Aug. 27, 1929. L. B. CHISHOLM 1,726,099

METHOD FOR MAKING COVERED ELASTIC STRANDS

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Fig. 1.

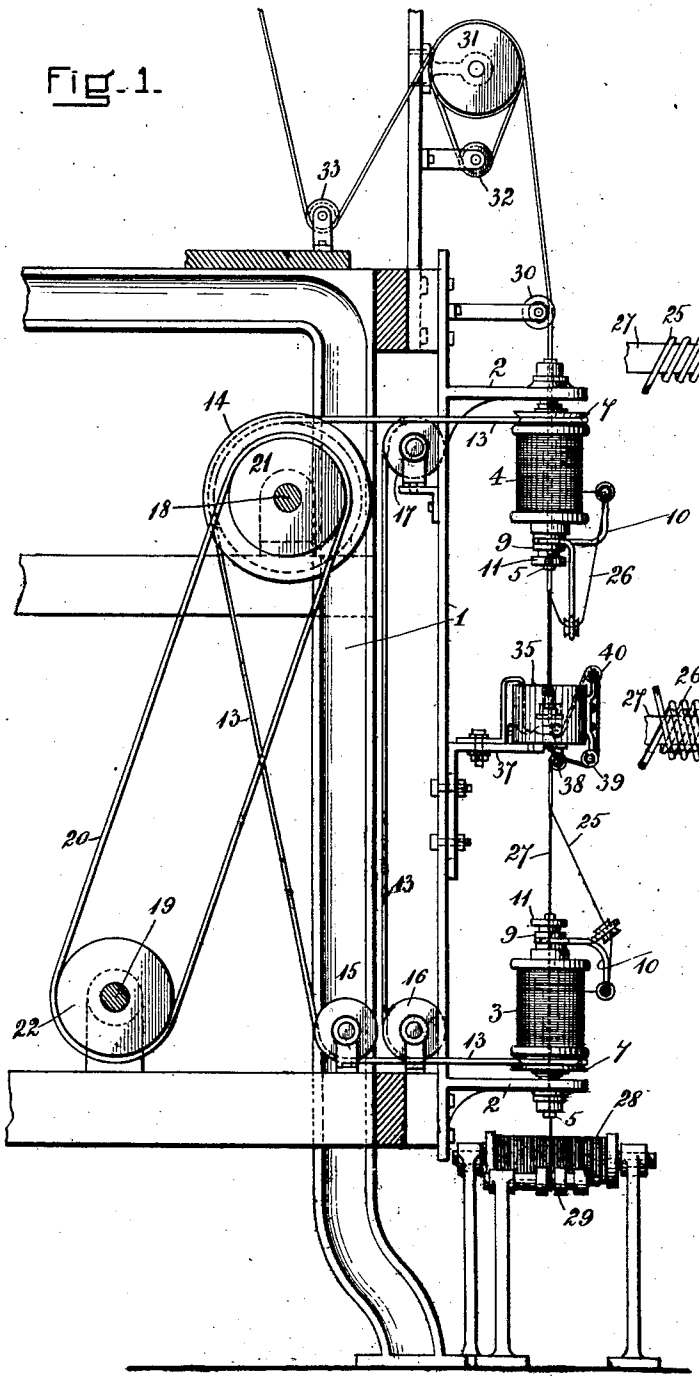


Fig. 11.

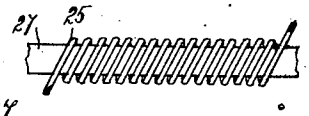
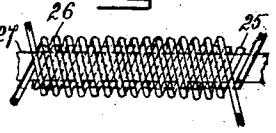


Fig. 12.



