May 18, 1926. 1,585,616

J. A. HEANY

YARN AND PROCESS OF MAKING SAME

Original Filed Jan. 23, 1924 2 Sheets-Sheet 1

Fig. 1.

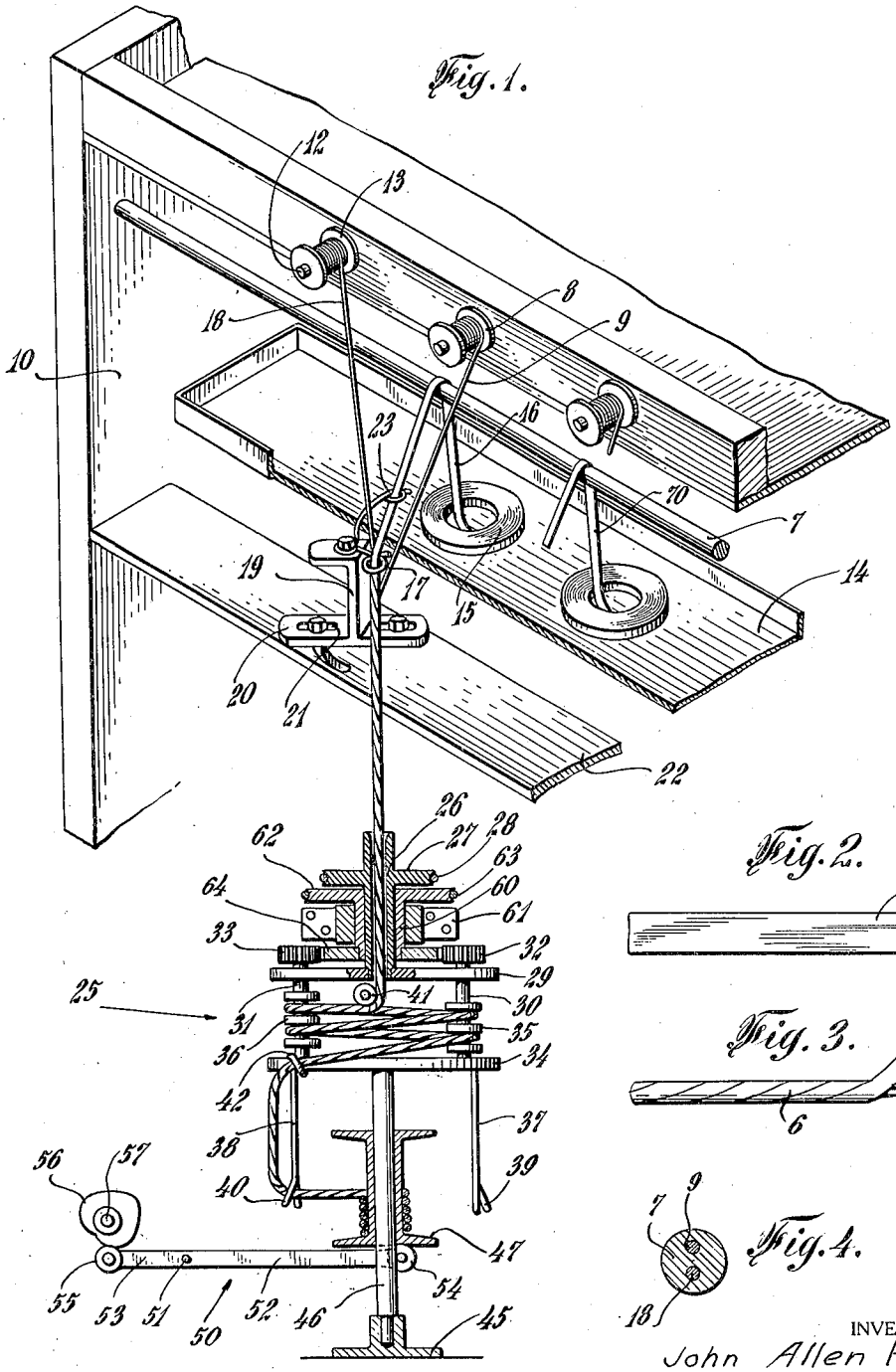


Fig. 2.

Fig. 3.

Fig. 4.

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Fig. 5.

