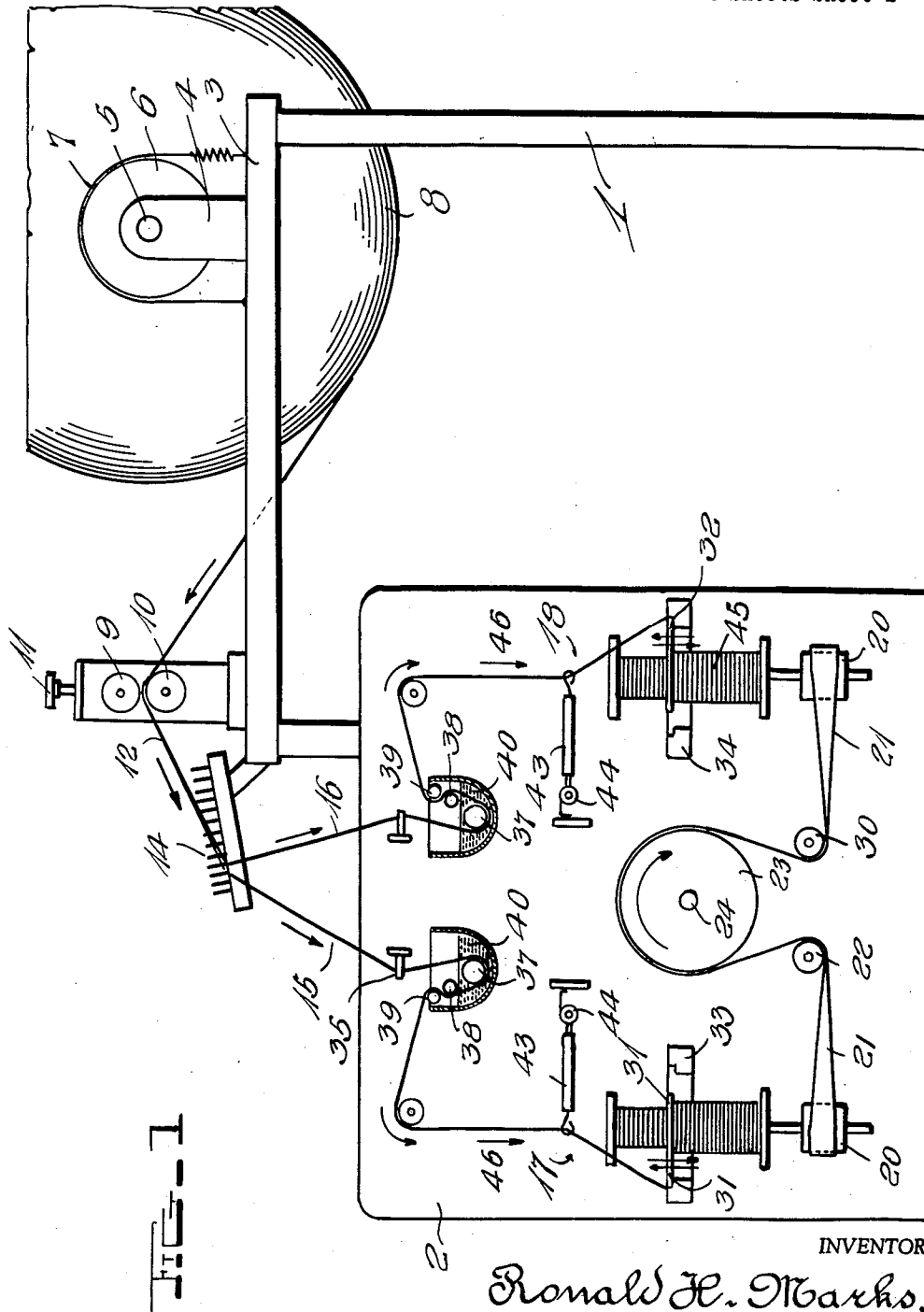
R. H. MARKS

3,010,181

METHOD OF PRODUCING KNITTED YARDAGE

Filed April 15, 1958

4 Sheets-Sheet 1



BY

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