May 18, 1926. 1,585,620

J. A. HEANY

YARN AND PROCESS OF MAKING SAME

Original Filed April 29, 1924 2 Sheets-Sheet 1

Fig. 1.

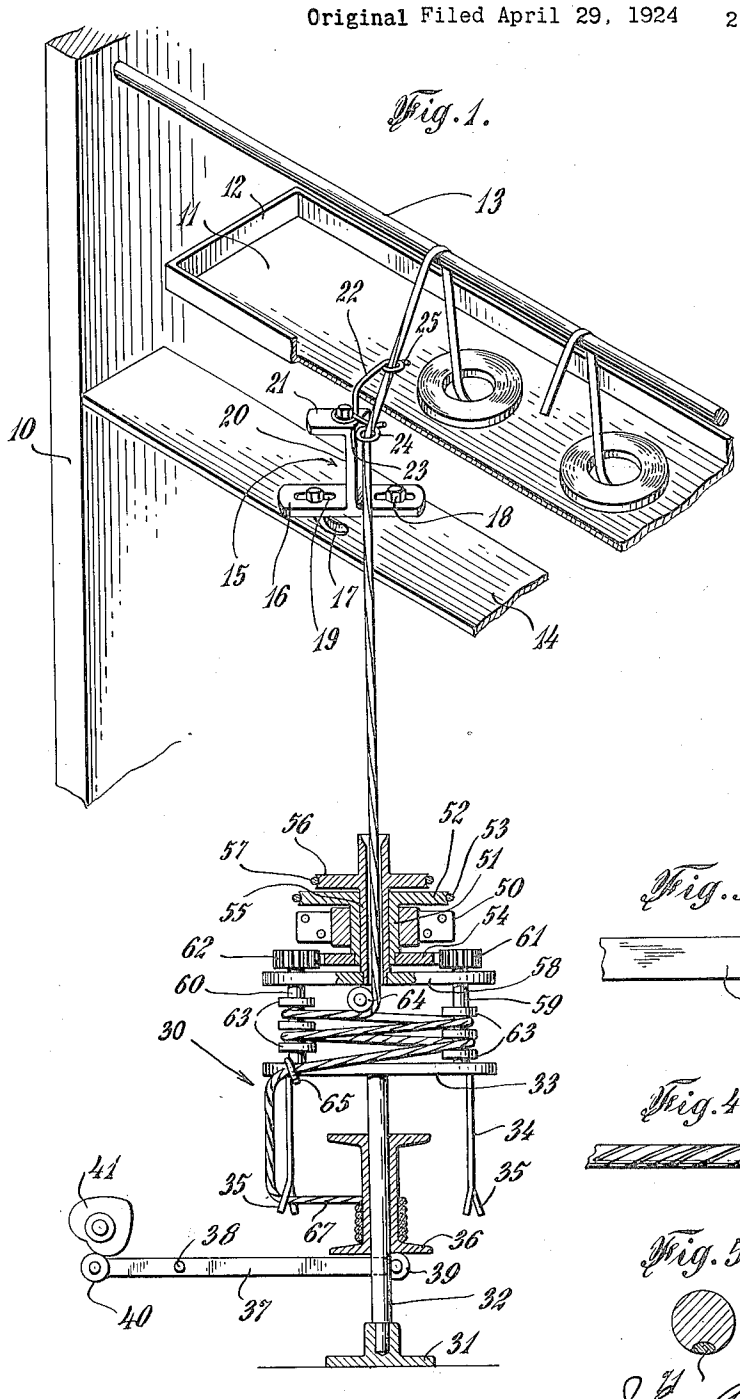


Fig. 3.



Fig. 4.

Fig. 5.