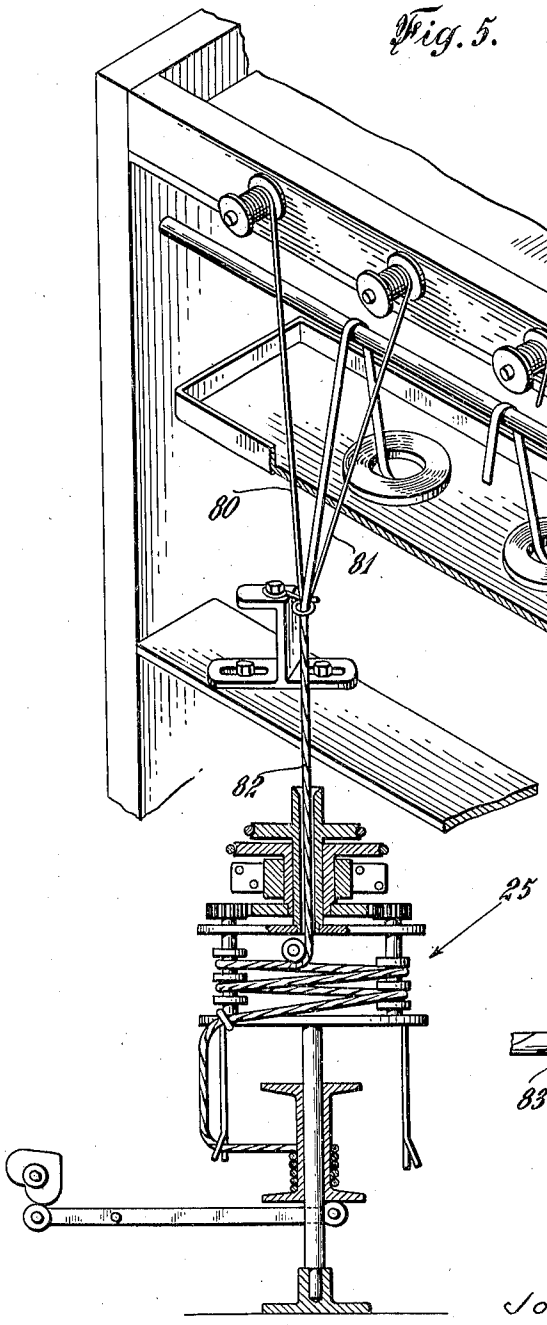


Fig. 6.

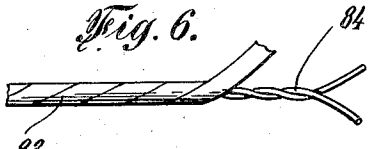


Fig. 7.



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UNITED STATES PATENT OFFICE.

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YARN AND PROCESS OF MAKING SAME.

Application filed January 23, 1924, Serial No. 687,938. Renewed January 25, 1926.

This invention relates to yarn structures and a process and apparatus for making the same. More specifically, the invention relates to simplified means for manufacturing yarn from paper strip composed of fibrous material which may be held together by a suitable binding material. An important step in the process consists in binding and forming suitable fibrous material, such as asbestos material, into a strip or band of sufficient cohesiveness and tenacity to undergo subsequent strand and yarn forming operations. The invention, moreover, relates to a yarn making apparatus by which a flexible, strong and smooth product is secured from asbestos paper strip without the employment of rubbing mechanism.

In my co-pending applications, Serial No. 654,117, filed July 27, 1923, Serial No. 654,118, filed July 27, 1923, Serial No. 684,325, filed January 4, 1924, and Serial No. 685,300, filed January 10, 1924, I have described various methods of working paper strip in conjunction with reinforcing filaments to secure a coherent and tenacious yarn structure. Particularly in my application 684,325, above referred to, I have described specific means for making a yarn from paper strip in which the strip is first treated to release the binder and then wrapped about or twisted with a single core filament. In the present invention, I have devised a process producing what is, in some respects, an improved product in which two or more filaments are employed, spaced one from the other between which the yarn material is closely bound and twisted, thus securing a yarn of marked coherence and strength.

Among the objects of the invention, therefore, is the provision of means for manufacturing yarn from paper strip imparting increased coherence and tenacity to the product. Another object is the utilization of a yarn construction in which the fibrous material is held in proper form by means of filaments or cores which are combined in the body of the yarn so as to bind the fibres together.

