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W. NANFELDT

YARN AND PROCESS OF MAKING THE SAME

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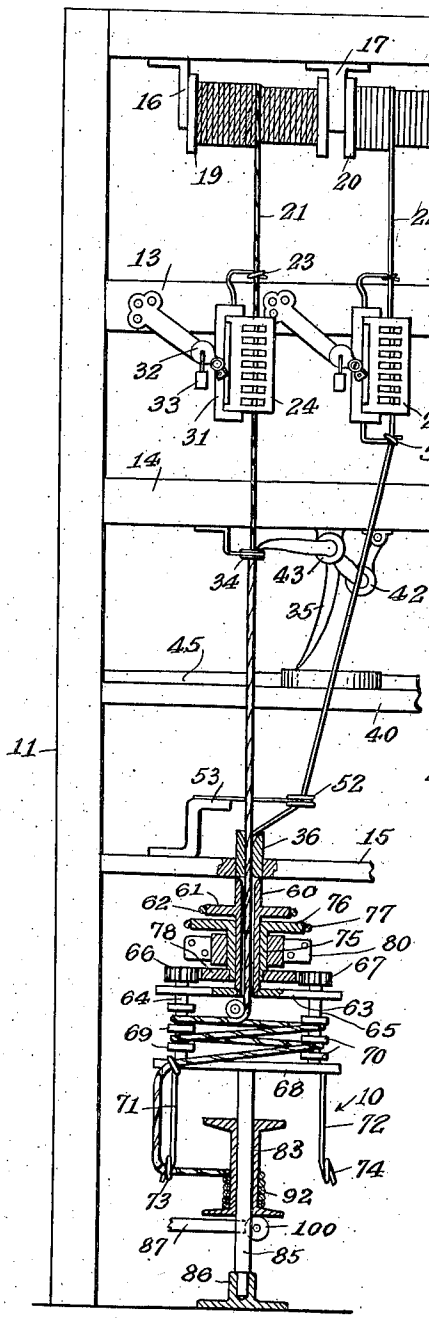


Fig. 1.

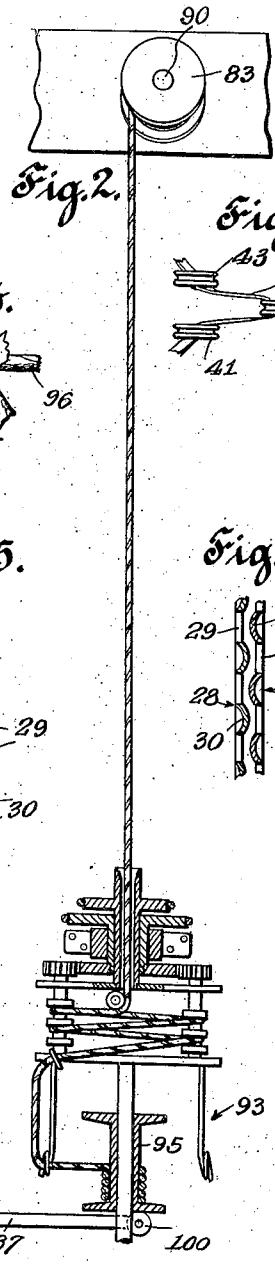


Fig. 2.

Fig. 3.

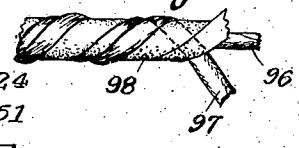


Fig. 4.

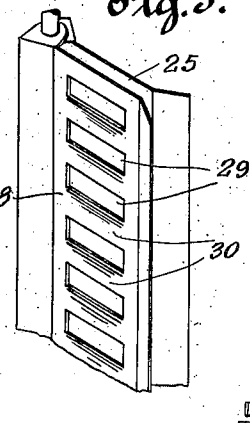


Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE.

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YARN AND PROCESS OF MAKING THE SAME.

Application filed April 17, 1925. Serial No. 23,777.

This invention relates to an improved yarn and process for making the same. The invention relates more specifically to a yarn having characteristic advantages for use in friction fabrics such as brake and transmission linings.

Stated in general terms, the invention consists in a new type of yarn in which jute or a vegetable fibre having similar properties is twisted about a twisted strand containing paper or asbestos material in the form of a paper strip and a core of cotton fibre. The invention consists also in a yarn making process in which the original jute strand is, in forming the completed yarn, partially untwisted during the twisting of the paper strip of asbestos.

