Nov. 23, 1943. H. D. MINICH 2,335,191

COVERED PRODUCTS AND THE PROCESS FOR PRODUCING THEM

Filed Nov. 30, 1942

Fig. 3

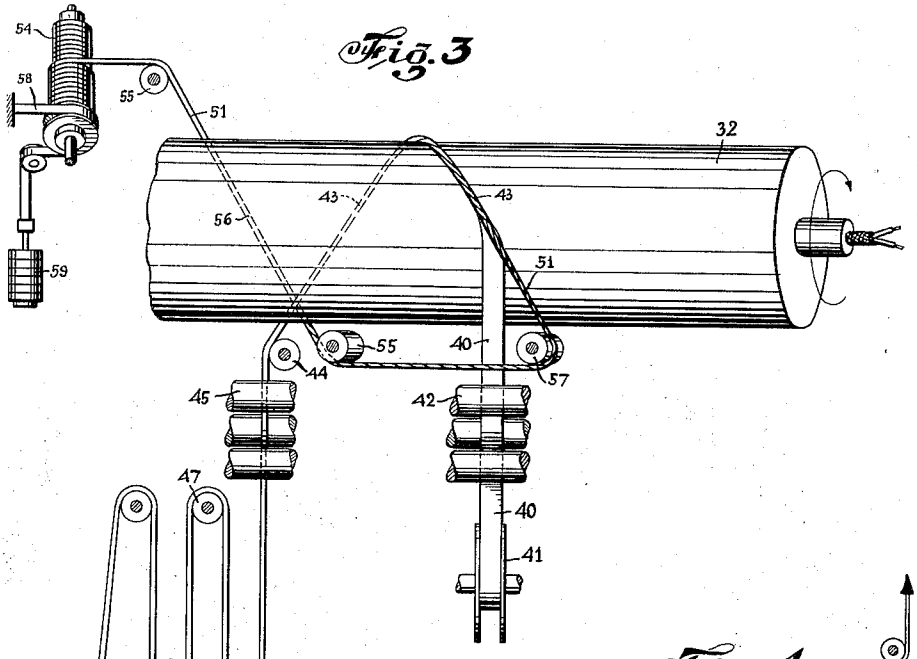


Fig. 4

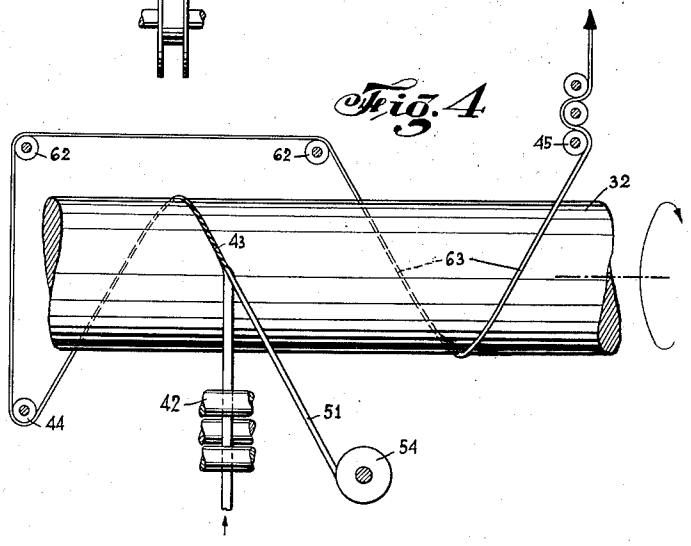


Fig. 5



Fig. 6

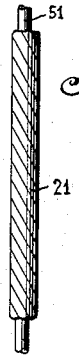
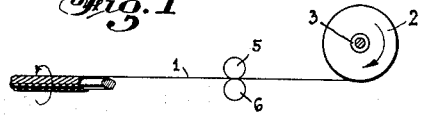


Fig. 1



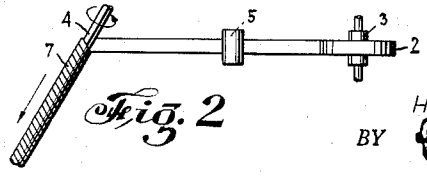


Fig. 2

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COVERED PRODUCT AND THE PROCESS FOR PRODUCING IT

Henry D. Minich, North Tarrytown, N. Y.