A further object of the invention is to provide a process or method of making yarn by bringing together simultaneously or substantially simultaneously a plurality of reinforcing filaments and asbestos paper-like material bound with sufficient cohesiveness and tenacity and adapted for yarn manufacture.

An important additional object is the provision of a process for applying core elements to fibrous yarn stock so that the fibres are held in proper relationship. It is an object also to provide means in yarn manufacture whereby fibrous material having fibres such as asbestos may be bound together to form a coherent, tenacious yarn. Further objects relating to various details of the mechanism, process and product will become apparent from consideration of the detailed description hereinafter presented, and of the drawings accompanying the specification, illustrating mechanism which may be preferred, and in which

Fig. 1 is a view partly in perspective, showing the mechanism employed in the process;

Fig. 2 is a view of a section of the paper used in the process;

Fig. 3 is a view of the completed yarn with an end unravelled to show the component elements of the yarn;

Fig. 4 is a cross section through the completed yarn;

Fig. 5 is a view showing a modified process;

Fig. 6 is a view showing a section of yarn made according to the process of Fig. 5; and

Fig. 7 is a cross-sectional view of the modified yarn.

The apparatus for carrying out the process of the present invention is indicated diagrammatically in Fig. 1. On a suitable standard 10 is mounted a support 11 having outwardly extending pins 12 upon which spools 13 of wire, thread or similar filamentary material are adapted to be placed. Beneath the support 11 is positioned a tray 14 which is designed to hold the various rolls 15 of tape or strip 16.

The strip 16, as indicated in Fig. 2, is in the form of paper manufactured from fibre stock which may contain either short or long fibres. The formation of the material into paper or paper-like material adapts the process particularly to the use of stock such as asbestos, the various fibres being held together by a binder such as starch. The pa-

per is manufactured in accordance to accepted processes, such, for example, as described in applicant's co-pending application, Serial Number 666,879, filed October 6, 1923, in which the material, there disclosed as 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, particularly at the surfaces thereof, 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 operations.

In the process, the various rolls are moistened in a liquid bath to loosen the binder inserted in the process of manufacturing the paper and the rolls placed upon the tray 14 as indicated in the drawing. Above the tray 14 is placed a guide rod 7 over which the tape 16 is adapted to be led and beneath the tray 14 a second guide in the form of a loop 17 is positioned through which the tape 16 and filament from the spool 13 are adapted to be fed. The loop 17 is supported from the bracket 19 having a base 20 slotted as at 21 to permit adjustment of the same upon a base plate 22. The strand formed by the junction of the tape 16 and filament 18 is joined immediately below the loop 17 by the wire 9 from the spool 8, said wire being separated from the tape by the width of the loop wall. The tape 16 is guided into the loop 17 through a loop 23 also supported from the bracket 19, this loop being so positioned relative to the filaments 9 and 18 that the tape as it passes through the loop 17 is approximately midway between the filaments, the filament 18 being on one side of the tape, and the filament 9 being on the other side thereof. The strand formed of the two filaments and tape is now subjected to a twisting operation in the twister mechanism 25, placed directly below the bracket plate 22. The twister is embodied in a twisting mechanism and a feeding mechanism, the twisting mechanism being actuated independently of the feeding mechanism, but the actuation of the feeding mechanism being partly dependent upon the speed of the twisting mechanism, so that by varying the driving of both of said mechanisms, or of one of them, the number of twists per inch of strand passing through the twister may be determined. As shown, the twisting mechanism includes a hollow sleeve 26 carrying near its upper end a drive pulley 27 grooved at its periphery to receive a drive cord 28 and at its lower end a cross bar 29 supporting at its outer ends the stub shafts 30 and 31. The upper ends of the stub shafts terminate in pinions 32 and 33 and the lower ends of the same are connected with a second cross bar 34, and intermediate the cross bars 29 and 34 the stub shafts carry guide rollers 35 and 36. From the ends of the cross bar 34 depend arms 37 and 38, terminating in pig tail guide loops 39 and 40. Additional guides are provided also in the roller 41 attached to the cross bar 29 and the guide loop 42 attached near the end of the cross bar 34.