In my co-pending application, filed April 6, 1925, Serial No. 21,087, I have described a yarn and a process and apparatus for making the same in which asbestos paper strip, or a paper-like strip or band of asbestos material bound together with sufficient cohesiveness and tenacity and adapted for yarn manufacture is twisted about a core of jute cord and subsequently a cord of cotton twisted with the asbestos and jute, thus forming a yarn in which asbestos, jute and cotton are combined in advantageous relationship to give a high degree of flexibility and resistance to frictional wear and the glazing action of heat and oils.

While useful in many ways, the yarn of the co-pending case is for some purposes deficient in elasticity and strength, especially when employed in certain types of friction fabrics and, moreover, it does not lend itself with highest efficiency to weaving operations.

An important object of the present invention consists in the provision of a yarn structure in which jute and asbestos are combined in a manner to give maximum elasticity. An object also is the provision of a yarn formed of twisted asbestos paper strip and vegetable fibre in which the vegetable fibre has a portion of its original twist. A further object also is to provide a yarn which has a sufficient degree of flexibility to permit weaving without rupture of the asbestos fibre strip forming a component part of the yarn. Various other objects of the invention relate to yarn structure having particular utility for friction fabrics and adapted to withstand wear in the presence of heat and oil; and to considerations relating to details of the process and product such as will appear on reference to the appended specification, and the accompanying drawings, in which—

Figure 1 is a view of a mechanism for supporting and feeding the yarn composing elements into the twisting mechanism;

Figure 2 is a view of an apparatus employed in a second step of the process of making the yarn;

Figure 3 is a detail showing the guides for the paper strip;

Figure 4 is a view of a section of the completed yarn;

Figure 5 is a detail of the feed resisting unit; and

Figure 6 is a part section of the feed resisting unit.

In the process of the present invention, I employ as component elements of the completed yarn structure, asbestos fibre in the form of paper strip and vegetable fibre in the form of strands of jute or cotton or of both jute and cotton or of other vegetable fibres having similar characteristics. The asbestos fibre is preferably agglomerated into paper strips, the mineral fibres being held together by a binder, such as starch. As a core element of the yarn, a cord or strand of cotton is employed which is adapted to be twisted with the paper strip and form a primary strand therewith about which subsequently a strand of vegetable fibre, such as jute, is twisted to form the preliminary yarn. For reasons as will appear hereafter, the cotton core has originally a suitable degree of twists to the left as fed into the twister mechanism and the jute or externally wound strand also has a suitable degree of twists to the left.

Referring to Figure 1 of the drawing, I have shown apparatus similar to that described in my co-ending application, filed April 6, 1925, Serial No. 21,087, for supporting spools of cotton and jute or similar yarn forming elements and additional means for guiding the movement of said yarn forming elements or strands into the twisting device 10. Fixed to the plurality of standards, one of which is numbered 11, as shown in the figure, are a plurality of cross beams or bars 12, 13, 14 and 15, from which

the various spools and guides are supported. Depending from the beam 12 are brackets 16, 17 and 18 intermediate which are placed the spools 19 and 20, the spool 19 carrying the cotton cord 21, and the spool 20 the jute cord 22.

The cotton cord is led downward through a pig tail guide 23 mounted on the cross beam 13, and a clamping device 24 through which the strand is led for the purpose of retarding the movement thereof and exerting a sufficient degree of tension thereon to maintain the same free of knots and undesirable twists. This clamping device consists of a fixed plate 25, shown in Figures 5 and 6, having a plurality of alternate horizontal slots 26 and ridges 27, and a pivoted plate 28 mounted in juxtaposition with fixed plate 25 and also having alternate horizontal slots 29 and ridges 30, the ridges 30 normally engaging the slots 26 of the fixed plate and the slots 29 engaging the ridges 27 of the fixed plate. The movable plate 28 is pivoted on the bracket 31 and is normally maintained yieldably in closed position relative to the fixed plate by means of a lever 32 pivoted on the bracket 31 and having one end contacting against the pivoted plate 28 and the other end beyond the pivot attached to the weight 33 whereby the lever tends to maintain the movable plate in closed position.