Application November 30, 1942, Serial No. 467,357

8 Claims. (Cl. 57—160)

This application is a continuation-in-part of my applications, Serial No. 77,123, filed April 30, 1936; Serial No. 350,627, filed August 3, 1940; and Serial No. 452,780, filed July 29, 1942.

This invention relates to covered products and the processes for producing them. The products are slender, elongated objects, preferably substantially circular in cross-section. They include covered filaments of different composition and including a core of one or more strands of wire, or thread, or of a plurality of strands, which may either be twisted or substantially straight, fabric materials including threads of cotton, linen, rayon, etc., whether the individual strands are twisted together or substantially straight, threads of glass fibers in which the fibers may be twisted or substantially straight, gut, etc.

According to the invention, an elongated core, such as a thread, is enclosed in a laminated covering formed by heating an elongated strip-like film formation of material, such as rubber hydrochloride film to a temperature at which it is coalescent and elastic, and stretching and rolling the so heated film formation in a spirally overlapped relation over the elongated thread core, so as to coalesce, compact and unite under pressure the overlapping film formation into a laminated covering structure while it is maintained heated and stretched around the core, and then cooling the covering with the core enclosed therein to the normal lower temperature at which the core forms a solid flexible enclosure surrounding and protecting the core.

Such covered products of the invention are slender, elongated objects, preferably substantially circular in cross-section. They include filaments of wires of different composition and including single strands of wire and wires made up of a plurality of strands, which may either be twisted or substantially straight, fabric materials including threads of cotton, linen, rayon, etc., whether the individual strands are twisted together or substantially straight, threads of rubber, threads of glass fibers in which the fibers may be twisted or substantially straight, gut, etc.

The covering film is stretched as it is wound spirally over the core. The film is in the form of a narrow ribbon which may be up to an inch in width but is generally narrower, of the order of about a quarter of an inch in width. As the film is wound over the core, it is heated and stretched to at least one half of its original thickness. It is applied hot to the material which it covers, and with sufficient pressure so that the overlapping layers of the covering coalesce to form a unitary sheath for the core and constitute therewith a unitary product.

It is a characteristic of the heated, stretched film that it is elastic and tends to retract. Since in the covered products of the invention the heated laminated film covering is stretched and tightly wrapped over the core while the film is heated and elastic, the laminated covering on cooling shrinks around the core as though the covering were shrunk to it.

Since the subject matter of the present invention was discovered while experimenting with thin rubber hydrochloride film, which was commercially available at the time of the invention, I will describe herein specific exemplifications of the invention as practiced with such thin rubber hydrochloride film material, reference being had to the accompanying drawing, wherein

Fig. 1 is an elevation and Fig. 2 a plan view showing more or less diagrammatically the use of equipment for wrapping a rayon thread;

Fig. 3 is a diagrammatic front view of another apparatus assembly used for making elongated laminated products, such as threads or covered wires, in accordance with the principles of the invention;

Fig. 4 is a diagrammatic view similar to Fig. 3 of an arrangement for making elongated laminated products of the invention;

Fig. 5 is a cross-sectional view showing a covered product of the invention in the form of a core, such as a wire core, covered by a laminated covering; and

Fig. 6 is an elevational view of a covered multistrand wire cord enclosed in a laminated covering of the invention and having a cross section of the type shown in Fig. 5.

In the drawing, the film in the form of a narrow ribbon 1 about one-quarter inch wide and .001 inch thick is supplied from the roll 2 which is wound on the core 3. As the film passes from the roll to be wrapped around the thread 4, it passes between the rolls 5 and 6. The rolls are forced together to prevent any slippage of the film between them. In practice, the ribbon will ordinarily contact one of the rolls over a large portion of its circumference to prevent any slippage. One or both of these rolls are driven at a surface speed no greater than one half the speed at which the thread 4 is twisted in winding the ribbon on it. One, and preferably both, of the rolls 5 and 6 are heated, so that as the ribbon comes in contact with them it is heated to a temperature at which it may be easily stretched. A temperature above about 70° C. is preferred for

stretching, and usually a temperature of about 100° C. will be employed. The heated film is wound spirally on the thread by rotating the thread rapidly with a surface speed at least twice that of the surface speed of the rolls 5 and 6. As the thread is rotated it is moved laterally in the direction shown by the arrow in order to produce the spiral winding 7. Any suitable means for rotating and moving the thread, such as the means shown in Figs. 3 and 4, may be employed.