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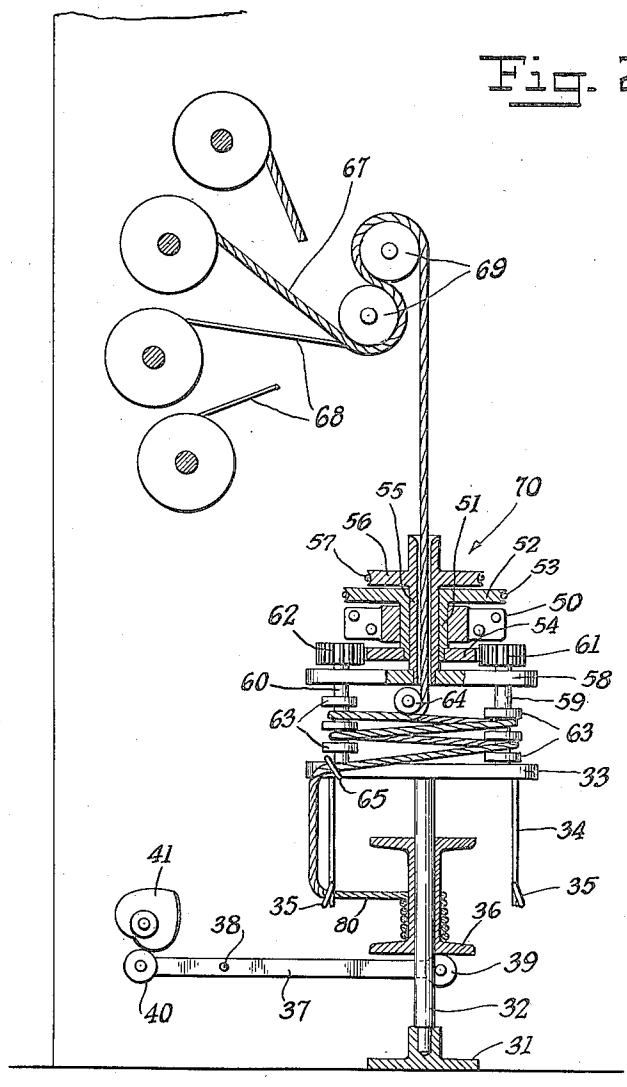
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Fig. 2.



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UNITED STATES PATENT OFFICE.

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YARN AND PROCESS OF MAKING SAME.

Application filed April 29, 1924, Serial No. 709,723. Renewed January 28, 1926.

This invention relates to yarn and a process for making the same. Specifically, the invention relates to an improved type of yarn and a new process of manufacturing the same from asbestos material and to improved means for reinforcing the material to produce a yarn of relatively high coherence and tensile strength.

In my co-pending application, Serial Number 685,300, filed January 10, 1924, I have disclosed a process for making yarn of fibrous asbestos material, which may be united with binding material, into a thin uniform paper-like strip or band of sufficient cohesiveness and tenacity to undergo subsequent strand forming operations, and then twisting the strip about a central reinforcing. Also, in my co-pending application, Serial Number 685,091, filed January 9, 1924, I have disclosed a type of yarn in which the asbestos paper strip is first rubbed by rubbing mechanism to form the strand and the strand then combined with a reinforcing filament and twisted together. As described in my co-pending application, Serial No. 516,129, filed Nov. 18, 1921, the asbestos material is formed into a pulp and passed through an ordinary paper making machine to form a web which is rolled up in the usual manner. This web, which in the paper making operation has been rendered sufficiently dry and compact to have the necessary strength, is separated by a slitting machine into narrow strips to be utilized in yarn manufacture. Satisfactory results are obtained by combining with the asbestos material in the pulp suitable binding material, which serves to increase the strength of the finished web or paper, thus rendering it suitable for manipulation in the yarn making operation. The present invention is, for some uses, an improvement over the inventions described in the above identified applications in employing simplified means for applying the reinforcing element to the strand of asbestos and in producing a yarn having valuable structural advantages.

