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PROCESS AND APPARATUS FOR MAKING YARN

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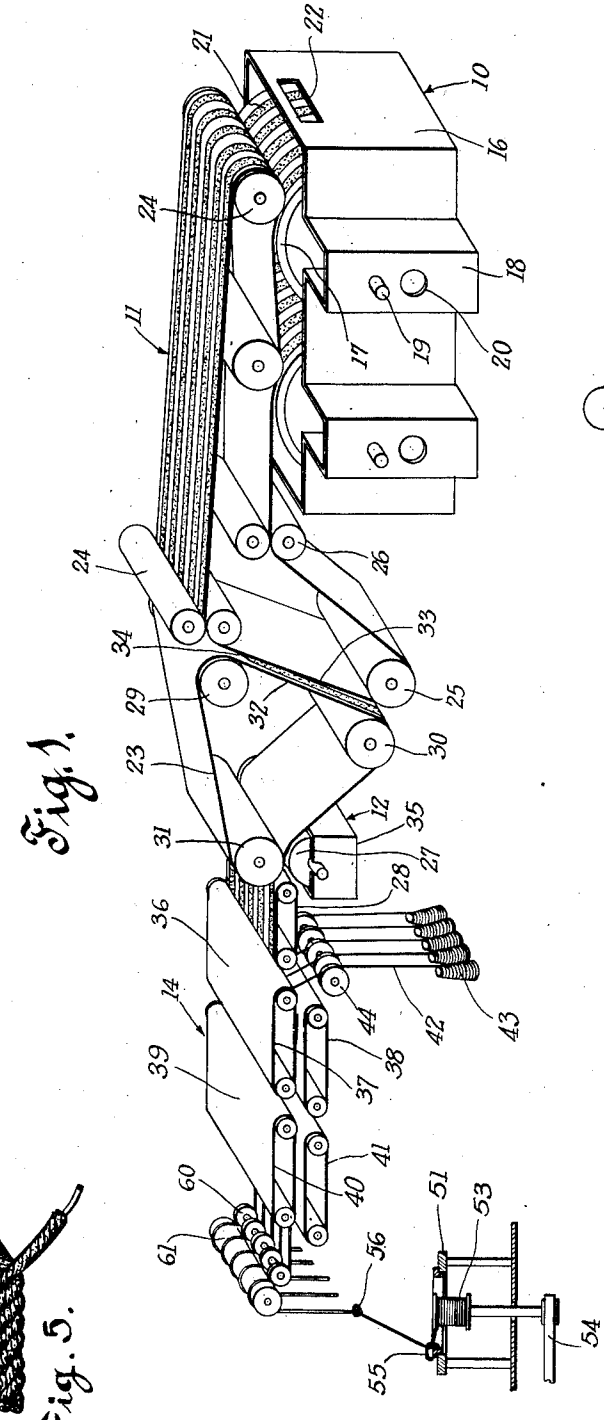


Fig. 1.

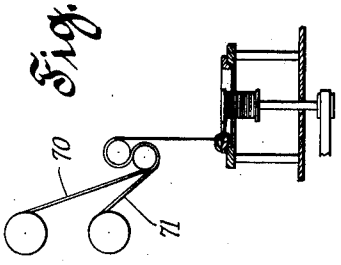


Fig. 4.



Fig. 3.



Fig. 2.

Fig. 5.

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PROCESS AND APPARATUS FOR MAKING YARN.

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This invention relates to a new process and apparatus for making yarn from raw material having little or no natural coherency such as short-fibred asbestos and various vegetable pulps and chemically set moulds.

Specifically, the invention contemplates the use of mechanism which carries non-coherent short-fibred asbestos from a pulp vat onto a belt carrier, moistens the sliver of relatively loose material and deposits the same in a condenser in contacting relationship with a thread or filament, and subsequently twists the reinforced strand into a smooth, compacted and resistant yarn.

In the manufacture of yarns from short fibred asbestos, it has heretofore been found requisite to mix with the asbestos long-fibred material such as cotton, jute or hemp or to apply some binder such as starch to hold the fibres together until the yarn could be fabricated. Serious deficiencies exist in yarns made according to these methods. On the one hand, where long vegetable fibres are used to reinforce asbestos yarn, the resulting fabric is defective for use in brake linings, steam pipe coverings, fire proof curtains, masks and in all the various uses where the fabric is subjected to high temperature conditions. On the other hand, where a soluble binder, such as starch, is employed, the resulting fabric, due either to mechanical jar displacing the particles of binder, or to solution in moisture accompanying rise in the moisture of surroundings, loses in part or completely all cohesive properties and rapidly disintegrates.

It is therefore in accordance with the object of the invention to provide means whereby raw material, which may or may not be fibrous and which in strand form is normally non-coherent, is manipulated and fabricated into a cohesive, tension-resisting fabric without the utilization of any auxilliary holding or binding agents. Coincident with the above object, it is contemplated to provide means whereby a durable yarn may, with the exception of the core, be manufactured from pure asbestos only, the fibres of said asbestos being of such dimensions and possessing normally such qualities as tend to prevent an enduring cohesion therebetween.