The ribbon 1 will usually be about .001 of an inch thick. It may be no more than .008 inch thick and may be as thick as .0015 inch or thicker. It may be a plasticized film or unplasticized. It may contain stabilizer, such as hexamethylene tetramine. It may be colored with dyes or pigments. The nature and composition of the ingredients added to the film will at least in some instances be controlled by the use to which the wrapped article is to be put.

After heating and before contacting the thread 4, the film is stretched, and the thickness of the film, as it is applied to the thread, may be no more than about .002 inch or even less and may be as thick as .0007 inch. Where only a color effect is desired, the wrapping, of course, may be exceedingly thin.

In wrapping the thread, the edges of the film are overlapped, and as the film is heated and as there is tension on the film due to the greater surface speed of the thread 4 as compared to the speed of the rolls 5 and 6, there is pressure on the stretched film as it is wrapped on the thread, and this pressure is sufficient to cause coalescence of the overlapping plies of the film unless, of course, the film is cooled before it reaches the thread. According to the preferred process the overlapping plies are coalesced. To insure the desired coalescence the heated film may be pressed to the thread by a roller or other suitable means. The overlapping may be sufficient to form two layers of the film in the coating, but ordinarily the coating will be no more than one layer in thickness. A second wrapping may be applied in a spiral of opposite direction.

The rubber hydrochloride material which has been subjected to the stretching operation while being coalesced and compacted over the core exhibits X-ray diffraction patterns of an oriented rubber hydrochloride crystalline structure of the type described in the article "An X-ray study of rubber hydrochloride," by Gehman, Field and Dinsmore in the India Rubber World, volume 98, No. 3, page 39.

Although the invention has been described more particularly as applied to the coating of rayon thread, various other articles may be wrapped in the same way. Glass thread wrapped in this way has been used to replace the gut of a tennis racket, thus forming a tennis racket string which is not affected by the weather. Furthermore an ordinary gut string has been similarly wrapped with rubber hydrochloride to protect it from moisture. Cotton, rayon and linen threads coated in this manner with rubber hydrochloride film are impervious to water and moisture and are therefore adapted for the use where the usual threads cannot be employed. Wire so coated has been found satisfactory for conducting electrical currents of low amperage, the rubber hydrochloride coating serving as an insulating material. Unplasticized rubber hydrochloride is ordinarily more satisfactory for electrical insulation than plasticized material. The wire may be composed of a single filament or many fine threads whch may be either twisted or untwisted. Any slender, elongated object of substantially cylindrical cross-section may be wrapped with rubber hydrochloride, as shown, to make it water-proof and moisture-vapor-proof.

Although in describing the drawing the thread has been described as being rotated, it is, of course, possible to mount the rolls 5 and 6 and the roll 2 on a revolving base which revolves around the thread and in this case, the thread may be held stationary. Furthermore, instead of moving the thread laterally with respect to the rest of the equipment (as indicated by the perpendicular arrow), the equipment may be moved and the thread may be left stationary.

Figs. 3 and 4 illustrate diagrammatically arrangements which have been evolved and used by me for producing covered products of the invention on a commercial basis, these arrangements being designed for the manufacture of either elongated covered products of the invention or laminated thread products in general. To simplify the description of the process of making a covered product by the arrangement of Figs. 3 and 4, I will first describe how a coreless laminated thread-like product is made by the arrangement of Figs. 3 and 4.

A film strip 40, stored in the form of a roll on spool 41, is fed by a set of suitably driven feed pinch-rollers 42, toward the heating surface of the cylinder, in a substantially flat condition, and the heated film formation is pulled on a bias along a helical path 43 over the heating cylinder 32 and led therefrom over a grooved guide roller 44 located on the other side of the cylinder 32 to a set of revolvably mounted stretch pinch-rollers 45 which are rotated so as to withdraw the film formation 40 from the heating cylinder 32 at a speed several times greater than the speed at which the film strip is being fed by the feed rollers 42.

The rotational speed of the heating cylinder 32, and the location of the feed rollers 42, guide roller 44 and stretch rollers 45 is so adjusted as to cause the rotating heating cylinder 32 not only to heat the film formation 40, but also to roll it upon itself as it is being stretched, while its lateral overlapping portions are being coalesced and and compacted into a laminated filamentary product, which is suitably cooled before reaching the stretching rollers 45. The resulting filament or thread product delivered by the stretching rollers is then suitably rolled on reel 46.