An important object of the invention, therefore, is to provide a strong and coherent yarn composed of material, such as asbestos fibre, suitably reinforced by the application of a reinforcing filament thereto. Another object is the provision of yarn, formed of asbestos material, which possesses marked tensile strength without the employment of long-fibred material or of an exterior sheath or other holding means therewith. An object, also, is the provision of a yarn in which the reinforcing filament is applied to the surface thereof in such a way as not to protrude from the surface. It is an object, also, of the invention to provide a simplified process by which the fibrous stock is manipulated into the form of a yarn strand having approximately circular cross section and subsequently combined with the reinforcing element without the employment of a rubbing operation. An object also is the provision of simple and efficient apparatus by means of which the process and the manufacture of the yarn above specified may be carried on.

Broadly stated, the invention consists in forming a non-coherent material, such as asbestos, for example, into the form of a strip, preferably held together by a binder, and feeding this strip, preferably after it has been moistened to loosen the binder, into a twisting machine in which the strip is formed into a strand. This strand is subsequently united with a filament, for instance, of wire, or by any suitable means as by twisting these two elements together.

Further objects and objects relating to details of the process and economies of manufacture will appear from a consideration of the detailed description to follow. I accomplish the objects of my invention by the means described in the following specification; my invention is clearly defined and pointed out in the following claims.

An embodiment of apparatus for carrying out my invention which may be preferred is illustrated in the accompanying drawing, forming a part of this specification, in which:

Fig. 1 is a view in perspective of a portion of the feeding and twisting mechanism, the twisting mechanism being shown partly in section;

Fig. 2 is a diagrammatic showing of the twister in which various asbestos strands are combined with reinforcing wires or filaments;

Fig. 3 is a view of a portion of the paper strip employed in the process;

Fig. 4 is a view of a portion of the completed yarn; and

Fig. 5 is a cross section of the completed

yarn shown in Fig. 4, showing the wire or thread embedded in the fibre.

Referring particularly to Fig. 1, there is shown in this view of the drawing, a fragment of the end support 10 of the twisting and feeding apparatus. To this support by any suitable means is attached the paper tray 11, consisting of a shallow pan having upstanding edges 12 suitable for reception of the liquid for moistening the coils or rolls of paper and above the tray 11, guide rod 13 is fixed to the support 10 over which the strip of paper is adapted to be fed. Below and in front of the tray 11 is a horizontal support 14 upon which is mounted a guide unit 15 through which the paper strip is adapted to have movement. In the embodiment shown, this guide unit 15 has a base plate 16 slotted as at 19, to receive holding bolts 18, thus permitting adjustment of the plate on the support. The support 14 also is slotted in the form of an arc 17 to receive one of the bolts so that transverse adjustment of the plate may be made. A standard 20 is fixed to the center of the plate 16, and terminates in an off-set bracket 21. To this bracket is attached a wire element having two arms 22 and 23, each terminating in pig tail loops 24 and 25, the loop 25 being above and to one side of the loop 24, as illustrated in Fig. 1. The loop 24 projects outwardly from the support 14 so that the paper strip passing through the loop 24 may feed vertically downward into the twisting mechanism 30.

The twisting mechanism 30 is positioned directly beneath the support 14 and comprises dual units, one of which controls the feeding of the yarn strand and the second of which controls the twisting thereof. Rotatably mounted on the base 31 is rod 32, at the top of which is a cross bar 33. From the ends of the bar 33 depend rods 34, the ends of which are forked as at 35 to form guides for the yarn. A spool 36 is positioned on the rod 32 and is adapted to have reciprocatory movement thereupon, this reciprocation being imparted by means of a lever arm 37 pivotally mounted at 38. The end of the arm 37 adjacent the spool carries a contacting roller 39 and the other end of the lever carries a contacting roller 40 which is engaged by the cam 41 of such conformation that upon rotation of the same, vertical reciprocation of the spool 36 is brought about.