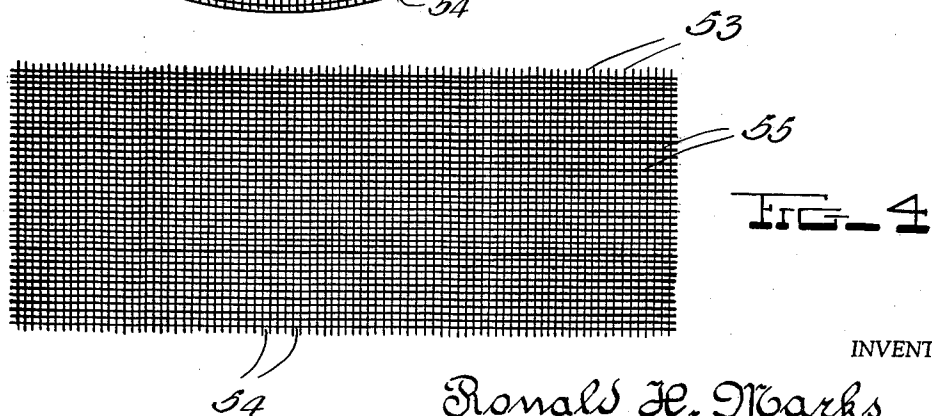
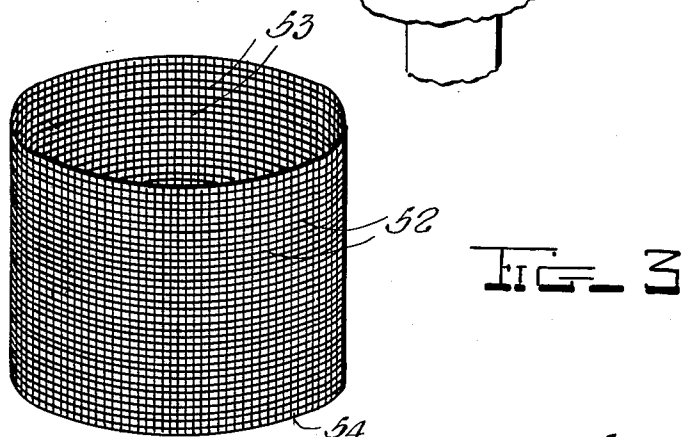
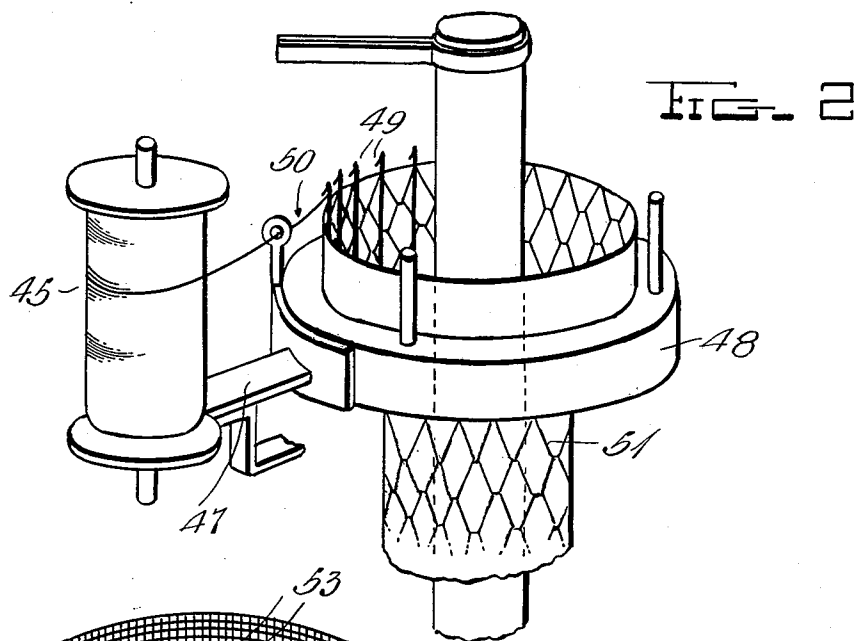
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METHOD OF PRODUCING KNITTED YARDAGE