The minimum temperature of the roll 32 is such that the rubber hydrochloride film will roll and not slide. This depends somewhat upon the surface of the roll. The speed at which the laminated filament is drawn from the cylinder 32 may be four times, more or less, that at which it is fed to the cylinder. The amount of stretch is dependent upon the difference in the circumferential speed of the cylinder 32 and the stretching rollers 45. The filament, in being drawn from the cylinder may be passed under tension over the freely revolvable grooved roller 44. This tends to compact the filament and cause the outer layer of film to become firmly united with the balance of the filament.

By suitably varying the location of the feed rollers 42 and the deflecting roller 44 to a position closer or farther away from the heating cylinder 32, and by varying their locations with respect to the cylinder, the extent of the helical path 43 along which the combined heating, roll-

ing, stretching and compacting actions take place, may be adjusted within a wide range. The effect of these combined operations is further adjustable by varying the width of the strip **40**, the temperature of the cylinder and the other variable factors entering in the process.

To obtain a still more uniform threadlike product, it is of advantage, after having it formed by rolling it in one direction, for instance, as it passes over the helical path **43** of the heating cylinder **33**, to subject it to an opposite roller treatment. Fig. 4 shows one form of arrangement for utilizing the same heating cylinder **32** for performing both rolling motions. The thread, after having been formed along the helical path **43**, as in the arrangement of Fig. 3, is led from roller **44**, over two similar rollers **62** into engagement with the rotatably mounted cylinder along an opposite pitched helical path portion **63**, the doubly rolled laminated thread product being shown withdrawn directly by the stretching rollers **45**. The effect of the reversed rolling action along the helix path **63** may be adjusted in a manner analogous to that explained in connection with the helix path **43**.

I have also found that the process of the invention as used for making the novel laminated thread-like or cord-like products described above in connection with Figs. 3 and 4 lends itself for making covered slender elongated objects, such as covered threads or cords having an inner core—for instance, of textile or rubber or glass threads or wire strands.

In making a covered thread with the arrangement of Fig. 3, a strip **40** of the covering film is first led from feed pinch-rollers **42** over rotating heating cylinder **32** toward stretching punch-rollers **45**, thereby starting the operation of making a spirally laminated stretched thread out of the film cover strip **40**. Thereupon, the end of a thread **51** which is to be covered is withdrawn from the storage spool **54** and led under or looped around the portion of the covering strip **40** near the point where it makes contact with the heated cylinder surface, so as to be caught by a pulled with the rolled strip **40** along its helical cylinder path **43** toward the stretching rollers **45**. This starts automatically the covering operation, because the covering strip **40**, instead of being merely spirally wound upon itself as it is being pulled on a bias over the heated cylinder surface, in the manner before described, is now spirally wound in overlapped relation over the thread core **51** and over itself, automatically pulling with it the thread core **51** as it is being heated, wound, stretched, coalesced and compacted by the combined pulling action of the stretching rollers **45** and the rolling action of the rotated heated cylinder surface **32**.

The cover strip **40** may be about .001 of an inch thick. It may be no more than .008 inch thick and may be as thick as .0015 inch or thicker. It may be colored with dves or pigments. The nature and composition of the ingredients added to the film will at least in some instances be controlled by the use to which the wrapped article is to be put.

The thickness of the covering, as it is applied to the thread, may be no more than about .0002 inch or even less and may be as thick as .0007 inch. Where only a color effect is desired, the wrapping, of course, may be exceedingly thin.

Various articles may be wrapped with a shrunk-on covering of the foregoing type. Glass thread wrapped in this way has been used to replace the gut of a tennis racket, thus forming a tennis racket string which is not affected by the weather. Furthermore, an ordinary gut string has been similarly wrapped with rubber hydrochloride to protect it from moisture. Cotton, rayon and linen threads coated in this manner with rubber hydrochloride film are impervious to water and moisture and are therefore adapted for the use where the usual threads cannot be employed. Wire so coated has been found satisfactory for conducting electrical currents of low amperage, the rubber hydrochloride coating serving as an insulating material. Unplasticized rubber hydrochloride is ordinarily more satisfactory for electrical insulation than plasticized material. The wire may be composed of a single filament or many fine threads which may be either twisted or untwisted. Any slender, elongated object of substantially cylindrical cross-section may be wrapped with rubber hydrochloride, as shown, to make it water-proof and moisture-vapor-proof.