The twister is supported from a base plate 45 by means of a standard 46 contacting with the center of the cross bar 34. The standard 46 is adapted to receive the spool 47 upon which the yarn is to be wound after it comes from the twisting mechanism and this spool is slidably mounted upon the standard to permit of proper placing of the yarn upon the spool. Mechanism for the appropriate reciprocation of the spool is diagrammatically indicated as consisting in a lever 50 pivoted at 51 and having a relatively long lever arm 52 and a relatively short lever arm 53. The lever arm 52 terminates in the roller 54 adapted to contact with the base of the spool 47 and the lever arm 53 terminates in the roller 55 adapted to contact with a cam 56 pivotally mounted at 57 adjacent the roller 55. It is apparent that rotation of this cam 56 will cause a reciprocation of spool 47, the curvature of the cam being such as to reciprocate the spool with the speed appropriate for the reception of the yarn coming from the twisting apparatus.

The feeding mechanism of the twister is included in a sleeve 60 surrounding the sleeve 26 and supported by a bracket 61, the upper end of the sleeve terminating in a drive pulley 62 grooved at its periphery to receive the drive cord 63 and carrying at its lower end the gear 64 which meshes with the stub shaft pinions 32 and 33 hereinabove described.

In the carrying out of the process of making yarn by the mechanism above described, and confining the method as applied in the production of a single final yarn, the various steps are as follows.

The roll of tape is moistened by water or any other liquid in the tray 14 and the strip 16 unwound preferably from the center of the roll and led over the guide 7 through the guide loops 23 and 17. The filament 18 is led through the guide loop 17 and thence into the twister and the filament 9 is fed directly into the twister. The twister is driven from an appropriate power source, the rotation of the same causing a twisting of the filaments extending above the twister to the spools 8 and 13, this twisting causing

the movement of the junction point of wire 9 upwardly with the wire 18 to a point immediately below the guide loop 19, further upward movement being restrained by the guide loop. The tape or strip 16 feeds beneath the guide loop 17 between the two filaments and as the various elements are twisted, the strand forms with the filaments 9 and 18 on opposite sides of the tape. This twisting action extends from the loop 17 to and through the twister 25 until the strand is finally wound upon the spool 47, forming the final yarn 6 as indicated in Fig. 3 of the drawing. It will be seen that in the final yarn the strip or band and the filaments are associated in a generally helical arrangement.

Note should be made of the fact that the filaments 9 and 18 form cores in the final yarn, the paper strip being wound completely around and covering the same. Due to the fact, however, arising from the method of initially joining the filaments with the strip that there is a separation of the filaments by the paper material there is no contact of the filaments in the final yarn, part of the material being compacted between the filaments and part being positioned around the same. By these means, a binding action is secured which is very effective in holding the yarn material in position upon the cores and preventing unravelling or disintegration due to friction or rubbing. Moreover, this construction, as will be readily apparent, gives to the yarn a high tensile strength, the core elements resisting breakage of the yarn from tension as well as forming a binding support for the yarn fabric.

It will be seen that the process above outlined is particularly applicable to material having relatively short fibres and which is non-coherent and formed into a strand with difficulty. Of such material is asbestos, and the process has been used with great success in the manufacture of asbestos yarns.

Mention has been made of the desirability of loosening the paper binder by moistening the roll of tape 15 at the beginning of the twisting operation. Moistening of the paper strip tends to soften the binder with which the paper material is impregnated during the paper making process and thus permit more readily the working of the same in the twisting and wrapping operation. It is not essential, however, that the binder be loosened as it is possible to carry out the process using the dry paper strip, the paper, however, being more subject to breakage when thus used. Also in certain instances, where a very flexible yarn is desired or where the thickness of the paper is such as to make its manipulation somewhat difficult, or wherever its presence is for any reason undesirable, the binder may be partially or completely removed either by dissolving as in liquid or by burning the same out of the paper, where asbestos or other mineral fibre is employed. Where a yarn of greater body is desired than results from the use of the single tape and filaments indicated in the above description, an additional paper strip 70 may be led conjointly into the strand with the strip 16 and the whole twisted together. Also instead of two filaments 9 and 18, separate core elements including a plurality of filaments may be fed into the twister with the tape, thus giving greatly increased tensile strength to the final product.