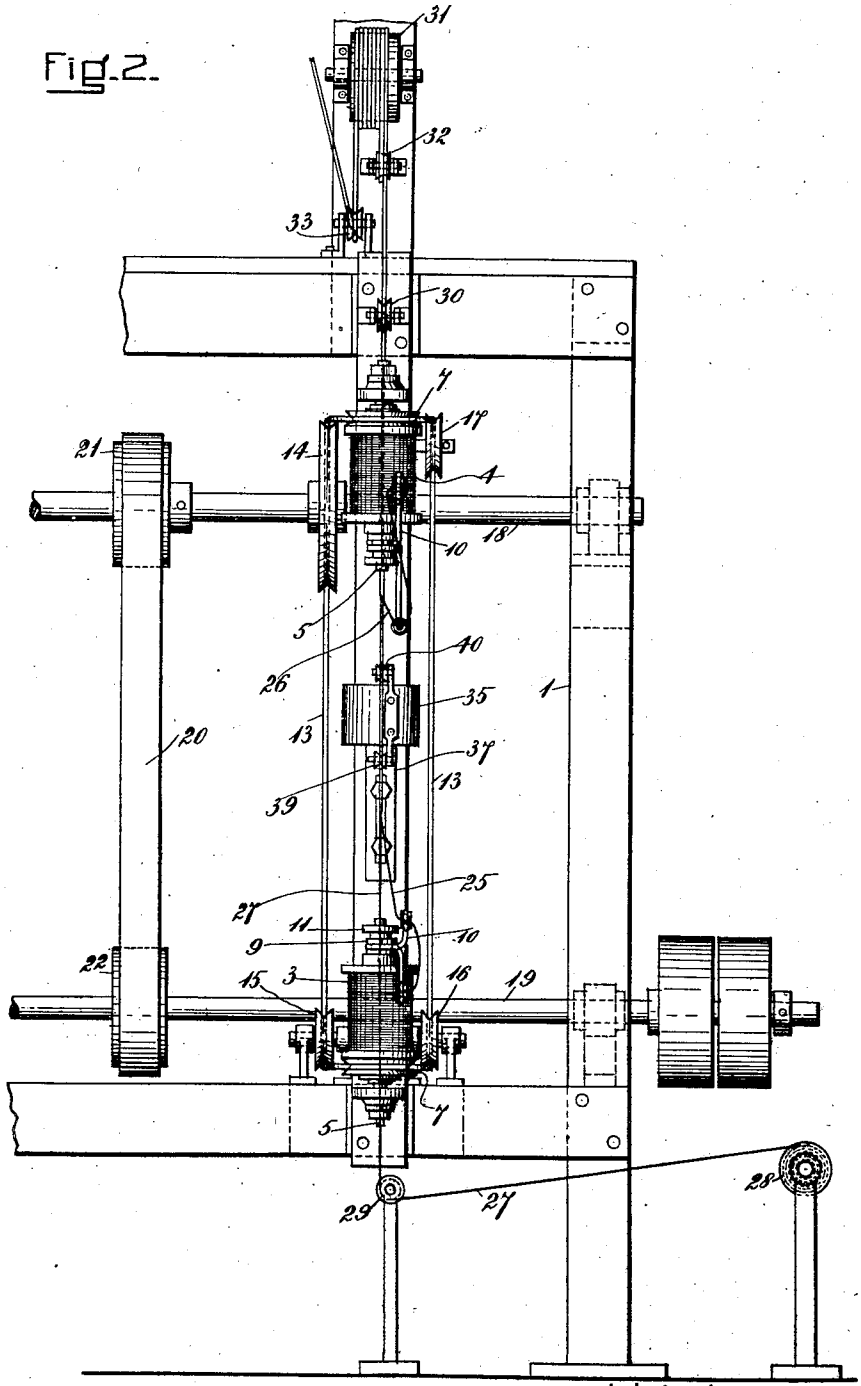
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METHOD FOR MAKING COVERED ELASTIC STRANDS

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Fig. 2.



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METHOD FOR MAKING COVERED ELASTIC STRANDS

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Fig. 3.