Rubber or a similar elastic thread may likewise be covered by a laminated covering in the manner described above in connection with Fig. 3. A thin covered elastic thread having stretching properties similar to the commercially used Lastex yarn, may thus be made. In order to make such elastic covering, it should be stretched before the laminated film covering is applied thereto. Furthermore, it is important that the elastic covered thread should be balanced and should not acquire any axial twist while the covering is being rolled thereover.

Fig. 3 shows one arrangement for making a thin elastic covered thread of balanced tension, having properties similar to Lastex yarn. From the revolvably mounted spool **54**, the thin elastic thread **51** is guided by two suitably located revolvably mounted grooved rollers **55** under a bias over a helical path **56** along the rotated surface of the heating cylinder so as to give it a pretwist opposite to the pretwist it receives after it is led over the additional similar roller **57** to the position where it comes into contact with the covering strip **40** and is further drawn with it and covered thereby as it is being twisted in opposite direction along the helix portion **43**, in a manner analogous to the thread covering operation described above.

The amount of pre-twist to which the rubber thread is subjected along the helix path **56** may be varied by adjusting the location of the two rollers **55** which guide it over the rotating cylinder **32**.

In addition, the rubber thread **51** must be maintained in the desired stretched condition while it is being led over the roller **57** toward the helical cylinder path **43** along which it is being covered. This preliminary stretch of the rubber thread **51** may be supplied by providing its spool **54** with a conventional drag brake, formed, for instance, of a brake pulley which is engaged by a brake band **58** held under a tension determined by adjustable weights **59** suspended thereon.

In making such elastic thread, it is important that the laminated film covering is thin enough so as to permit the stretched covered elastic thread to contract after leaving the feed rollers. If the covering is made of too many superimposed overlapping spirally wound film formations, the covering may, after cooling, resist contraction of the final product by the elastic characteristics of the rubber core to an extent that will

greatly reduce the utility of the finally covered thread in serving as an elastic yarn.

If a very fine covering is applied to a stretched elastic rubber thread, in the manner explained above, for instance, by using a cover strip **40**, $\frac{1}{16}$ of an inch wide, a good thin elastic yarn thread product will result if the rubber thread is covered while it is maintained in the stretched condition in the manner explained above. If such thread is provided with a too heavy covering, it will, after cooling, hold the rubber core in an expanded position.

In order to give elastic thread made with such covering additional elasticity, the covered thread, after passing out from the stretching rollers **45**, may be passed through a bath, for instance, a water bath maintained at a temperature in the range between about 180° to 200° or 210°, so as to permit it to relax and contract to any desired greater extent than that with which it is coming from the stretching rollers.

Covered products of the present invention—made by the combined heating, coalescing and stretching operations followed by cooling while held stretched—if wound too soon on a pulpboard core, will cause the core to collapse because of a tendency to shrink, remaining in the final cooled laminated film product delivered by the stretching rollers **45**.

According to this invention, after heating, coalescing and stretching, followed by cooling, the covered product is allowed to shrink before it is wound. The amount which the laminated product will shrink or retract is dependent upon its composition, the temperature to which it is cooled under tension, etc.

Rubber hydrochloride film has been found to be one of a limited class of materials which when heated above the normal temperature become not only coalescent, but also become elastic, and contract at once when released from the stretching tension, much like natural rubber at normal temperatures, and such materials may be generally designated as being "thermo-elastic" in differentiation from "thermo-plastic" materials which have little or no tendency to contract upon release of the stretching tension.

By heating, the internal viscosity of such thermoplastic film is reduced. The internal viscosity of the thermo-elastic laminated film products of this invention is reduced on heating so that the film products can be readily stretched. The stretch becomes permanent at the temperature at which the stretching tension is released, except for a certain contraction or retraction which does not occur immediately, and whose extent depends upon the degree of stretching, the temperature of stretching, and the temperature at which the tension on the laminated film product is released. According to the invention, the winding of the stretched laminated film product is delayed until such retraction has taken place.

This may be done in the way indicated in Fig. 3 by leading the laminated film product, delivered by the stretching rollers **45**, in the form of a series of festoons over festoon rollers **47** and floating rollers **48**, and rolling it on the reel **46** only after it has substantially fully contracted and does not retain a tendency to shrink.