In the manufacture of the yarn, there is no limit necessary as to the filament used. Where the yarn is to be employed in uses requiring great resistance against wear and high tensile strength, metallic wires are preferably employed such as brass, the same also being heat resisting and therefore usable in connection with asbestos in the manufacture of heat resisting yarns. Where there is no necessity for resistance to heat, the filaments may be formed of cotton thread or various other vegetable fibres containing elements having greater tensile strength than the material entering into the makeup of the paper strip.

A modification of the process is illustrated in Fig. 5 of the drawing, in which two filaments 80 and 81 are fed together with the tape through the guide 17, and after a preliminary twisting prior to entry into the twister 25, the combined elements as a unitary strand 82 are subjected to a final twisting step to produce the final yarn 83 shown in Fig. 6 and Fig. 7. The apparatus of the modified process is similar to that of the Fig. 1 in all essential details.

In the operation of the modified process, the paper strip is wrapped and twisted about the filaments 80 and 81 instead of between them as in the preferred form, the filaments twisting together as indicated at 84 in Fig. 6 and forming an uneven core surface about which the paper is moulded. A yarn made according to this process while more subject to surface tear than the yarn of the preferred form is useful in such applications as require a yielding and smooth exterior with no metallic binding filaments exposed.

I do not claim broadly bringing together asbestos paper-like material and a plurality of filaments and then associating them into a yarn, as such broad subject matter is covered in my said co-pending application, Serial Number 685,300. However, I have found that in certain cases and for certain purposes it is advantageous to bring together the asbestos paper-like material and the filaments simultaneously or substantially simultaneously as specified or indicated in the process claims of this application.

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. One important use of the yarn of the present invention is in the manufacture of friction fabrics for brake and transmission linings.

Various other modifications and variations of the process indicated will be apparent to those skilled in the art, such modifications, however, as involve the subject matter and spirit of the invention indicated, being covered by the claims hereto appended.

Having described the invention, what is claimed is:

1. A process for making yarn from asbestos paper strip containing a workable binder, which comprises bringing together simultaneously or substantially simultaneously a paper strip and a plurality of reinforcing elements, and twisting said strip with said reinforcing elements.

2. A process of making yarn from asbestos paper strip containing a workable binder, which comprises supplying a paper strip at low tension and a plurality of reinforcing elements at higher tension, bringing them together simultaneously or substantially so, and twisting the strip with the reinforcing elements.

3. A process of making yarn from asbestos paper strip containing a workable binder, which comprises supplying a paper strip from a package so formed that the package may remain stationary and the tension of the strip will depend upon the weight of the strip extending from the package, passing the strip into engagement with a guide to determine the direction in which the strip is to be drawn from the package and to assist in determining the subsequent path of the strip, bringing the strip and a plurality of reinforcing elements together at a common point or substantially so, and simultaneously twisting said strip with said reinforcing elements.

4. A process of making yarn from asbestos paper strip containing a workable binder, which comprises feeding a strip from the center of a flat roll to a guide at which the direction of movement of the strip is changed, bringing together the strip from said guide and two reinforcing elements against frictional drag by passing them through a common guide, and twisting the strip and the reinforcing elements with each other.

5. A process of making yarn from asbestos paper strip containing a workable binder, which comprises feeding a strip from a flat horizontally-positioned roll upwardly to a guide, passing said strip and a plurality of reinforcing elements downwardly to and through a guide, and twisting the strip and elements thus brought together.

6. A process of making yarn from asbestos paper strip containing a workable binder, which comprises drawing a strip from a flat roll in a direction transverse to the plane of the roll, passing the strip to a guide, bringing together the strip from said guide and a plurality of reinforcing elements from suitable sources of supply by passing them through a common guide, and twisting the strip and elements together.

7. A process of making yarn from asbestos strip material of low tensile strength and containing a workable binder, which comprises supplying a strip to a guide from a flat roll of material and in a direction transverse to the plane of the roll, bringing said strip and a plurality of reinforcing elements together simultaneously or substantially so, and twisting said strip and elements together.

8. A process of making yarn from asbestos strip material of low tensile strength and containing a workable binder, which comprises supplying a strip from a flat roll and in a direction transverse to the plane of the roll, changing the direction of said strip by means of a guide, bringing together the strip and a plurality of reinforcing elements simultaneously or substantially so, and twisting together said strip and reinforcing elements.