Above the cross bar 33 is placed a bracket 50 in which the sleeve 51 is rotatably mounted. The upper end of the sleeve carries a pulley 52 having a channeled periphery in which a pulley cord 53 is placed and to the lower end of the sleeve a gear 54 is attached. Within the sleeve 51 is a second sleeve 55 adjacent the top of which is fixed a drive pulley 56 carrying at its periphery a drive cord 57. At the base of the sleeve 55 is a cross bar 58 in the ends of which are rotatably mounted shafts 59 and 60. The upper ends of the shafts 59 and 60 carry pinions 61 and 62 which engage the gear 54, previously described. The shafts 59 and 60 carry also guide rollers 63, there being two on each shaft. Additional guides are provided also in the guide roller 64 fixed beneath the cross bar 58 and the guide loop 65 fixed at a point adjacent one end of the cross bar 33.

Of the parts described above, the pulley 56, sleeve 55, cross bars 59 and 60 constitute with the connecting parts the twister mechanism, and the pulley 52, sleeve 51, gear 54, pinions 61 and 62, shafts 59 and 60, and guide rollers 63 constitute the feed mechanism. The strand, as it is fed from the guide loops 25 and 24, passes through the hollow sleeve 55 about the roller 64, rollers 63, through loops 65 and 35 and thence to the spool 36, upon which it is wound in layers. The rapidity of movement of the yarn through the twister is determined by the speed of operation of the feed mechanism driven by pulley 52 and the twists per inch of the yarn is determined by the speed of operation of the pulley 56 with its attached elements. The power driving cam 41 which causes reciprocation of the spool and operation of the pulley 56, is mutually adjusted so that reciprocation of the spool occurs when a complete layer of yarn is wound thereupon.

The details and the various steps of the process should be clearly understood from the description given above. The yarn material 66 which consists of fibrous material and may be formed into a paper strip preferably held together by a binder, as described, for example, in my co-pending application Serial Number 516,129, is preferably moistened by any suitable means, as by a spray or by water contained in the tray 11. (See Fig. 1.) The inner end of the strip is then led over the guide rod 13 through the loops 25 and 24 into the twister 30 and the power applied. The twist is at once imparted to the strip, the twist being most pronounced at a point adjacent the roller 64, diminishing in the degree of twist up to and through the guide loops 24 and 25, so that different stages of twisting are apparent, the first above the loop 24 where a slight twist is imparted and a second below the loop 24 and above the roller 64, where a pronounced twist is obtained. The moistening of the strip imparts such flexibility thereto that it is readily twisted without breakage and at the same time it is maintained sufficiently coherent to prevent the pulling apart of the material. While such moistening or softening of the strip or band is found to be desirable under some

conditions, it should be understood that such moistening or softening is not essential under all conditions. The twisting of the strip extends, as previously indicated, through the loops 24 and 25, thus assisting in leading the material through the guides with a minimum of friction.

After the twisted yarn strand 67 has been wound upon the spool 36, the second step of the process is proceeded with. While still moist, the strand 67 is combined with one or more filaments 68 which may be either a flexible wire or a thread of such material as cotton. The filament and strand are fed over guide rolls 69 into a twister 70 as indicated in Fig. 2, similar in all respects to the twister 30 of Fig. 1. The twisting operation on the combined filament and strand causes the filament to be wrapped helically around the strand and embedded in the surface of the strand, the moist material yielding to the tension of the filament as shown at 71 of Fig. 5. The completed yarn as derived from this second operation and as illustrated at 80 in Fig. 4, is a close, compact yarn with the filament holding the material in dense relationship and giving marked coherence and tenacity to this structure.

As stated in my co-pending application, Serial No. 685,091, filed January 9, 1924, it is possible to fabricate a yarn without loosening the binder in the asbestos material by merely subjecting the asbestos paper to the rubbing action of the rub motion belts to loosen the paper structure. In the present case the loosening of the paper structure may be effected by the twisting action without the necessity of loosening the binding material in the asbestos paper.