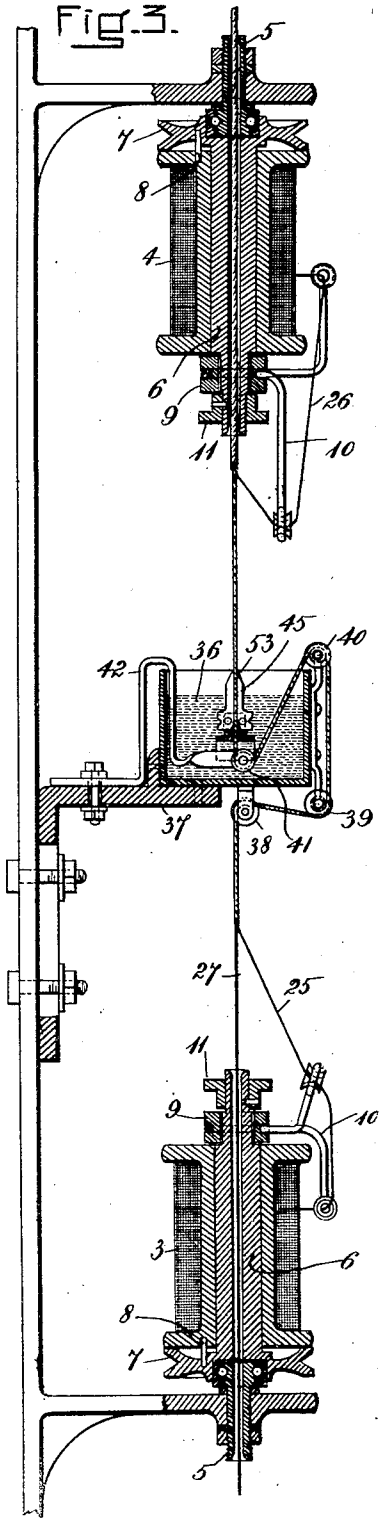


Fig. 4.

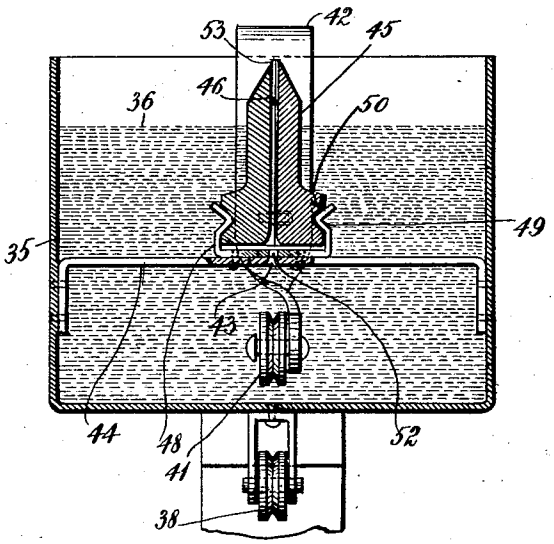


Fig. 5.

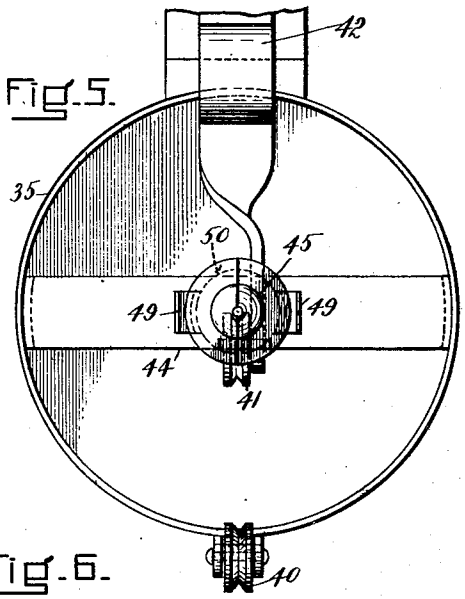
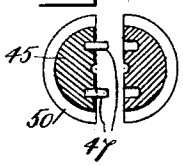


Fig. 6.



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METHOD FOR MAKING COVERED ELASTIC STRANDS

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Fig. 7.