It is apparent that with the cord passing through the device intermediate the two plates that considerable frictional grip is placed thereon which tends to yieldably resist movement of the cord or strand 21 through the same.

Beyond the clamping device 24, the strand 21 is led through a circular porcelain guide 34 supported from the beam 14 at which point it is combined with the asbestos strip 35 and through the friction cylinder 36 supported on the beam 15 where it is combined with the jute strand and thence into the twister 10.

The asbestos paper utilized in the formation of the yarn is preferably in the form of a narrow continuous strip wound as a roll, cut or slitted from the original wide paper roll. This narrow roll of paper strip is placed on the tray 40 extending horizontally from the standard 11 of the supporting frame intermediate the beams 14 and 15 in such position as to permit feeding of the strip from the center of the roll to guides 41, 42 and 43 suspended from the beam 14 adjacent the guide ring 34. The guides 41 and 43 are fixed while the guide 42 is pivotally supported so that it may be moved into or out of line with the line of centers of guides 41 and 43, in this manner permitting variation in the frictional resistance applicable to the strip as it passes through the guides. The strip is needled through these various guides 41, 42 and 43 or if the strip is mechanically weak, through two or one of these guides and thence into the main axial guide 34 into union with the core strand 21.

The tray 40 is preferably formed with up standing edges 45 so that a small amount of water may be retained therein for the purpose of moistening the absorbent paper of the asbestos rolls in order to loosen the binder in the paper and permit easier working of the strip in the twisting operations.

The jute cord or strand 22 is led from the spool 20 adjacent the spool 19 through a clamping device 24 with the exception that the pig tail guide 51 is placed at the base of the device instead of at the top as in the previously described mechanism. From the guide 51, the jute strand is led into a circular guide 52 supported by a bracket 53 from the beam 15 so as to maintain the guide adjacent to but slidably displaced from the vertical axis of the twister, as shown clearly in Figure 1. From this guide 52, the jute is led into union with the combined cotton strand 21 and the paper strip 35 in the friction cylinder 36 and thereon into the twister 10.

The twisting device 10 is of well known construction consisting essentially in combined rotatable feed mechanism and twisting mechanism. The twist mechanism includes a tube 60 on which is fixed a pulley 61 with a grooved periphery in which a pulley cord 62 is adapted to be seated and to impart power thereto. The tube 60 terminates at its base in a cross bar 63, the ends of which carry stub shafts 64 and 65. The upper ends of these shafts carry pinions 66 and 67 and the lower ends terminate in a second cross bar 68, there being provided on these shafts guide pulleys 69 and 70 for the proper positioning and feeding of the yarn as will be described hereafter. The cross bar 68 also supports at either end rods 71 and 72, the ends of which terminate in pig tail guides 73 and 74.

The feeding mechanism includes a tube 75 enclosing the tube 60, the upper end of which is integral with the power pulley 76 having a periphery which is grooved to receive the cord 77. The lower end of the tube 75 supports a gear 78 which meshes with pinions 66 and 67. The tube 75 is rotatably supported by the sleeve 79 fixed to the bracket 80.

It is necessary, of course, to provide means for reciprocating the spool 83 while the twister is in operation and I have indicated in Figures 1 and 2 mechanism which may be employed for this purpose. The spool 83 is slidably and rotatably mounted on the twister support 85 which is rotatably mounted in the base bracket 86. A lever arm 87, pivoted at 88 on an adjacent portion of the frame, is employed to reciprocate the spools 83 and 95, the lever having

Friction Yarn and process and apparatus for making same (US Patent 1,585,626, 1926)
Published by AsbestosClaims.Law
ACL Doc 22460 · Page 3 of 6
asbestosclaims.law/library/22460/3

contact rollers 89 and 100 at opposite ends, the roller 100 contacting with the base of the spool and the roller 89 contacting with a heart-shaped cam 101 pivotally mounted for rotation adjacent the roller 89 and contacting therewith. It is apparent that rotation of the cam 101 will cause reciprocation of the yarn spools with a delay of movement of the same at either limit of movement, this type of reciprocation permitting proper application of the yarn on the spool.