By the above operation, it is apparent that by the simple process of twisting a strip of normally non-coherent material into a strand and subsequently twisting the strand with a filament, a yarn structure is obtained which meets the most rigid requirements for all ordinary uses. Particularly advantageous is a yarn of this type when utilized for heat resisting fabrics or friction resisting material, such as brake lining. It is apparent that by adjusting control of the twister that a great variety of yarns are obtainable which differ in tenacity and flexibility.

In describing the process above I have referred to the formation of a coreless yarn from a single strip of asbestos paper-like material. I do not limit myself to such a formation of yarn from a single strip, as the invention clearly contemplates the formation of a yarn from a plurality of strips or bands of asbestos material.

I have found it advantageous, also, where the paper material is lacking in sufficient coherency, to add a proportion of kraft fibre to the original stock and in this way secure a material with such strength as to permit manipulation of the same while wet.

It will be noted that in forming a strand or a yarn in accordance with my invention the asbestos paper-like material or strips or bands of asbestos material are formed into a strand by twisting the material in a plurality of successive stages of increasing closeness, thereby resulting in a strand which is very uniform in strength, smoothness and durability. It follows that one or more moistened strips may be twisted with one or more dry strips.

While the process is referred to in connection with asbestos material, it is, of course, obvious that the process is equally applicable to any fibrous or non-fibrous structure. 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 fibre 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. It is apparent, also, that various modifications of the detailed steps of the process may be made without varying from the spirit of the invention and it is desired, therefore, to claim the invention broadly as well as specifically, as indicated by the claims hereto appended.

I claim—

1. The process of making coreless yarn which includes forming one or more flat paper-like strips of asbestos material in which the fibres are held together by suitable workable binding material, and twisting said strip or strips from flat form directly into a single element yarn.

2. The process of making coreless yarn which includes forming one or more flat paper-like strips of asbestos material in which the fibres are held together by workable binding material, treating the strip or strips to render the binding material more workable, and twisting said strip or strips from flat form directly into a single element yarn.

3. The process of making coreless yarn which includes forming one or more flat paper-like strips of asbestos material in which the fibres are held together by workable binding material, twisting the strip or strips from flat form directly into a single element strand, and winding said strand with a reinforcing element to form a wrapped yarn.

4. In a process of making coreless asbestos yarn, the following steps: forming a pulp containing asbestos material; passing the pulp through a paper making machine and binding and forming the pulp and asbestos

material into at least one flat strip or band of finished asbestos paper; and twisting a strip of the finished paper from its flat form directly into a single element yarn.

5. In a process of making coreless asbestos yarn, the following steps: forming paper from asbestos material and such binding material as to permit slitting the paper; slitting the paper into flat strips; and twisting one or more of said strips from its flat form directly into a single element yarn.

6. In a process of making coreless asbestos yarn, the following steps: forming a pulp containing asbestos material; passing the pulp through a paper making machine and binding and forming one or more flat strips of asbestos paper; twisting one or more strips of the finished paper from flat form directly into a single element strand; and twisting said strand with a reinforcing element to form a wrapped yarn.

7. In a process of making coreless asbestos yarn, the following steps: forming paper of asbestos material and binding material securing together the fibres of said asbestos material; slitting the finished paper into flat strips; twisting one or more strips of said finished paper from flat form directly into a single element strand; and winding said strand with a reinforcing element to form a finished wrapped yarn.

8. In a process of making coreless asbestos yarn, the following steps: forming paper from asbestos material and suitable binding material to permit slitting; slitting the finished paper into flat strips; treating one or more strips to loosen the binding material; and twisting the same from flat form directly into a single element yarn.

9. In a process of making asbestos yarn, the following steps: forming paper from asbestos material and suitable binding material to permit slitting; slitting the finished paper into flat strips; treating one or more strips to loosen the binding material; twisting the same from flat form directly into a single element strand; and twisting the strand with a reinforcing element.

