Dec. 8, 1925. 1,564,238

J. A. HEANY

ASBESTOS INSULATING MEDIUM

Original Filed Jan. 30, 1920

Fig. 1

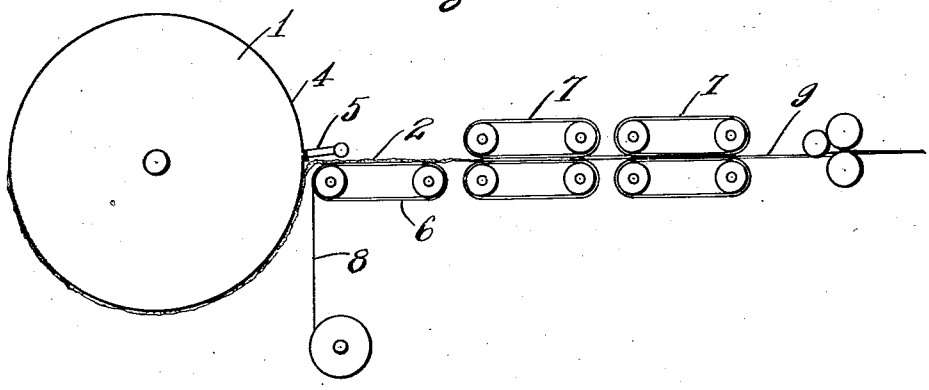



Fig. 2

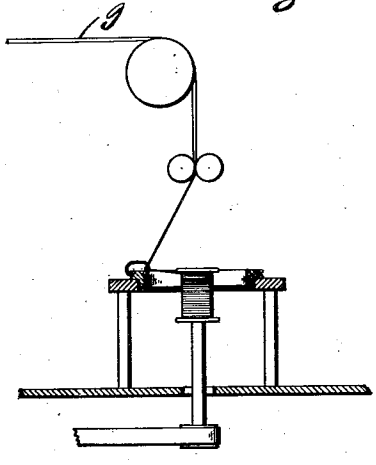
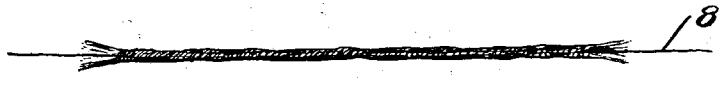



Fig. 3




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# UNITED STATES PATENT OFFICE.

JOHN ALLEN HEANY, OF NEW HAVEN, CONNECTICUT, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ROCKBESTOS PRODUCTS CORPORATION, A CORPORATION OF MASSACHUSETTS.

## ASBESTOS INSULATING MEDIUM.

Application filed January 30, 1920, Serial No. 355,117. Renewed April 28, 1925.

*To all whom it may concern:*

Be it known that I, JOHN ALLEN HEANY, a citizen of the United States, and a resident of New Haven, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Asbestos Insulating Mediums, of which the following is a specification.

My invention relates to asbestos yarn and to the method of producing the same. The general objects of the invention are: to lower the cost of production of the yarn, to increase its tensile strength, to improve its insulating qualities, and to decrease its combustible content. More particular objects will become apparent as the description proceeds.

So far as I am aware, the only method known prior to my invention of producing asbestos yarn on a commercial scale involves the usual spinning operations employed in the textile arts. Since asbestos fibers have a smooth glassy texture and do not possess the hooks and grooves found on cotton and other common textile fibers, they do not adhere together or felt, and it is therefore impossible to produce an asbestos yarn approximately pure by the usual spinning operations employed in the manufacture of cotton and other common yarns. Instead, it has been found necessary, in practicing the method heretofore used, to mix the asbestos fibers with a large percentage of cotton, particularly in making yarn of the smaller sizes. Furthermore, the long-fibered asbestos, which is relatively scarce and expensive, has been used; for even with the large percentage of cotton employed, the short-fibered and relatively cheap asbestos has not been considered suitable for spinning.

The asbestos yarn produced by this old process is expensive. Moreover, because of the high percentage of combustible material intermingled throughout with the asbestos, the very purpose of the ultimate product to serve as a heat-resisting medium is largely defeated. Furthermore, the yarn has such low tensile strength that it is difficult and expensive to work it up into fabrics and other commercial products.

The yarn of my invention may be made the practical equivalent of a pure asbestos yarn; it has great tensile strength as compared with the yarn produced by the old process; and it is manufactured by a method which renders it feasible to use successfully the cheap grade of asbestos commonly known in the art as "mill fiber." "Mill fiber" is readily obtainable and at a price far below that of the hand-worked, long-fibered asbestos largely used in the old process.