Filed April 15, 1958

4 Sheets-Sheet 2



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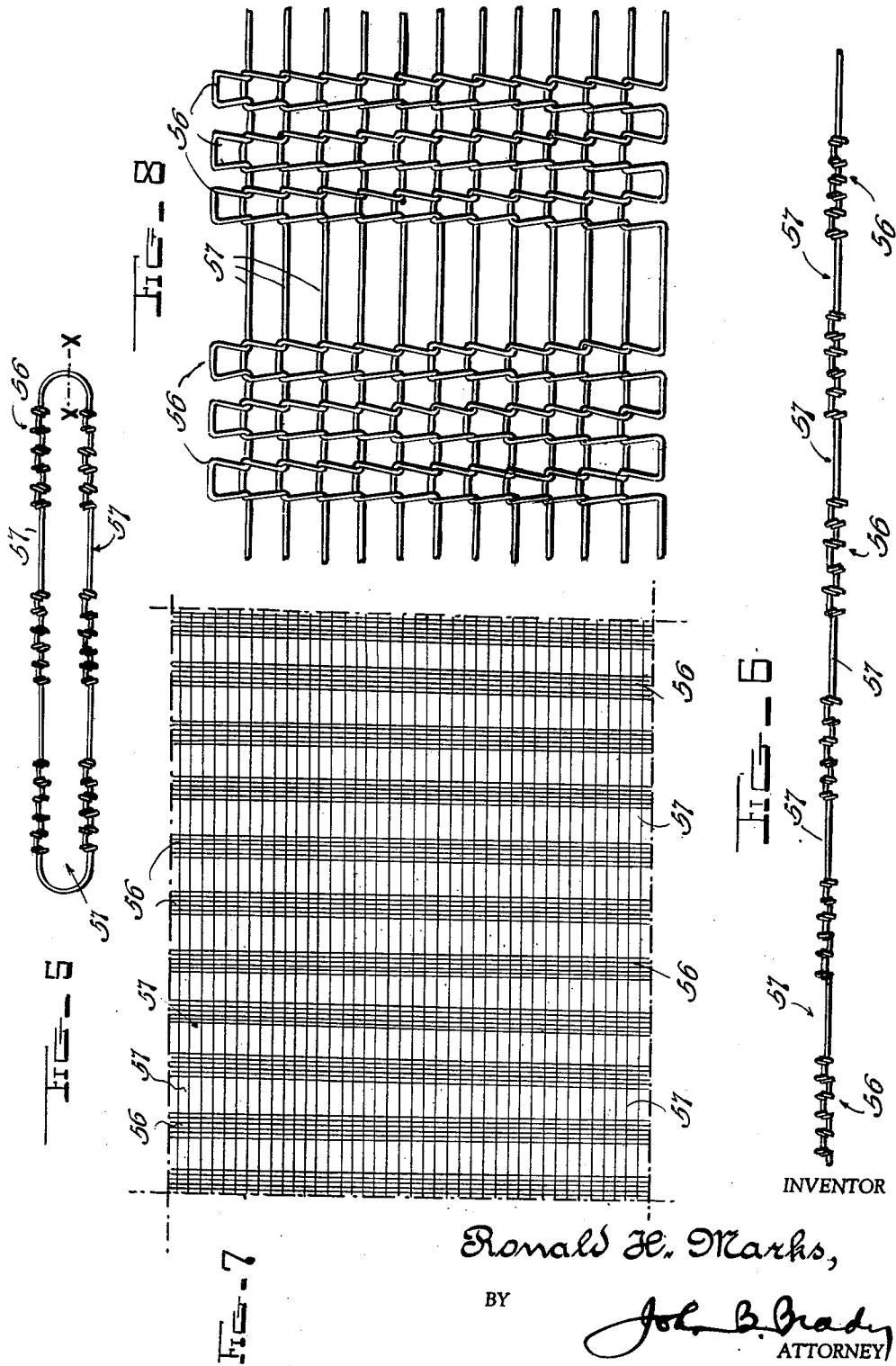
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METHOD OF PRODUCING KNITTED YARDAGE

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4 Sheets-Sheet 3



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3,010,181

METHOD OF PRODUCING KNITTED YARDAGE

Filed April 15, 1958

4 Sheets-Sheet 4

FIG. 11

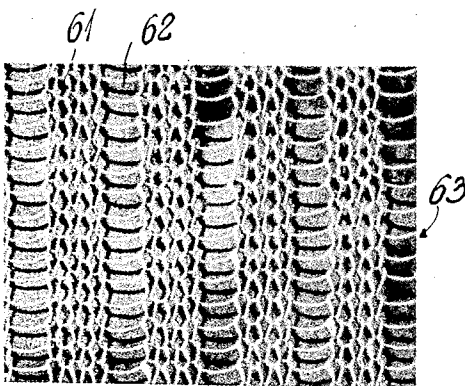


FIG. 12

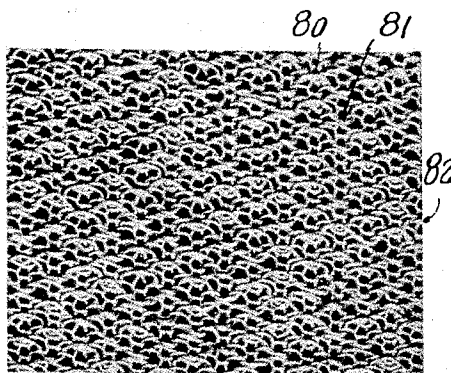
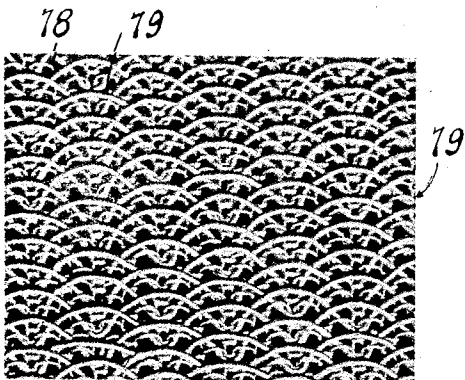
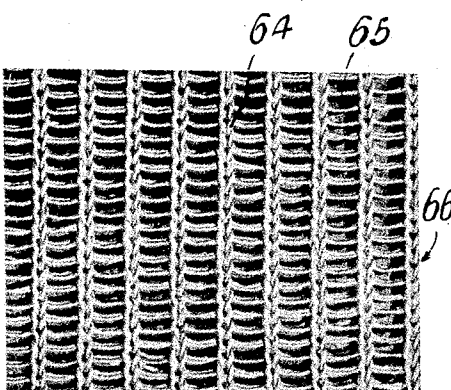