10. In a process of making coreless asbestos yarn, the following steps: forming a pulp containing asbestos material and suitable binding material; passing the pulp through a paper making machine and winding the finished asbestos paper into a roll; running the paper from said roll through a slitting machine to form flat strips thereof and rewinding the strips thus formed; and twisting one or more of said strips from its flat form directly into a single element yarn.

11. A method of making coreless asbestos yarn for the manufacture of fabrics and other purposes, which comprises the steps of binding and forming asbestos material into thin uniform paper-like strips or bands of sufficient cohesiveness and tenacity to undergo subsequent strand forming operations, and of directly twisting one or more of said strips or bands from flat form to form a coreless strand.

12. A method of making asbestos yarn for the manufacture of fabrics and other purposes, which comprises the steps of binding and forming asbestos material into a thin uniform paper-like strip or band of sufficient cohesiveness and tenacity to undergo subsequent strand and yarn forming operations, directly twisting said strip or band from its flat form to form a coreless strand, and thereafter combining said coreless strand with a filament to form a yarn.

13. A method of making asbestos yarn for the manufacture of fabrics and other purposes, which comprises binding and forming asbestos material united with binding material into a thin uniform paper-like strip or band of sufficient cohesiveness and tenacity to undergo subsequent strand and yarn forming operations, directly twisting said strip or band from its flat form to form a coreless strand, and thereafter combining the coreless strand with a filament to form a yarn.

14. A method of making coreless asbestos yarn for the manufacture of fabrics and other purposes, which comprises binding and forming asbestos material into a dry thin uniform paper-like strip or band of sufficient cohesiveness and tenacity to undergo subsequent strand and yarn forming operations, moistening said strip or band, feeding said moistened strip or band downwardly, and simultaneously twisting the same to form a single element yarn.

15. A method of making coreless asbestos yarn for the manufacture of fabrics and other purposes, which comprises binding and forming asbestos material into a thin uniform-paper-like strip or band of sufficient cohesiveness and tenacity to undergo subsequent strand and yarn forming operations, directly twisting the strip or band to form a coreless strand, and thereafter helically embedding a filament in the surface of said coreless strand to form a yarn.

16. A method of making coreless asbestos yarn for the manufacture of fabrics and other purposes, which comprises binding and forming asbestos material into a thin uniform paper-like strip or band of sufficient cohesiveness and tenacity to undergo subsequent strand and yarn forming operations, moistening said strip or band twisting said moistened strip or band to form a moistened coreless strand, and thereafter helically embedding a filament in the surface of said moistened coreless strand to form a yarn.

17. In a method of making asbestos yarn for the manufacture of fabrics and other purposes, the steps which consist in binding

and forming asbestos material into a thin uniform paper-like strip or band of sufficient cohesiveness and tenacity to undergo subsequent strand and yarn forming operations, and feeding said strip or band downwardly and simultaneously twisting the same to form a single element yarn.

18. In a process of making asbestos yarn, the following steps: forming paper from asbestos material and sufficient workable binding material as to permit slitting of the paper; slitting the paper into strips; directly twisting a strip of such paper to form a single element or coreless strand; and thereafter helically embedding a reinforcing filament in the surface of said strand to form a yarn.

19. In a process of making asbestos yarn, the following steps: forming a pulp containing asbestos material and a workable binder; passing the pulp through a paper making machine and winding the finished asbestos paper into a roll; running the paper from said roll through a slitting machine and rewinding the strips thus formed; directly twisting each of said strips to form single element or coreless strands; and thereafter helically embedding a reinforcing filament in each of said strands to form final yarns.

20. A method of making asbestos yarn from asbestos paper-like material bound with sufficient cohesiveness and tenacity to undergo subsequent mechanical strand and yarn forming operations, which comprises mechanically forming said paper-like material into coreless strands, and thereafter mechanically combining a plurality of said strands and one or more reinforcing filaments to form a yarn.