To obtain a more uniform covered thread-like product of the invention, the covered product, on being withdrawn from roller **44**, may be passed over a helical path of the heating roller **32** having a pitch in the opposite direction to the pitch of the helical path **43** so as to roll the covered product in opposite direction, in the manner indicated in Fig. 4. Thus, after the covered product has been made by rolling the covering film over a core **51** fed toward the roller **32**, in the manner described in connection with Fig. 3, the covered product so formed, after being withdrawn over roller **44** in Fig. 4, is led over a suitably mounted roller **62** into engagement with another portion of the rotating heated cylinder **32** along an oppositely pitched helical path portion **63**, the doubly rolled covered product being shown withdrawn directly by the stretching rollers **45**. In making covered products of the invention which do not require a pretwisted core, the core thread **51** may be led directly from a supply spool **54** to the portion of the covering **43** near the point where it makes contact with the heating roller **32**.

In the foregoing I have described the outgrowth of my accidental discovery of the thermo-elastic characteristics of rubber hydrochloride film material, and how various new improved laminated products may be made from such thermo-elastic film material which becomes elastic, like rubber, when heated to a temperature at which it becomes coalescent and tends to fuse. A further examination of the characteristics of such material established that unlike natural rubber, which has an amorphous structure at normal temperatures, rubber hydrochloride has a crystalline structure at normal temperatures, as established by X-ray diffraction patterns. When such rubber hydrochloride is heated to temperatures in the range between about 180° to 230° F. at which it becomes coalescent and elastic, it retains its elastic structure, its X-ray crystalline pattern passing, however, into an amorphous pattern when it is heated above 230° F.

When such rubber hydrochloride film is heated to a temperature of coalescence at which it becomes elastic, up to about 230° F., and it is stretched while so heated, it gives an X-ray diffraction pattern of a distinctly oriented crystalline structure. The various characteristics of such rubber hydrochloride film material have been fully described in the article "An X-ray study of rubber hydrochloride," by Gehman, Field and Dinsmore in the India Rubber World, volume 98, No. 3, page 39.

Fig. 5 shows in an exaggerated manner the cross section of a covered multi-strand core of the invention, and Fig. 6 illustrates a portion of such covered wire with the covering removed from its ends.

Since my original discoveries described above in connection with rubber hydrochloride material, there have been developed and made commercially available several types of films made from polyvinyl derivatives, polystyrol derivatives, etc., which exhibit definite thermoelastic characteristics similar to those possessed by rubber hydrochloride, namely, of becoming coalescent and elastic when heated above normal temperature, and which have been found suitable for making improved desirable laminated products by the process of the present invention described above.

It will be apparent to those skilled in the art that the novel principles of the invention disclosed herein in connection with specific exemplifications thereof will suggest various other modifications and applications of the same. It is accordingly desired that in construing the breadth of the appended claims they shall not be limited to the specific exemplications of the invention described herein.

I claim:

1. In the process of covering an elongated object, such as a thread core, with a thin covering of sheet material, such as rubber hydrochloride which is fusible and has a crystalline structure exhibiting elastic properties within a predetermined range of elevated temperatures, the steps of heating an elongated film formation of such material to an elevated temperature within said predetermined range, stretching and rolling said film formation in overlapping relation over said core so as to increase the length of said formation to at least about two times its original length, and to coalesce adjacent overlapping portions of said formation into a continuous covering while heated, and setting the covering by cooling it in its stretched coalesced condition in which it forms a cover united to said core.

2. In the production of a slender elongated object, such as a thread or cord, the process comprising heating elongated film-like formations of rubber hydrochloride material and winding said formations in spirally overlapped relation over a slender elongated core while stretching and uniting the adjacent lateral portions of said formations in the heated state and setting the wrapped formations in the stretched united state.

3. In the production of a slender elongated product, such as a thread or a cord, having a core enclosed in a covering formed from an elongated film-like formation composed essentially of thermo-elastic material, such as rubber hydrochloride, which is substantially solid under normal conditions and becomes elastic when heated to a temperature at which it is coalescent, the process including heating the film-like formation of the thermo-elastic material to a raised temperature at which it becomes coalescent and elastic, and wrapping the heated elongated formation in a general spirally overlapped relation over said core while stretching and uniting adjacent overlapping portions of the heated formation under pressure while hot into a laminated covering surrounding said core, and then setting the resulting product by cooling it, while maintaining the laminated covering in the stretched condition, to a temperature at which it retains its stretched united laminated structure.