FIG. 13

83

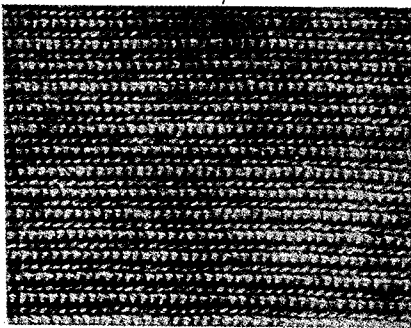


FIG. 14

FIG. 9

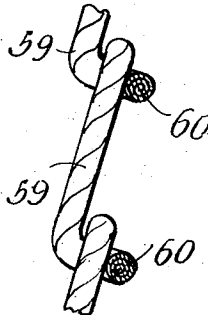
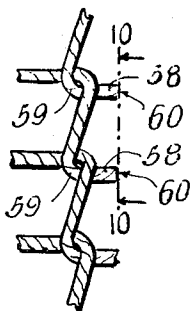


FIG. 15

FIG. 10

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3,010,181

METHOD OF PRODUCING KNITTED YARDAGE

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Filed Apr. 15, 1958, Ser. No. 728,687
8 Claims. (Cl. 28—76)

My invention relates broadly to a process of knitting paper yarn into a knitted paper product and a novel construction of knitted paper product and more particularly to a process and construction of knitted paper product in which paper yarn is knitted while moist and used when dry.

This application is a continuation-in-part of my application Serial Number 542,078, filed October 21, 1955, for Knitted Paper Yardage Formed from Seamless Circular Tubular Knitted Paper Product and Method of Producing the Same.

I have discovered that paper, when properly formed into strands and knitted while moist, results in a paper product having qualities which are wholly unexpected so far as paper is concerned. Paper sheet material normally tears relatively easily and tends to disintegrate when subjected to moisture. However, by use of the method of my invention, a knitted paper product is produced by knitting which has superior properties and qualities that are distinctly different from the properties and qualities of the original paper from which the product of my invention is formed.

One of the objects of my invention is to provide a method of producing a knitted paper product by knitting paper strands in a moist condition into a knitted paper product which is subsequently dried for use in various applications.

Another object of my invention is to provide a method of forming a circular paper structure of tubular seamless mesh in which each elemental sector of the paper material is formed by knitted paper strands dependent on adjacent elemental sectors for formation of the whole circular structure and in which the knitted paper structure is cut, slit, or stamped into yardage patterns of self-sustaining paper materials and thereafter dried, resulting in an economical non-woven, soft and pliable paper knit material having numerous utilitarian applications.

Still another object of my invention is to provide a method of converting roll sheet paper into a strong knitted paper assembly in which the paper from a relatively wide web is initially slitted into strips while dry, subjected to the addition of moisture, and spindled while centrifugally ridding the paper after twisting before spindling to excessive moisture and knitting the twisted paper yarn while moist to produce self-sustaining knitted paper yardage.

Still another object of my invention is to provide a method of knitting twisted paper strands of a diametrical size of the range of .010 mm. to .14 mm. while moist into a seamless, circular, tubular assembly possessing the property that, when slit longitudinally, the structure of the entire assembly remains completely intact.

A further object of my invention is to provide a method of knitting twisted paper strands while in a moist condition into a knitted paper product which is subsequently dried to produce a construction of paper product in which the ends of the dried strands, when severed, are substantially untearable or non-raveling due to the nature of the paper yarn itself.

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Other and further objects of my invention reside in a method and structure of knitted paper product by which relatively stiff strands of paper yarn are rendered soft and pliable and knitted while in such soft and pliable condition and subsequently dried in the knitted stage, producing a knitted paper product somewhat stiffer than the character of the yarn in the process of knitting but possessing properties of considerably greater strength than the original paper yarn all as set forth more fully in the specification hereinafter following by reference to the accompanying drawings, in which:

FIG. 1 is a schematic view of the method of my invention for producing twisted paper yarn and showing the centrifugal method which I employ for ridding the yarn of excess moisture which is applied thereto in the course of the twisting process;

FIG. 2 is a fragmentary perspective view of one method of knitting the moist yarn produced in accordance with the process delineated in FIG. 1 into a seamless, circular, tubular assembly possessing the superior properties heretofore mentioned over the characteristics of the original web of roll paper schematically shown in FIG. 1;

FIG. 3 schematically illustrates the knitted, seamless, tubular paper assembly knitted from paper yarn according to the method schematically shown in FIG. 2;

FIG. 4 is a view illustrating the knitted paper assembly after it has been slit from the knitted tubular assembly of FIG. 3 and illustrating the single thickness knitted paper assembly constituting the paper yardage of my invention;

FIG. 5 is a schematic sectional view of a transverse element of a typical knitted paper seamless, circular, tubular product formed according to a particular pattern;

FIG. 6 is a view of the knitted paper assembly of FIG. 5 slitted longitudinally to produce a single thickness knitted paper assembly according to the pattern of FIG. 5;

FIG. 7 is a schematic view of an area of yardage cut from a tubular knitted product to provide a single thickness knitted paper product according to the pattern shown in FIGS. 5 and 6;

FIG. 8 is an enlarged view of the paper yardage illustrated in FIGS. 5-7, showing the manner in which the paper strands are knitted to provide a self-sustaining paper product;

FIG. 9 is a fragmentary enlarged plan view of the knitted paper product of my invention in which the knitted strands have been shown in separated relation sufficiently to illustrate the self-sustaining character of the paper yardage where the twisted surface of one paper strand interlocks with the twisted surface of an adjacent paper strand, thus providing a strong, durable, knitted paper product;

FIG. 10 is a fragmentary, vertical sectional view on line 10-10 of FIG. 9 and showing particularly the character of the twisted paper strands when dry, where, by reason of the nature of the paper yarn itself, the ends of the strands are substantially untearable or non-raveling for all practical purposes.