It is an object also to provide mechanism which will automatically form the short asbestos or other fibres, or non-fibrous material in a sliver, maintain the sliver in a moistened condition, wrap the sliver about a continuous core, and twist the resultant strand into a final commercial yarn.

Other objects enter into the provision of means for carrying out the process above indicated continuously, for simultaneously making a plurality of yarns, for twisting the strand as it comes from the condenser in such a manner as to form holding corrugations or undulations on the core, for twisting together a plurality of individual strands or rovings to form a reinforced multiple strand, and for rubbing, condensing or rolling the sliver of material into a smooth cord or strand about a thread or filament of substantially greater tensile strength and rigidity than the fibred stock.

Objects specifically are contemplated also in the provision of mechanism for removing the raw material to the condensing rubbers and for maintaining the sliver suitably moistened during the process of manufacture. These and various other objects related to details of construction and operation will be apparent on consideration of the various steps of the process and the specific embodiment of the apparatus hereinbelow described, and illustrated in the accompanying drawing, in which

Figure I is a diagrammatic view of the complete apparatus;

Figure II is a section of a sliver strip indicating the non-coherent texture;

Figure III is a view of the completed yarn with parts broken away to show the twisted core, and

Figure IV is a view of apparatus suitable for intertwisting different strands; and

Figure V shows a completed yarn formed of plural strands.

The apparatus illustrated which may be preferred, is comprised in six cooperating

elements; the pulp tank 10, the sliver belt 11, the moistener 12, the core feed 13, the condenser 14, and the twister 15.

The pulp tank 10 is of a form employed in paper manufacture and consists of an open top, rectangular receptacle 16 containing one or more cylinders 17 pivotally mounted for rotation in extensions 18 through the walls of which the cylinder shafts 19 protrude. The extensions 18 have openings 20 through which suction is applied by any appropriate means to remove excess liquid in the vat or tank 10 and cause a circulation of the liquids helpful in forming the slivers on the cylinders or drums 17. To this end the drum is perforated circumferentially in spaced strips as indicated at 21 and the tank liquids in passing through these perforations deposit the fibrous asbestos material thereupon.

The wet pulp is supplied to the tank 10 through inlets 22 from various mixing and beater vats, not shown.

The sliver carrier or belt 11 is mounted directly above the rotatable tank drums 17 and is designed to carry the slivers 34 from the tank to the transfer belt 23. The belt 11, which is preferably of felt, rides around a weight roller 24 in contact with cylinders 17, passes through pressure rollers 24′ guide roller 25, pressure rollers 26 and over the tank drum 17. From the sliver belt the transfer belt 23 carries the slivers, in the form of strips or bands, over the moistener rolls 27 onto the conveyor belt 28. The transfer belt 23 is mounted on three rollers 29, 30 and 31, the roller 29 being positioned adjacent the rollers 24, the roller 30 adjacent the roller 25 and the roller 31 adjacent the roller 27. By this conformation, a portion of the transfer belt as 32 is contiguous a portion 33 of the sliver belt 11 and is thereby adapted to receive the slivers 34 therefrom and carry them to the moistener roll 27.

As above indicated, the rolls 27 and 31 are contiguously placed and serve therefore as guide and pressure rolls. The moistener roll 27 is adapted to rotate in a water tank 35 and thus apply, when desirable, sufficient moisture to the slivers to make them readily workable.

From the transfer belt 23, the slivers are carried by the conveyer 28 into the condenser 14. The condenser comprises two pairs of rubbing belts, the pair 36 formed of coacting belts 37 and 38, and the pair 39 of belts 40 and 41. These belts have motion, carrying forward the slivers placed in between and also transverse motion giving a rubbing or rolling action, condensing the strip to a cylindrical strand. In the apparatus as illustrated, cores, threads or filaments 42 are fed from bobbins 43 over rollers 44 in the condenser 14 simultaneously with the slivers 34, a thread for each sliver strip, and in the rub process the strip is folded and rolled over and about the thread so as to completely envelop the same. In the first rubber 36, the strand is partially formed and in the rubber 39, the strand is rolled to a smooth and uniform yarn.

The final operation takes place in the twister 15. This mechanism may be of any conventional design and is here shown as a "ring twister." It includes the reciprocating and freely rotatable ring holder 51 mounted concentrically relative to the spool shaft 52, said shaft carrying the spool 53 and being subjected to rotation by power means 54. The ring 55 is off-set from the shaft axis while the ring 56 is axially positioned so that with the strand threaded therethrough, rotation of the spool causes rotation of the holder 51 and twists the strand. The twisting operation, while not essential in the manufacture of a usable yarn, is nevertheless highly advantageous in securing a completed yarn of highest cohesion and smoothest texture.

The operation of forming a close, tenacious and smoothly fabricated yarn from short-fibred asbestos follows closely from the above description.

The rotating drums 21 by reason of the sieve construction which permits inflow of fibre laden liquid and offers a roughened holding surface, carries strips of loose non-coherent fibrous stock to the silver belt 11, which in turn carries the slivers to the transfer belt 23. The slivers are here moistened if too dry for working by moistener 12 and transferred by conveyer 28 to the condenser 14 where alined with filaments 42 they are rubbed into a smooth, cylindrical yarn, which may be used for some purposes without additional manipulation.