The specific method I employ in making yarn from the "mill fiber" asbestos may be briefly described as follows: I add initially to the crude "mill fiber" or other cheap grade of asbestos a small percentage of cotton, (for example, about 10%), and run the mixture through a "picker." Here the cotton and asbestos are thoroughly beaten, picked apart and intermingled in a flocculent condition and also subjected to an air current and to sifting in order to carry away the dust and other impurities. I preferably pass the asbestos and cotton two or more times through the "picker" so as thoroughly to separate and carry away the impurities which form a considerable proportion of the "mill fiber", and so as to produce at the same time a uniform mixture of the cotton and asbestos in a flocculent condition. The product obtained is a clean, flocculent and uniform mass of asbestos and cotton fibers, thoroughly intermingled and intimately entangled, which is adapted to be carded without further treatment.

This method of simultaneously cleaning the asbestos and mixing it with the cotton enables me to take the inferior grades of asbestos, including even the cheap "mill fiber" as it comes from the mines and inexpensively prepare such asbestos for the carding operations. As is well known, the "mill fiber" asbestos sold in commerce consists of short irregular fibers and particles of asbestos mixed with a considerable proportion of crushed rock, dirt and dust. The problem has been to separate out the impurities and retain the asbestos fibers in condition for carding; and this problem was a serious one, for most of the fibers are so short that if the crude material were subjected to the ordinary beating and screening operations a very large percentage of the fibers would be carried away with the impurities. The method I have described (though discovered only after much experimentation) solves the problem


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in a simple way. By consolidating the hitherto-distinct steps of cleaning the asbestos and mixing it with the cotton, I not only produce the desired mixture in a better condition for carding, but also at the same time avoid excessive loss of the short fibers of asbestos. The short asbestos fibers become entangled with the hooks of the relatively long cotton fibers, and are thus held from escaping with the dust and other impurities, so that, although there is some loss of the asbestos, the loss is not nearly so great as it would be, were it attempted to clean the "mill fiber" alone by the mechanical operations heretofore employed in cleaning asbestos.

I next take the flocculent mixture of asbestos and cotton obtained by the above process and subject it to a thorough carding to produce uniform slivers of substantially parallel fibers. These slivers are fed from the doffer combs to and between longitudinally-progressing and laterally-reciprocating belts or rubbers, by which they are rolled under pressure into strands, each consisting of a bundle or roll of asbestos fibers having intermingled therewith a small percentage of cotton. In the method I preferably employ, a reinforcing filament of small diameter but relatively high tensile strength is fed through the rubbers in parallel relation with each sliver, and the latter is transversely rolled thereon. The strand thus produced consists of a thin filamentary core of relatively high tensile strength embedded in and completely enclosed by a soft roll or sheath of asbestos fibers uniformly mixed with a small percentage of cotton fibers. When the initial mixture comprises approximately 10% of cotton, the finished yarn will have about 20% of cotton, due partly to the addition of the reinforcing filament, and more largely, to the asbestos losses during the various operations of mixing, carding, etc. Of course it is to be understood that the percentage of cotton in the finished yarn may be varied to suit different conditions and requirements. I can successfully make, by my process, beginning with crude and much adulterated "mill fiber", as it comes directly from the mines, a yarn having a cotton content as low as 10%, which, for all practical purposes, is the equivalent of a pure asbestos yarn.

The strand which has been produced by the operations described above is adapted to be twisted together with another similar strand, or it may be twisted by itself to form the product which is the subject of this application, viz, a tightly-twisted yarn comprising asbestos fibers and only a harmless amount of cotton fibers, a portion of the cotton being in the form of a central thread of relatively high tensile strength, and the remainder of the cotton being uniformly distributed among the asbestos fibers and serving to bind the latter together and hold them around or upon the thread.

The yarn of my invention has several distinct and important advantages over the yarn produced by the old process. Although its cotton content may be much less than that of the old yarn, its tensile strength is from four to five times as great as that of the old yarn. This gives my yarn a very decided advantage as regards the cost of labor and equipment required in subsequent weaving or braiding operations. A more important advantage resides in the superior heat-resisting quality of my yarn, which is due not only to its smaller cotton content, but, more particularly, to the peculiar disposition thereof. In my yarn a part of the cotton is segregated, being concentrated in the form of a spun filament of relatively high tensile strength, located preferably along the axis of the yarn. The primary function of this filament is to give the yarn ample tensile strength to undergo the manufacturing operations to which it is to be subjected. The remainder of the cotton is uniformly entangled with the asbestos fibers. This part of the cotton contributes to the tensile strength of the yarn, but it is not substantially needed for this purpose and its primary function is to entangle short asbestos fibers stably about the central thread, and while this cotton should be in sufficient ratio to such asbestos fibers as are actually used to effect this function, the ratio may be small even with short asbestos fibers.