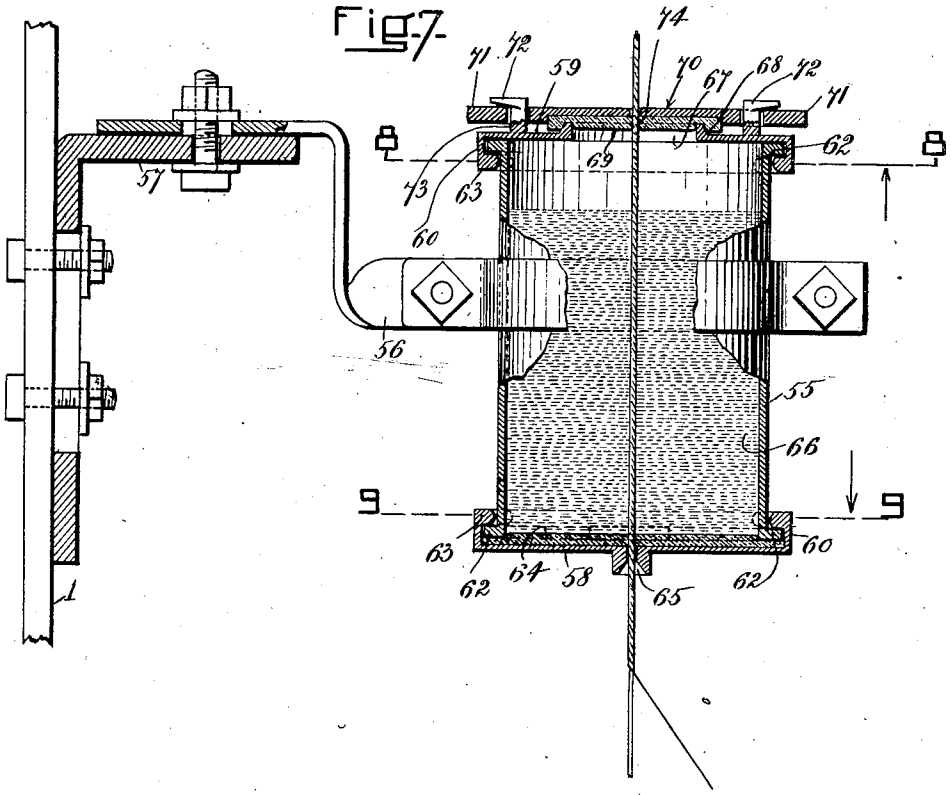


Fig. 8.

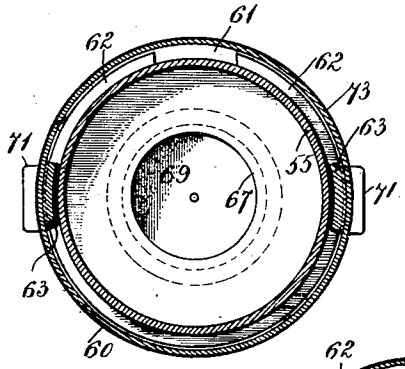


Fig. 10.

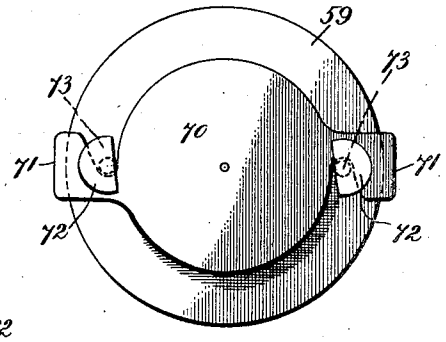
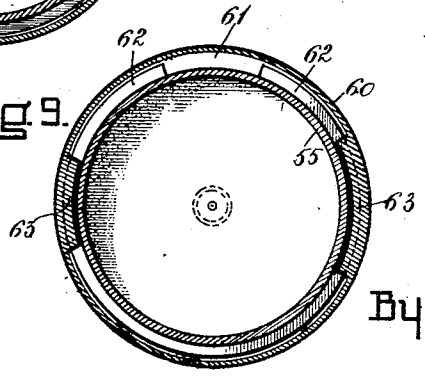


Fig. 9.



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UNITED STATES PATENT OFFICE.

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METHOD FOR MAKING COVERED ELASTIC STRANDS.

Application filed July 1, 1927. Serial No. 202,906.

The invention relates to a method for making covered elastic strands which comprise a covered elastic core and a fibrous thread covering wrapped around the core and in which the core is cemented to its covering to prevent slippage and creeping of the core within the covering in case the core is severed, the core lying normally within its covering under tension.

Owing to the use of a liquid cementing material or rubber cement in the making of these covered strands for cementing the core to it fibrous covering, difficulties have been experienced in the making of the strand among which are noted the following: Such application of the cementing material as will effect a proper bond between the core and its covering as will prevent creeping of the core especially when the core is highly tensioned, and at the same time will not interfere with the normal elasticity of the core and proper functioning of the covered strand in any fabric of which it may form a part. A too free application of the cementing material is apt to make a too sticky and gummy thread which is not only unsightly, but is apt to bond together the coils of the fibrous covering which interferes by acting as a drag upon the elastic core. The application of the thread covering and the cementing material should be such as will effect a proper bond between the elastic core and its covering, as noted above, but no more, the coils of the fibrous covering being free to ride upon the core as it is highly tensioned or allowed to relax.

Another difficulty arises on account of the nature of the cementing material employed consisting as it does of a rubber cement or other elastic cement. These cements are of a very sticky or gummy nature. They dry quickly when exposed to air and will accumulate or mass on exposed surfaces. In consequence hardened pieces or bits of the cement are apt to be picked up and fasten themselves to the strand during the cementing operation and these pieces are apparent and disfigure any fabric in which the elastic strands are used.