To complete the final yarn, however, the raw yarn is fed between rollers 60 and 61 and into the twister 15, where the core 42 and covering material are both subjected to a twist causing a series of undulations, corrugations, or protuberances in the core and material. This operation serves to bind the material to the core by adding a rotational striation thereto, and, especially, where a metallic core is employed, by wedging or clamping the material between the successive protuberances. Notably is this true where the core is coiled by the twist so that the envelope is bound between adjacent core sections. In any instance, however, the torsional effect in the strand serves to give greater tenacity, stability and cohesion to the finished yarn and prevent easy stripping.

In Figure III is illustrated a section of completed yarn showing the twisted core.

The process, as above described, covers the steps requisite to produce a simple single core yarn. In some instances, however, it is desirable to obtain a yarn having maxi-

mum tenacity, combined with flexibility and other propertes inherent in the single core yarn and to obtain this product the process is extended as follows. Instead of drawing each strand as it emerges from the condenser 14 through a separate twister, two or more strands 70 and 71 (Figure IV) are fed simultaneously over the rollers 60, 61 into the twisting device, the yarn emerging as a smooth and compact strand having pronounced tenacity, coherence and durability.

Instead of twisting the two strands in the condition as obtained from the rubber, in some instances each strand may be separately twisted and then the two twisted strands twisted together in a mechanim as illustrated in Figure IV, thus obtaining a yarn in which there is a maximum of retaining and tensile strength.

In the description of the process as above indicated, reference is made by way of example to the use of asbestos as typifying a stock having short fibres and normally non-coherent. It is not intended, however, to limit the process merely to asbestos yarns as it is within the scope and intent of the invention that any non-coherent material may be fabricated by the process and apparatus described into usable yarns. The term non-coherent is sufficiently broad, and is intended to cover not only short-fibred stock, but also material forming a pulp having scarcely any fibrous structure or from which fibrous material has been removed by chemical or mechanical means. In any case, the main features of the process are applicable, to formulate the substance into a coherent yarn having highly useful and advantageous properties.

From consideration of the above detailed description, the advantages of the apparatus and process are apparent. By employing the various steps indicated in conjunction with the mechanism detailed or any mechanism giving similar results, applicant is enabled to form from stock having little or no permanent coherence a yarn which is useful not only in all relationships that yarn made from long-fibred or bound material is usable, but also in certain relationships such as for heat insulation, where the long vegetable fibred stock is impossible.

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 asbetos 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.

Various modifications of the apparatus and process will, of course, be obvious to those skilled in the art to which the invention pertains, but it is emphasized that the disclosure is merely illustrative, applicant reserving right to all such modifications as come within the scope of the claims hereto appended.

I claim as my invention:

1. The hereindescribed process of making asbestos yarn, which comprises forming a pulp from asbestos material, withdrawing said asbestos material from said pulp in the form of a felted strip or band and advancing said strip or band, compressing the strip or band as it advances, moistening the strip or band as it advances, advancing a filament with the advancing strip or band and forming the strip or band around the filament, to form a strand, and twisting the advacing strand into a yarn.

2. The hereindescribed process of making asbestos yarn, which comprises forming a strip or band from pulp of asbestos material and advancing the strip or band, compressing the strip or band as it advances, and combining the strip or band, as it advances, with a core to form a strand.

3. The hereindescribed process of making asbestos yarn, which comprises forming a strip or band from pulp of asbestos material, advancing said strip or band as formed, moistening the strip or band as it advances, advancing a filament, conveying the strip or band substantially without tension into juxtaposition with said filament, and combining the filament and the strip or band, as they advance, into a strand.

4. The hereindescribed process of making asbestos yarn, which comprises forming a strip or band from pulp of asbestos material, advancing said strip or band as it is formed, moistening the strip or band as it advances, advancing a wire filament, conveying the strip or band substantially without tension into juxtaposition with said wire filament, combining the strip or band and the wire filament, as they advance, into a strand, and twisting said strand, as it is formed, into a yarn.

5. A continuous process for forming asbestos yarn, which comprises forming pulp of asbestos material, withdrawing said asbestos material in the form of a strip or band, compressing said strip or band, moistening said strip or band as it advances, condensing said strip or band on and advancing core to form a strand, and forming said strand into a yarn.

6. In apparatus for making yarn, in combination, a tank for pulp, means for removing said pulp in strip or band form from said tank, a conveyer for advancing said strip or band as formed, means for compressing the strip or band as it is advanced by said conveyer, means for moistening the strip or band as it advances, means, including a second conveyer, for receiving the strip

or band from the moistening means and conveying it substantially without tension, means for receiving said strip or band from the second conveyer and combining it with a filament to form a strand.

7. In apparatus for making yarn, in combination, a tank for pulp, means for removing the pulp from the tank in strip or band form and advancing the strip or band, means for compacting the strip or band as it advances, means for combining said strip or band with a wire filament to form a strand, and means to form the strand into a yarn.

In testimony whereof, I affix my signature.

JOHN ALLEN HEANY.