21. A method of making asbestos yarn from asbestos paper-like material bound with sufficient cohesiveness and tenacity to undergo subsequent mechanical strand and yarn forming operations, which comprises mechanically forming said paper-like material into coreless strands, and thereafter mechanically combining a plurality of said strands and one or more reinforcing filaments in helical arrangement to form a yarn.

22. A method of making asbestos yarn from asbestos paper-like material bound with sufficient cohesiveness and tenacity to undergo subsequent mechanical strand and yarn forming operations, which comprises mechanically forming said paper-like material into coreless strands, and thereafter mechanically forming a plurality of said strands and one or more metallic reinforcing filaments into a twisted yarn.

23. A method of making asbestos yarn from asbestos paper-like material bound with sufficient cohesiveness and tenacity and adapted for yarn manufacture, which includes moistening said paper-like material, mechanically forming said paper-like material into a plurality of coreless strands, and thereafter mechanically combining said strands with one or more reinforcing filaments to form a yarn.

24. A method of making asbestos yarn from asbestos paper-like material bound with sufficient cohesiveness and tenacity and adapted for yarn manufacture, which includes moistening said paper-like material, mechanically forming said paper-like material into coreless strands, and thereafter mechanically combining a plurality of said strands and one or more reinforcing filaments in helical arrangement to form a yarn.

25. A method of making asbestos yarn from asbestos paper-like material bound with sufficient cohesiveness and tenacity and adapted for yarn manufacture, which includes moistening said paper-like material, mechanically forming said paper-like material into coreless strands, and thereafter mechanically forming a plurality of said strands and one or more metallic reinforcing filaments into a twisted yarn.

26. A method of making coreless asbestos yarn from a paper-like strip or band of asbestos material bound with sufficient cohesiveness and tenacity and adapted for yarn manufacture, which comprises advancing said strip or band, and directly twisting said strip or band to form a single element yarn.

27. An asbestos yarn formed of a plurality of coreless strands of asbestos paper-like material bound with sufficient cohesiveness and tenacity to undergo strand and yarn forming operations and having one or more reinforcing filaments combined therewith.

28. An asbestos yarn formed of a plurality of coreless strands at least one of which consists of asbestos material present in paper-like strip formation, bound with sufficient cohesiveness and tenacity to retain such paper-like formation and also having one or more reinforcing filaments combined therewith.

29. An asbestos yarn formed of a plurality of coreless strands at least one of which consists of asbestos material present in paper-like strip formation, bound with sufficient cohesiveness and tenacity to retain such paper-like formation, and also having one or more metallic reinforcing filaments combined therewith in helical arrangement.

30. An asbestos yarn comprising one or more reinforcing filaments combined with a plurality of coreless strands at least one of which consists of asbestos material present in paper-like strip formation and one or more of which contains binding material.

31. A method of making coreless asbestos yarn from asbestos paper-like material bound with sufficient cohesiveness and tenacity to adapt it to strand and yarn manu-

facture, which includes the step of twisting said paper-like material in a plurality of successive steps of increasing closeness to form a strand.

32. A method of making coreless asbestos yarn from strips or bands of asbestos material bound with sufficient cohesiveness and tenacity to adapt it to strand and yarn manufacture, which includes the steps of twisting together a plurality of said strips or bands in a plurality of successive stages of increasing closeness to form a strand.

33. A method of making coreless asbestos yarn from asbestos paper-like material bound with sufficient cohesiveness and tenacity to adapt it to strand and yarn manufacture, which includes the steps of moistening said paper-like material, and of twisting said moist paper-like material in a plurality of stages of increasing closeness to form a strand.

34. A method of making coreless asbestos yarn from strips or bands of asbestos material bound with sufficient cohesiveness and tenacity to adapt it to strand and yarn manufacture, which includes the steps of moistening at least one of said strips and of twisting a plurality of said strips including one or more moistened strips in a plurality of stages of increasing closeness to form a strand.

In testimony whereof, I affix my signature.

JOHN ALLEN HEANY.

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