FIG. 11 is a plan view of a fragmentary portion of a single thickness paper mesh material knitted in a special pattern in accordance with my invention;

FIG. 12 is a fragmentary view of paper yardage embodying my invention where the paper is knit in a different pattern;

FIG. 13 illustrates a fragmentary portion of paper yardage knit in accordance with my invention in a still different pattern;

FIG. 14 shows, in plan view, paper yardage embodying my invention, but knit in a still further pattern; and

FIG. 15 is a plan view of a fragmentary portion of knitted paper yardage embodying my invention but knitted in a still further modified pattern.

The knitted paper yardage of my invention is formed from individual strips of paper twisted to provide high tensile strength. I produce this high tensile strength paper yarn according to the process explained more fully in my co-pending application entitled High Speed Continuous Process and Apparatus for the Slitting, Twisting and Spindling of Paper Into Yarn, Serial No. 727,559, filed April 10, 1958, now Patent No. 2,955,408. Briefly, I utilize a rolled web of sheet paper having a basis weight range of 7½ pounds to 90 pounds where the roll has a diameter of approximately 40" and a width of approximately 12", and weighs approximately 400 pounds. This roll of web material is delivered dry to the processing equipment and is slitted into strips of approximately ⅜" in width while dry, and is drawn through a separating means to a means for applying moisture to the strips. The strips directly connect to the ring-type twisters and to spindles by which the strips are individually twisted while subjected to the application of a treatment liquid. The twisted moist strips are coiled upon individual spindles which, by virtue of their rotation at high speed, centrifugally, throw off moisture from the twisted strips. The twisted strips, however, retain sufficient moisture to render the strips soft and pliable as yarn. This yarn, while in its moist condition, is knitted into a seamless, circular, tubular assembly which is removed from the knitting machine in a moist condition and subsequently slitted end-to-end to produce a single thickness knitted paper product. This product is then dried and may be utilized as yardage for a variety of applications. The dimensions herein have been given by way of example as the individual strips which form the paper yarn may have a width of the order of ⅜" to 1" in producing a paper yarn having a diametrical size of the range of .010 mm. to .14 mm. The knitted paper yardage possesses the properties of weight, strength, stretch, and utilitarian use which is greater than the same properties of the original paper roll sheet or web from which the knitted paper yardage is formed. For example, a .05 mm. paper yarn formed in accordance with my invention may have a tensile strength of 5½ pounds and may vary over a range of 5½ to 10 or 12 pounds. When this twisted paper yarn is knitted into a paper assembly from the yardage of my invention is produced, the tensile strength of the resulting single thickness knitted paper product is far in excess of the tensile strength of the original paper yarn.

Referring to the drawings in more detail, reference character 1 designates the frame of the machine on which the paper yarn of my invention is produced and wherein there is a supplemental frame structure 2 carrying spindles and the drive mechanism therefor. The frame 1 includes a platform 3 having a pair of spaced standards for mounting a horizontal shaft on which the roll of sheet paper web material is mounted. The standards are shown at 4, journaling a shaft 5, which carries a paper centering device 6 and a tensioning device 7 for controlling the uniform rotation of shaft 5 in a clockwise direction when looking at the end of the shaft shown in FIG. 1. The centering device 6 provides a mounting means for the roll of paper web material 8. This roll of paper is relatively dry just as it is received from the mill in a relatively dry state and moisture is not added to the web of paper. This dry web of paper is pulled through a series of spaced adjustable knives represented at 9 and 10 which are adjustable in overlapping relation by operation of adjusting means 11 by which the dry web of paper is severed into strips designated at 12. These strips, having a

width of approximately ⅜" in the example heretofore given, may total as many as 64 strands where the width of the web is of the order of 12". The strips are spread through a comb represented at 14, from which some of the strips are directed forwardly as shown at 15 and others of the strips are directed rearwardly as represented at 16. The strips are not engaged by feed rollers but simply pass over guide rollers and receive their propulsion force from the ring travelers and the spindles shown generally at 17 and 18. These spindles are mounted on vertical shafts which carry drive pulleys thereon designated at 20. A main drive shaft 24 drives the drum 23 over which drive belt 21 operates and is directed around guide rollers 22 and 30 to engage the drive pulleys 20 on the spindle shafts. A group of these spindles may be driven simultaneously and the view indicated herein is to be considered in the illustrative sense. The spindles include winding bobbins designated at 45 which coact with ring travelers indicated at 31 and 32 which revolve around the raceways indicated at 33 and 34. The spindles revolve at high speed, and the up and down action of the ring raceways is a determining factor in the speed of laying the twisted paper yarn on the spindles in even and symmetrical layers. The twisting of the paper yarn is accomplished by the rotation of the ring travelers 31 and 32.