The result effected by the particular distribution of the cotton in my yarn is this: The central reinforcing thread is entirely enveloped by a covering consisting principally of asbestos fibers before the yarn is twisted, and the finished yarn comprises a tightly-twisted insulating covering or sheath enclosing said reinforcing thread which greatly protects the same from the destructive effects of heat. Because of the structure of the insulating envelope, it is impossible to expose the reinforcing filament to the full effects of external heat without tearing through the envelope.

Moreover, the central thread occupies such a small space in the yarn, and the ratio of the asbestos to the other cotton intermingled therewith is so high, that after the yarn has been woven into a fabric or braided on an electrical conductor, for example, the entire cotton content of the yarn may be destroyed without seriously impairing the further usefulness of the fabric or other ultimate product. For some purposes, therefore, the filamentary core may be regarded as a temporary tension member to impart to the whole combination sufficient

strength to enable it to be twisted, woven, etc., while the cotton fibers intermingled with the asbestos may be regarded as a temporary binding medium to facilitate first the manufacture of the yarn, and in turn, the manufacture of the yarn into ultimate products.

On the other hand, in the yarn produced by the well-known spinning process, the cotton fibers are uniformly distributed throughout the yarn and all serve the double function of holding the asbestos fibers together and giving tensile strength. In order to perform the latter function with even a slight degree of effectiveness, the ratio of the cotton to the asbestos must necessarily be high, particularly in yarn of the smaller sizes. It therefore follows that if the cotton content is destroyed, the ultimate product of which the yarn is a constituent is, as it were, honeycombed throughout its entire extent and readily disintegrates. On the other hand, my yarn embodies the thought of divorcing the function of binding the asbestos fibers from the function of imparting tensile strength. In effect, I have segregated a small part of the cotton content of the old yarn, forming therewith a spun filament to perform the strengthening function (which it does far more effectively than was done by the total cotton content of the old yarn), retaining only enough cotton intermingled with asbestos fibers to properly hold and bind the latter.

I am thus enabled to discard one half or more of the cotton content of the old yarn and still produce a yarn far superior in strength and heat-resisting power; and I do this by a simple and inexpensive process which enables me to use cheap materials practically unavailable before.

I do not, of course, limit my invention to any particular ratio of cotton to asbestos, either in the initial mixture or in the finished yarn, since the ratio will naturally be varied in practice to suit different requirements and conditions. The gist of my invention, so far as the process is concerned, resides in mixing the asbestos even while quite impure with only sufficient cotton to prevent excessive asbestos losses during subsequent operations, and without regard to any function of imparting cohesiveness to the carded slivers or tensile strength to the finished yarn, carding the mixture to produce slivers, rolling the slivers under pressure, and twisting the rolls together with reinforcing threads. Whereas in the old process it has been found necessary in making asbestos yarn of the smaller sizes to add as much as 50% of cotton to the asbestos in order to produce slivers having sufficient cohesion to undergo mule-spinning, and in order to produce a yarn having the required tensile strength; in my process it is necessary to add to the asbestos only enough cotton to prevent excessive asbestos losses during mixing, carding, etc., without regard to the size of the yarn or to its tensile strength; since in my process in which rolling and twisting steps are substituted for mule-spinning, the carded slivers are not subjected to any strain and the tensile strength of the finished yarn is not dependent on the cotton content of the slivers. A further important result obtained is that the new process will produce a high-grade yarn out of the low-grade "mill fiber" asbestos which has heretofore not been successfully used, except as an adulterant, in the production of asbestos yarn.

Various modifications may be made without departing from the spirit of my invention. It is, for example, within the scope of the invention to use a filament of metal, such as brass wire, as the strengthening member instead of a cotton thread. Instead of rolling the asbestos fibers around a filament, I may roll these fibers into a strand and then subsequently twist this strand together with a strengthening filament of cotton or other fibrous material or metal. Instead of a single strengthening filament, two or more such filaments may be used, if desired. Other changes within the spirit of the invention will suggest themselves to those skilled in the art.