The operation of the twisting mechanism follows from the above description as rotation of the pulley 61 determines the speed of rotation or twist of the mechanism while the speed of rotation of the pulley 76 determines the number of twists per inch of the yarn fed into the twisting device. The yarn is led through the central tube 60 about the guide 81 over the various stub shaft guides 69 and 70 and through the guide 82 and pig tail guides 74 onto the spool 83. Power is then applied to the pulleys 76 and 61, the speed of rotation of the pulleys being predetermined by the number of twists per inch desired in the twisted product as wound on the spool 83. The twister is given such a speed of rotation so as to impart to the asbestos paper strip a twist of approximately 3 turns per inch to the right in the advancing direction of the yarn, this right handed turn, it will be observed, removing a portion of the left hand twist in both the cotton core and the jute strand, these elements having left handed twists as previously indicated, the final twisted product having therein paper strip with 3 turns per inch to the right and cotton and jute strands with approximately 1½ turns per inch to the left.

The initial twist normally present in the jute and cotton and the reverse twist in the strip are for a specific purpose. It has been found that a stronger yarn is obtained when the cord elements of the yarn are not completely untwisted. Where the jute strand, for example, is twisted in reverse relation to its normal condition so as to completely untwist the same, the fibres loosen and tend to bunch and make bulky the woven strands, thereby making the yarn of poor quality for weaving purposes. This result frequently comes about also that when the jute is untwisted and twisted in the reverse direction as the fibres become freed at the point of change of direction of twist. It is therefore desirable that a portion of the original twist be maintained in the jute strand and while this is not so important in the cotton strand which is relatively weaker and less stiff than jute, the principle is nevertheless advantageously applicable to the cotton strand.

It may be mentioned further that while a complete untwisting of the component strand of the yarn is undesirable, a partial untwisting is of value in that the partially loosened fibres tend to combine and unite more freely and closely with the moistened asbestos paper strip in the twisting operation, thereby compacting the yarn elements together and forming a more uniform product.

The first step of the process as above described is for the purpose of producing a preliminary yarn, the strands of which in conjunction with the paper strip are relatively loosely twisted together so as to permit an initial yarn formation with the component parts as nearly parallel as possible. This is desirable as a large number of twists in the preliminary yarn will diminish the strength of the same, the strands assuming a pronounced spiral formation, and, consequently, the first step of the process is utilized to combine the strands and the strip in proper relationship with each other and in such formation as to give maximum tensile strength.

The second step of the process involves a twisting operation which increases the number of twists per inch of the preliminary yarn, as formed by the first process step, to approximately 6 turns to the right per inch in the direction in which the yarn is fed into the twister. While the yarn is still moist, the spool 83 is positioned on a pin 90 inclined at a slight angle upwardly from the horizontal as shown in Figure 2, so that the upper and lower edge of the spool has frictional contact with the supporting beam 91. The preliminary yarn 92 is then led into a second twister 93 which in construction is similar to the twister 10 employed in the first step of the process and giving an increased number of twists, approximating 6 turns to the inch to the right, which is wound on the spool 95 ready for use in the weaving or other operations.

The final yarn is illustrated in Figure 4 with portions of the component elements unravelled from the loose end, the core 96 being of cotton, the strand 97 being of jute and the strip 98 being of asbestos fibre. The twisting operation is such as to bring various elements to the surface of the finished yarn so that the wearing surface of the yarn is composed of both vegetable and mineral fibre, mineral fibre consisting of asbestos and the vegetable fibre consisting of jute. It should be observed that the area per inch of asbestos is appreciably greater than that of the combined area of the vegetable strands of the yarn so that when the yarn is woven into fabric utilized for frictional purposes such as brake lining or transmission lining for automobiles, the fabric very effectively resists the action of heat. Moreover, by reason of the fact that the asbestos surface

is broken by spirals of vegetable fibre, such as jute, the tendency of the yarn surface to glaze is markedly diminished, the action of the vegetable fibre being apparently to supply a small measure of lubricant to the braking surface through its superior absorptive action and also to afford channels brought about through the more rapid deterioration of the vegetable fibre in which oil and carbon and various foreign substances may be deposited. The advantage of the diminution of the glazing action is that chattering of the brake lining and sticking, such as arise when the brake lining surface is vitreous in its surface composition, is obvious.

An important feature relating both to the yarn and the process for making same resides in the use of asbestos paper-like material or strips or bands of asbestos material bound together with sufficient cohesiveness and tenacity and adapted for yarn manufacture. It should be understood that the term "asbestos material," wherever it appears in the specification and claims, is intended to refer to material having a substantial percentage of asbestos fibres, such as to give more or less the characteristics of asbestos as far as working and handling are concerned, and the term "asbestos material" where used in the specification and claims shall be considered as thus defined.