The path of the paper strips designated at 15 and 16 to the ring travelers and the spindles is completed through similar components which I have designated by similar reference characters and only one set of these will be traced. For example, the dry strip of paper 15 passes through a loop guide 35 and into trough 36 in which there are three longitudinally extending spaced stationary rods which I have indicated at 37, 38, and 39. The trough 36 contains treatment fluid 40, such as water or other wetting agent. The round rod 37 is located below the liquid level while the round rods 38 and 39 are located above the surface of the liquid level. The dry strip 15 passes into the wetting agent around the stationary rod 37 and is threaded upwardly between the spaced rods 38 and 39 located above the liquid level. The paper strip, now moistened, is passed over the rod or roller 41 which is positively driven in a counter clockwise direction and assists in moving the paper strip toward the ring twister. The paper strip is guided into the assembly 17 by means of the looped guide 42 mounted on the hinged plate 43 hinged at 44 to permit the plate 43 to move up and down through a vertical path according to the movement of the ring traveler 31 and raceway 33 up and down the associated spindle 45, so that when guide 42 is in the extreme up position, the raceway 33 is also in the extreme upward position and with the raceway 33 in the extreme down position the guide 42 also moves to the extreme downward position. The hinge mounting 44 operates both upwardly and downwardly. The ring twister assembly 17 operates to impart the twisting movement to the strip 15 for twisting the strip into yarn in its moist condition between the fix established by the roller 41 and the ring twister 31. The moisture imparted to the strip 15 by the wetting agent 40 is effective to allow the paper strip between the roller 41 and the revolving traveler 31 to receive a relatively tight twist forming paper yarn at the same time that the yarn is being pulled in the direction indicated by arrows 46. The tensile strength of the paper strip is increased by the twisting within the area extending from roller 41 to the ring traveler 31 which compensates for the possible decrease in tensile strength established by the wetting. Thus the ability of the filament of paper yarn to transmit a pulling force from the revolving spindle and ring twister assembly 17 to the dry roll or web of paper 8 is not impaired as the moving strip 15 is dry and the portion of the yarn below roller 41 and above ring traveler 31, even though moistened, is twisted and effectively increases the tensile strength of the filament of twisted paper so far as the abil-

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ity of the strand to transmit a pulling force to the web of the paper roll 8 is concerned.

The winding bobbin 45 of the spindle assembly on the paper yarn machine of FIG. 1 is transferred to the circular knitting machine schematically shown in FIG. 2, where the bobbin 45 is mounted on a bracket 47 supported on the circular knitting machine represented at 48. The circular knitting machine 48 is provided with a needle mechanism designated at 49 which operates to knit the paper yarn in its moist, nascent state, delivered by winding bobbin 45, which is not permitted to dry. In the process of forming the yarn, the collecting spindles are driven at a high rate of speed sufficient to centrifugally rid the twisted yarn of excessive moisture, but insufficient to dry the twisted yarn. It is this damp, moist yarn which is supplied to the knitting machine 48, and by virtue of the soft and pliable character of the paper yarn shown at 50, the needle mechanism 49, is enabled to knit the twisted strands of moist paper into the seamless, circular, tubular paper product represented at 51, which is drawn downwardly through the knitting machine. It is, of course, evident that even though in a moist condition rendering it sufficiently flexible to readily move through the knitting machine, the yarn has adequate tensile strength to assure its relatively rapid passage through the knitting operation without undue breakage or separation. The seamless, tubular paper product formed by the knitting operation may be periodically cut to provide the seamless tubular knitted assembly 52 shown in FIG. 3 consisting of substantially vertically extending twisted paper filaments 53 knitted with respect to substantially laterally extending twisted paper filaments 54. This tubular, seamless, circular paper assembly is longitudinally slitted to provide the paper product shown in FIG. 4 at 55. This single thickness knitted paper assembly is allowed to dry and constitutes the paper yardage of my invention capable of numerous applications.

In FIG. 5 I have illustrated an enlarged transverse sectional view of a seamless, circular paper assembly of a particular pattern in which groups of rows of paper yarn are knitted in a predetermined pattern provided by the closely knit rows of paper yarn shown at 56 separated by spaced sectors of paper yarn represented at 57. When this tubular assembly is removed from the knitting machine in a moist condition, the tubular assembly is slitted along the line X—X to produce the flat, single thickness knitted paper yardage shown in FIG. 6. The overall appearance of the knitted paper yardage according to the pattern in FIG. 5, is shown generally in FIG. 7, constituted by spaced rows of vertically knit yarn 56 with spaces 57 therebetween.

FIG. 8 is an enlargement of a fragmentary portion of the knitted yardage shown in FIGS. 5-7 from which it will be more clearly understood that the pattern formed into the yardage consists of groups of vertical rows of knitted paper zones 56 separated by the spaced portions shown at 57.