In the drawings, in which a preferred embodiment of apparatus suitable for carrying out the invention is illustrated,—

Fig. 1 is a diagrammatic view of an apparatus for applying carded asbestos fibers to a supporting thread;

Fig. 2 is a similar view of apparatus for twisting the strand produced by the apparatus shown in Fig. 1;

Fig. 3 is a view of the product obtained by twisting a single strand.

I do not illustrate the method of cleaning the asbestos and mixing it with cotton since the description already given is sufficient to enable one skilled in the art to practice said method.

In the drawings, there is shown at 1 the upper doffing cylinder of a carding machine used in combing out and arranging the asbestos and cotton fibers in the best form for effective manipulation. Bands or slivers 2 of carded fibers are stripped from the doffer rings 4 by means of oscillating combs 5, and the slivers 2 are carried by the transferring belt 6 to the entrance end of one or more sets of rub motion belts 7 which are given both a longitudinally-progressing and a laterally-reciprocating motion to thereby roll or rub the individual bands of carded fibers 2 together with a corresponding number of supporting or reinforcing threads 8 between adjacent stretches of the belts and


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thereby apply the asbestos fibers in the form of a soft convoluted sheath in a completely-enclosing relation to the centrally-disposed supporting threads. The resulting strand 9 emerging from the rub belts 7 consists, as will be seen, of a body of asbestos fibers having intermingled therewith a small percentage of other fibers rolled or rubbed by motions applied across their length in a compact engaging relation to a centrally-disposed supporting thread. The strand 9 is preferably wound at this stage in the operation into rolls or cops, in which form they may be conveniently transferred to a suitable twisting apparatus such as illustrated in Fig. 2, or the strands 9 may be led directly into twisting mechanism forming part of the same apparatus in which the rub motion mechanism referred to is embodied.

What I claim is:

1. The process of treating materials in preparation for the manufacture of yarn which consists in combining the cleaning of crude asbestos, and the incorporating therewith of cotton, by picking apart the asbestos material and the cotton fibers and mixing them in a flocculent condition.

2. The process of manufacturing asbestos yarn which consists in mixing asbestos fibers with a relatively small percentage of cotton, carding the same to produce a sliver of uniformly-distributed asbestos and cotton fibers, rolling said sliver under pressure around a relatively strong filament, and finally twisting the strand thus produced.

3. The process of manufacturing asbestos yarn which consists in mixing asbestos fibers with less than 15% of cotton, carding the same to produce uniform slivers, rolling said slivers under pressure around relatively strong filaments, and finally twisting the strands thus produced.

4. The process of manufacturing yarn from low-grade, short-fibered asbestos which consists in mixing such asbestos with a small percentage of cotton for the purpose of holding the short asbestos fibers together to prevent excessive losses of the latter during the yarn-forming operations, carding the mixture of asbestos and cotton to produce a sliver, rolling the sliver under pressure around a thin but relatively strong filament, and finally twisting the strand thus produced.

5. The process of manufacturing asbestos yarn from the low-grade asbestos commonly known in commerce as "mill fiber"; which consists in simultaneously cleaning the crude asbestos and mixing therewith a relatively small percentage of cotton to produce a clean flocculent mass of intimately-entangled asbestos and cotton fibers, carding the same to form a sliver, feeding the sliver in parallel relation with a relatively strong filament between longitudinally-travelling and laterally-reciprocating surfaces whereby the sliver is rolled under pressure around the filament, and finally twisting the strand thus produced.

6. The process of making asbestos yarn which consists in mixing asbestos with cotton, the ratio of cotton to asbestos being sufficient to prevent excessive asbestos losses during subsequent operations but being substantially smaller than that necessary to adapt the mixture for a spinning operation, carding the asbestos and cotton fibers to form slivers, rolling the slivers under pressure around relatively-strong filaments, and finally twisting the strands thus produced.

7. The process of making asbestos yarn from the low-grade asbestos commonly known in commerce as "mill fiber," which consists in mechanically cleaning the mill fiber while mixing therewith cotton fibers, whereby the short asbestos fibers are entangled with the relatively long cotton fibers and held from escaping with the dust and other impurities, carding the mixture thus produced to form a sliver, rolling the sliver under pressure to form a compact bundle or roll of longitudinally-arranged fibers, and twisting said roll together with a relatively strong filament.

JOHN ALLEN HEANY.