9. A method of making 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, bringing together simultaneously or substantially simultaneously the strip or band and a plurality of reinforcing filaments, and twisting said strip or band with said reinforcing filaments to form a yarn.

10. A method of making 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, bringing together simultaneously or substantially simultaneously the strip or band and a plurality or reinforcing filaments with said reinforcing filaments located on opposite sides of the strip, and twisting said strip or band with said reinforcing filaments to form a yarn.

11. A method of making 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, bringing together simultaneously or substantially simultaneously the moistened strip or band and a plurality of reinforcing filaments, and twisting said moistened strip or band with said reinforcing filaments to form a yarn.

12. A method of making asbestos yarn for the manufacture of fabrics and other purposes, which comprises 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, moistening said strip or band, bringing together simultaneously or substantially simultaneously the moistened strip or band and a plurality of reinforcing filaments, and twisting said moistened strip or band with said reinforcing filaments 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 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, bringing together simultaneously or substantially simultaneously the moistened strip or band and a plurality of reinforcing filaments with said reinforcing filaments located on opposite sides of the strip or band, and twisting said moistened strip or band with said reinforcing filaments to form a yarn.

14. A method of making asbestos yarn from uniform paper-like strips or bands of asbestos material bound with sufficient cohesiveness and tenacity and adapted for yarn manufacture, which comprises bringing together simultaneously or substantially simultaneously a strip or band and a plurality of filaments, and associating said strip or band and said filaments in a generally helical arrangement to form a yarn.

15. A method of making asbestos yarn from uniform paper-like strips of asbestos material bound with sufficient cohesiveness and tenacity and adapted for yarn manufacture, which comprises bringing together simultaneously or substantially simultaneously the strip or band and a plurality of reinforcing filaments with said filaments arranged on opposite sides of the strip, and associating said strip or band and said filaments in a generally helical arrangement to form a yarn.

16. A method of making asbestos yarn for the manufacture of fabrics and other purposes, which comprises binding and forming asbestos material into paper-like strips or bands of sufficient cohesiveness and tenacity to undergo subsequent strand and yarn forming operations, and bringing together simultaneously or substantially simultaneously one or more strips or bands and a plurality of reinforcing filaments to form a yarn, at least one of said filaments being metallic.

17. An asbestos yarn comprising a core formed of a plurality of filaments twisted together and, arranged helically thereabout, one or more strips or bands of asbestos material bound with sufficient cohesiveness and tenacity to undergo strand and yarn forming operations.

18. An asbestos yarn comprising a core formed of a plurality of wire helices fitting together and, arranged therearound and combined therewith, asbestos paper-like material bound with sufficient cohesiveness and tenacity to undergo strand and yarn forming operations.

19. A method of making asbestos yarn from asbestos paper-like material of sufficient cohesiveness and tenacity and adapted for yarn manufacture, which comprises mechanically bringing together simultaneously or substantially simultaneously the paper-like material and a plurality of filaments, and mechanically associating said paper-like material and said filaments in a generally helical arrangement to form a yarn.

20. A method of making asbestos yarn from asbestos paper-like material bound with sufficient cohesiveness and tenacity and adapted for yarn manufacture, which comprises mechanically bringing together simultaneously or substantially simultaneously the paper-like material and a plurality of reinforcing filaments with said filaments separated by the paper-like material, and mechanically associating said paper-like material and said filaments in a generally helical arrangement to form a yarn.

21. A method of making asbestos yarn for the manufacture of fabrics and other purposes, which comprises binding and forming asbestos paper-like material of sufficient cohesiveness and tenacity to undergo subsequent mechanical strand and yarn forming operations, and mechanically bringing together simultaneously or substantially simultaneously said paper-like material and a plurality of reinforcing filaments to form a yarn.

22. A method of making asbestos yarn from asbestos paper-like material bound with sufficient cohesiveness and tenacity and adapted for yarn manufacture, which comprises moistening said paper-like material, mechanically bringing together simultaneously or substantially simultaneously the paper-like material and a plurality of reinforcing filaments, and mechanically associ-

ating said paper-like material and said filaments in a generally helical arrangement to form a 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 comprises moistening said paper-like material, and mechanically bringing together simultaneously or substantially simultaneously said paper-like material and a plurality of reinforcing filaments to form a yarn.

In testimony whereof, I affix my signature.

JOHN ALLEN HEANY.