In FIG. 9 I have shown a magnified fragmentary view of a modified form of knit paper assembly where the transversely extending strands of paper yarn shown at 58 project from the paper assembly 59 and terminate in raw ends 60 that are substantially non-tearing or non-raveling due to the nature of the paper yarn itself. In the vertical sectional view shown in FIG. 10 taken on line 10—10 of FIG. 9 I have shown in more detail how the raw cut ends of the knit paper are self-sustaining or non-tearable or non-raveling due to the nature of the paper yarn itself. In both FIGS. 9 and 10 the character of the twisted paper filaments has been more clearly brought out in that the twisted surface of each filament is spiralled and the external spirals of one filament interlock with the external spirals of an adjacent filament. Inasmuch as these spiralled surface interlocks exist in the coating paper strands as they are knitted when wet, these interlocking spirals dry out as positive interlocks when the filaments

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become dry, thereby insuring a strong, durable knitted paper product. The attributes of strength grow out of the discovery I have made that practical results are obtained in a knitted paper assembly when the twisted paper yarn formed according to the method of FIG. 1 is employed in the nascent state in the knitting machine of FIG. 2 while the yarn is substantially wet, in which condition the surface of the paper constituting the paper yarn may be shaped and formed under the tension developed by the stretching of the yarn in the knitting operation of FIG. 2 to insure a strong, reliable knitted paper assembly when the damp or moist knitted strands are dehydrated.

By adjustment of the needle mechanism illustrated at 49 in FIG. 2, I may produce knitted paper assemblies of various designs. In FIG. 11, for example, I have shown a knitted paper assembly consisting of five longitudinally extending rows of knitted loops of paper yarn shown at 61 interconnected by transversely extending strands of paper yarn shown at 62. When strands 62 are severed longitudinally, as represented at 63, the ends of these strands are self-sustaining due to the nature of the paper yarn itself.

In FIG. 12 I have shown an other modified knitted paper assembly consisting of tightly knitted longitudinally extending rows of paper yarn shown at 64 interconnected by transversely extending paper yarn strands shown at 65. When this assembly is slit longitudinally along the edge 66, for example, the edge presented by the strands is self-sustaining due to the nature of the yarn itself.

FIG. 13 depicts a further modified form of paper assembly embodying my invention in which a pattern consisting of knitted paper filaments formed in substantially semicircular loops of paper strands indicated at 67 are provided and interconnected by loops of paper strands indicated generally at 78. These strands, when severed along the edge 79, for example, are self-sustaining due to the nature of the paper yarn itself.

In FIG. 14 I have shown still another knitted paper assembly embodying my invention in which semicircular loops of paper strands are indicated at 80 formed on radii substantially less than the radii on which the loops 77 in FIG. 13 are formed. These smaller loops 80 in FIG. 14 are interconnected by longitudinally extending loops 81 by adjustment of the needle mechanism 49 in FIG. 2 at the time of knitting the assembly of paper strands. When the assembly shown in FIG. 14 is longitudinally slitted, the transverse severed ends of the loops represented at 82 are self-sustaining due to the nature of the paper yarn itself.

In FIG. 15 I have illustrated another pattern formed from knitted paper where the knitted paper strands are more tightly knitted than in the previously described forms of my invention as shown at 83. When the knitted assembly 83 is severed longitudinally along the edge 84, the cut ends of the strands are self-sustaining due to the nature of the paper yarn itself.

Various other patterns may be produced for paper assemblies by adjustment of the needle mechanism 49 in the knitting process depicted in FIG. 2.

I have used the expression "self-sustaining" throughout the specification and claims to clearly explain the non-raveling or non-tearable characteristics of the paper yarn used in the knitted assembly constituting the yardage of my invention. I have used the terms "non-raveling" and "non-tearable" herein as meaning substantially non-raveling and substantially non-tearable for all practical purposes, as the knitted assembly of my invention is extremely tough and strong and, when severed, the edge thereof remains clean and substantially smooth for long periods of time.

The paper yarn, when knitted into a paper assembly, results in a product having qualities that are unexpected in so far as paper is concerned. It is most unusual and unexpected to find that the knitted paper assembly of my invention can be washed and otherwise treated. Any

attempt at washing or fluid treating the original roll sheet of paper web material could only result in rapid deterioration and dissolution of the paper, whereas, in applications of the knitted paper yardage of my invention to clothing, for example, I have found that the knitted paper material may be washed and cleaned for reuse many times. This, of course, could not be accomplished by use of the original sheet paper. The paper yardage of my invention may be readily folded and adhesively affixed and sewed to itself which adapts the material particularly in the manufacture of garments and clothing from paper. The properties of the paper material produced by knitting paper strands are strikingly different from those which would normally be expected through the use of paper.