4. In the production of a slender elongated product, such as a thread or a cord, having a core enclosed in a covering formed from an elongated film-like formation composed essentially of thermo-elastic material, such as rubber hydrochloride, which is substantially solid under normal conditions and becomes elastic when heated to a temperature at which it is coalescent, the process including heating the film-like formation of the thermo-elastic material to a raised temperature at which it becomes coalescent and elastic, and wrapping the heated elongated formation in a general spirally overlapped relation over said core while stretching and uniting adjacent overlapping portions of the heated formation under pressure while hot into a laminated covering surrounding said core, and then setting the resulting product by cooling it, while maintaining the laminated covering in the stretched condition, to a temperature at which it retains its stretched united laminated structure, and carrying on the above process continuously so that as some portions of the formation are being heated, stretched and united other portions of the formation are being cooled as a constituent part of the laminated product.

5. In the production of a slender elongated product, such as a thread or a cord, having a core enclosed in a covering formed from an elongated film-like formation composed essentially of a material, such as rubber hydrochloride, which is substantially solid under normal conditions and becomes coalescent when heated to a raised temperature of a predetermined range, the process including heating the film-like formation of said material to said raised temperature at which it becomes coalescent, wrapping the heated elongated formation in a general spirally overlapped relation over said core and subjecting said heated formation and the core portions on which said formation is being wrapped to rolling under pressure over a support so as to unite adjacent overlapping portions of the heated formation under pressure while hot into a laminated covering surrounding said core, and then setting the resulting product by cooling it to a temperature at which said covering retains its united laminated structure.

6. In the production of a slender elongated product, such as a thread or a cord, having a core enclosed in a covering formed from an elongated film-like formation composed essentially of a material, such as rubber hydrochloride, which is substantially solid under normal conditions and becomes coalescent when heated to a raised temperature of a predetermined range, the process including heating the film-like formation of said material to said raised temperature at which it becomes coalescent, wrapping the heated elongated formation in a general spirally overlapped relation over said core and subjecting said heated formation and the core portions on which said formation is being wrapped to rolling under pressure over a support first in one direction and then in the opposite direction so as to unite adjacent overlapping portions of the heated formation under pressure while hot into a laminated covering surrounding said core, and then setting the resulting product by cooling it to a temperature at which said covering retains its united laminated structure.

7. In the production of a slender elongated product, such as a thread or a cord, having a core enclosed in a covering formed from an elongated film-like formation composed essentially of a material, such as rubber hydrochloride, which is substantially solid under normal conditions and becomes coalescent when heated to a raised temperature of a predetermined range, the process including heating the film-like formation of said material to said raised temperature at which it becomes coalescent, wrapping the heated elongated formation in a general spirally overlapped relation over said core and subjecting said heated formation and the core portions on which said formation is being wrapped to rolling under pressure over a support so as to unite adjacent overlapping portions of the heated formation under pressure while hot into a laminated covering surrounding said core, and then setting the resulting product by cooling it to a temperature at which said covering retains its united laminated structure, and carrying on the above process continuously so that as some portions of the formation are being heated, wrapped and united other portions of the formation are being cooled as a constituent part of the laminated covering of the elongated product.

8. In the production of a slender elongated product, such as a thread or a cord, having a core enclosed in a covering formed from an elon-

gated film-like formation composed essentially of a material, such as rubber hydrochloride, which is substantially solid under normal conditions and becomes coalescent when heated to a raised temperature of a predetermined range, the process including heating the film-like formation of said material to said raised temperature at which it becomes coalescent, wrapping the heated elongated formation in a general spirally overlapped relation over said core and subjecting said heated formation and the core portions on which said formation is being wrapped to rolling under pressure over a support first in one direction and then in the opposite direction so as to unite adjacent overlapping portions of the heated formation under pressure while hot into a laminated covering surrounding said core, and then setting the resulting product by cooling it to a temperature at which said covering retains its united laminated structure, and carrying on the above process continuously so that as some portions of the formation are being heated, wrapped and united other portions of the formation are being cooled as a constituent part of the laminated covering of the elongated product.

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