In the description of the process hereinabove made, I have specified the use of cotton as a core strand and jute as an external strand, but in my investigations of yarn structure, I have found that these particular strands may be varied provided substances having similar physical characteristics are employed. For instance, I have found that a yarn having a cotton core and also a cotton external strand is flexible and possessed of high degree of tensile strength and a sufficient amount of elasticity to work up readily into woven fabrics and I contemplate the utilization of yarn of this type in the application of my process. Various other modifications of the process such as come within the spirit of the invention may, of course, be made, such changes coming within the scope of the claims hereunto appended.

I desire to claim as my invention:

1. A process for making yarn which includes twisting in a certain direction a paper strip with a core element having a normal twist in the opposite direction to form a strand; and subsequently twisting said strand with a strand of jute fibres.

2. A process for making yarn which includes twisting a paper strip with a core element to form a strand, subsequently twisting the strand with a strand of jute fibre to form a preliminary yarn, and finally twisting the preliminary yarn upon itself to increase the closeness of twists thereof.

3. The process for making yarn which includes twisting a paper strip with a strand of twisted vegetable fibres to form a strand unit, and subsequently twisting said strand unit with a second vegetable fibre strand twisted in the same direction as the first strand, in a direction to untwist both of said strands of vegetable fibre.

4. A process for making yarn which includes twisting together a twisted cotton core strand and a strip of asbestos paper-like material, subsequently twisting said core strand and said strip with a strand of jute fibre to form a preliminary yarn structure and finally closely twisting said preliminary yarn structure to form a closely twisted final yarn.

5. A process for making yarn which includes twisting a non-mineral fibre core strand with paper strip to form a strand unit subsequently twisting in the same direction said unit with an oppositely twisted strand of vegetable fibre to form a preliminary yarn, and finally twisting said preliminary yarn more closely to form a final yarn.

6. A process for making yarn which includes twisting together a core strand of vegetable fibre and a strip or band of asbestos paper-like material to form a preliminary strand unit and subsequently twisting said unit with an oppositely twisted strand of vegetable fibre to untwist said twisted strand of vegetable fibre.

7. A process for making yarn which includes twisting in one direction an oppositely twisted cotton core strand and an asbestos paper-like strip to form a preliminary strand unit and subsequently twisting said strand unit in the same direction with an oppositely twisted strand of jute fibre, and finally tightly twisting the strand unit and the strand of jute fibre to form a completed yarn.

8. A yarn comprising a core, a paper-like strip or band of asbestos material covering said core, and a loosely twisted strand of jute fibre binding said strip or band to said core.

9. A yarn comprising a loosely twisted core of non-mineral fibre, asbestos paper-like material covering said core, and a relatively loosely twisted strand of jute fibre embedded in said paper-like material.

10. An asbestos yarn comprising a relatively loose cotton core strand, asbestos paper strip wrapped around said core strand and a loosely twisted strand of jute fibre wrapped about said asbestos paper strip.

11. An asbestos yarn including a relatively soft core strand and a cover therefor formed of asbestos paper strip and jute fibre providing alternate areas of asbestos and jute on the surface of the yarn.

12. A yarn comprising a cotton core, a cover for said core formed from asbestos

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paper-like material bound together with sufficient cohesiveness and tenacity and adapted for yarn manufacture and loosely twisted jute wrapped about said paper-like material.

13. A process of making yarn which includes twisting in one direction an oppositely twisted core strand of cotton fibre with an untwisted strip of asbestos paper-like material, and subsequently twisting in the same direction the strand of cotton fibre and the paper strip with a strand of jute having a normal twist opposite to that imparted in the twisting of the yarn forming operation.

14. A process of making yarn which includes twisting in one direction an oppositely twisted core strand of cotton fibre with an untwisted strip of asbestos paper-like material, subsequently twisting in the same direction the strand of cotton fibre and the paper strip with a strand of jute having a normal twist opposite to that imparted in the twisting of the yarn forming operation, and subsequently imparting a closer twist to said strands and paper strip to form a final yarn.

In testimony whereof, I affix my signature.

WILLIAM NANFELDT.