The knitted paper product of my invention has a variety of uses certain of which I mention herein as follows:

- (1) A decorative fabric from which curtains or draperies are made;
- (2) As a backing for rugs particularly tufted rugs;
- (3) As a reinforcement or backing for rubber or plastics;
- (4) In the manufacture of wearing apparel, such as hats, blouses, skirts, dresses, underwear (after a softening process hereinafter described in detail), T-shirts and other clothing, and ornamental covering for handbags and purses;
- (5) As a tobacco cloth for shading the tobacco in the growing of shade tobacco;
- (6) In the construction of fish nets;
- (7) As a seat-cover material for automobiles and other vehicles;
- (8) As an upholstery tubing in the manufacture of furniture for maintaining the position of wadding material in furniture seats, sides, arms, and backs;
- (9) As a wadding material for preventing loss of drilling and through crevices and fractures in the earth strata;
- (10) As a backing for asphalt for roofing and road-building and as part of a lamination structure where the asphalt clings to the knitted paper yardage of my invention forming a bond therewith;
- (11) As a wrapping material for general merchandise;
- (12) In a bonding construction as a bonding surface for plaster and cement in the making of partitions and walls;
- (13) A material for sleeping bags;
- (14) As an enclosure or bag for dirt or sand for building dikes and protective barriers;
- (15) For hammocks and tennis nets.

Other applications of the yardage of my invention will suggest themselves after a consideration of the foregoing examples.

While I have described my invention in certain of its preferred embodiments, I realize that modifications may be made and I desire that it be understood that no limitations upon my invention are intended other than may be imposed by the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States, is as follows:

1. The continuous method of forming paper yardage which consists in, splitting a paper sheet into strips, adding moisture to each of said strips to render the strips amenable to twisting while maintaining the strips in integral connection with the paper sheet, twisting the strips while moist and also while maintaining said strips in integral connection with said paper sheet to form yarn, the finished yarn containing sufficient moisture from the moisture adding step to render the yarn sufficiently flexible for knitting, and thereafter feeding said yarn while still in such condition to a knitting machine to form a paper mesh yardage.

2. The continuous method of forming paper yardage which consists in, splitting a paper sheet into strips, adding moisture to each of said strips to render the strips amenable to twisting while maintaining the strips in in-

tegral connection with the paper sheet, twisting the strips while moist and also while maintaining said strips in integral connection with said paper sheet to form yarn, the finished yarn containing sufficient moisture from the moisture adding step to render the yarn sufficiently flexible for knitting on a circular knitting machine, feeding said yarn while still in such condition to a circular knitting machine to form a seamless tubular product and finally slitting said tubular product longitudinally to convert said tubular product into a flat sheet of paper yardage.

3. The continuous method of forming fabric from a web material having an inherent stiffness when dry and also having a relatively low tensile strength when moistened, said method consisting of, rotatably mounting a roll of said web material, slitting said web material into a plurality of strips, connecting the extremity of each strip to a spindle so that the sole connections between the spindles and the roll of web material are the strips, whereby operation of the spindles pulls the material from the roll, applying moisture to each strip at a predetermined area in the path of travel of the strip, twisting each strip to form yarn immediately following the moistening of the strip whereby said twisting imparts tensile strength to the strip and compensates for loss of tensile strength due to moistening, and then knitting said twisted yarn into a fabric while said yarn is still moist from the aforesaid moistening step to assure that said yarn has sufficient flexibility to facilitate knitting thereof.

4. The continuous method of forming fabric from a web material having an inherent stiffness when dry and also having a relatively low tensile strength when moistened, said method consisting of, rotatably mounting a roll of said web material, slitting said web material into a plurality of strips, connecting the extremity of each strip to a spindle, passing each strip through a moistening zone which is disposed along a predetermined area of the path of travel of the strip to apply moisture to said strip, thereafter twisting each strip to form yarn immediately following the moistening of the yarn whereby said twisting imparts tensile strength to the yarn and compensates for loss of tensile strength due to moistening, and then knitting said twisted yarn into a fabric while said yarn is still moist from the aforesaid moistening step to assure that said yarn has sufficient flexibility to facilitate knitting thereof.

5. The method set forth in claim 1, wherein the yarn is knitted into a tubular form, and then slitting the tubular knit material longitudinally to convert the tubular knit material into a flat section of fabric.

6. The continuous method of forming fabric from a paper sheet, said method consisting of, rotatably mounting a roll of said paper sheet, slitting said paper sheet into a plurality of strips, connecting the extremity of each strip to a spindle so that the sole connections between the spindles and the roll of paper sheet are the strips, whereby operation of the spindles pulls the paper from the roll, applying moisture to each paper strip at a predetermined area in the path of travel of said strip, twisting each paper strip to form yarn immediately following the moistening of the strip whereby said twisting imparts tensile strength to the strip and compensates for loss of tensile strength due to moistening, winding said paper yarn upon the spindles, and then drawing said yarn from the spindles and knitting said paper yarn into a fabric while said yarn is still moist from the aforesaid moistening step to assure that said paper yarn has sufficient flexibility to facilitate knitting thereof.

7. The method set forth in claim 6 wherein the yarn is knitted into a seamless tubular product, and then slitting said tubular product longitudinally to convert the tubular product into a flat section of fabric.

8. The continuous method of forming paper yardage from a web of paper sheet material which consists in, slitting said paper sheet material into strips, immediately

thereafter adding moisture to each of said strips to render the strips amenable to a subsequent twisting step, thereafter twisting the strips while in their moistened condition to form yarn, the finished yarn containing sufficient moisture from the moisture-adding step to render the yarn sufficiently flexible for knitting, and thereafter feeding said yarn while still in such flexible condition to a knitting machine to form a paper mesh yardage.

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