The general object of the invention is to overcome the difficulties above referred to, and I have found they may be overcome by practising the coating operation according to the following method:

The elastic core to be covered is tensioned to an extent greater than its normal tension, or, in other words, the tension under which the core lies in the normal unstretched strand, it being understood that in an elastic strand the core lies within the strand under some tension. The amount of tension given the core is preferably an amount determined by stretching the elastic strand to an extent just short of its normal stretch. To the elastic strand thus tensioned a thread covering is applied in the usual manner. This thread covering may consist of a single thread or a number of combined threads. The thread covering is so applied that a space will separate its coils. The amount of space between the coils is commensurate with the amount of stretch desired to be attained in the completed strand. That is, as the core is allowed to contract the coils will be brought together limiting further contraction of the core which will then be held tensioned within the covering and accordingly the amount of separation of the coils determines the amount of stretch desired to be obtained in the completed strand.

After the application of the thread covering the covered core still tensioned as aforesaid with the coils of the thread covering separated from one another, is passed through a bath of cementing material in order that the cementing material may enter between the coils of the thread covering and form a bond between the thread covering and the elastic core, cementing the one to the other. When applied in this way I have found that the ordinary rubber cements are inadequate inasmuch as they will not properly enter between the coils of the thread covering and form such bond between the core and its covering as will properly cement the core to the covering. I have found, however, that if a water-dispersed rubber or water emulsion of rubber be employed in this connection or one in which the rubber is in a very finely divided form, such preparation of rubber will act effectively and will enter between the coils of the thread covering and penetrate sufficiently to form a proper bond between the elastic core and the covering.

After passing through the bath of cementing material the covered strand is then freed of surplus cement before the strand has been exposed to the air. In connection with this freeing of the strand of surplus cement, it

is desirable that the covered strand be freed in so far as possible of all cementing material other than that remaining to form a proper bond between the core and its covering.

After its freezing of surplus cementing material, the covered strand with core still tensioned has applied to it an outer thread covering, care being taken that before the application of this outer covering the initially covered strand shall not contact with any surface on which cementing material might accumulate and harden, or, in other words, any surface from which bits or pieces of the cementing material might be picked off and adhere to the running strand. The outer thread covering is applied in the same manner, with substantially the same spacing of coils as the inner covering, except that the spirals are preferably made to run in a reverse direction. This outer covering is for the purpose of adding finish to the thread and by enveloping the inner covering, bearing more or less cementing material on its outer surface, prevents it from gumming mechanism or rolls over which the strand is led and to which, were it not for the outer enveloping covering, cementing material from the inner covering might adhere and accumulate and be picked off in small bits or pieces from time to time by the running strand, it being a very difficult matter to eliminate all surplus cementing material from the outer or exposed surface of the initial covering after running through the bath of cementing material.

After the application of the outer enveloping covering the strand is passed on, allowed to relax and afterward wound in the usual manner.

Instead of first applying a thread covering to the elastic core before running through the bath of cementing material, the core is first run through this bath before winding with the thread covering. In such case instead of using a bath of water-dispersed rubber or water emulsion of rubber as before, an ordinary thin rubber cement may be employed provided the rubber solvent in the rubber cement is not such as will injure the elastic core. After passing through the bath of cementing material the elastic core is freed of surplus cement before the core has been exposed to the air the same as before and afterward a thread covering is applied to the elastic core which then bears a thin film of cementing material, care being taken that before the application of the thread covering the coated core shall not contact with any surface on which the cementing material might accumulate and harden and bits thereof afterward picked off by the running core. The thread covering thus applied is applied with coils separated from one another according to the manner of application of the initial thread covering in the method first described. With the thread covering thus applied to the elastic core after the core has run through the cementing material a secondary or outer thread covering is not necessary. It may be applied, however, if desired to give further finish to the strand.

The method and variations thereof can be better understood in the light of the apparatus shown in the drawings for practising it, and in which—

Figure 1 is a side elevation of the machine.

Fig. 2 is a front elevation thereof.

Fig. 3 is a vertical section of a portion of the machine.

Fig. 4 is a vertical section of the cement-holding receptacle and mechanism incidental to it.

Fig. 5 is a plan of the cement-holding mechanism as shown in Fig. 4.

Fig. 6 is a cross section of a detail of construction of the cement-holding mechanism shown in Fig. 4.

Fig. 7 is a vertical section showing a modified and preferred form of the cement-holding receptacle and mechanism incidental to it.

Fig. 8 is a section on the line 8—8 of Fig. 7.

Fig. 9 is a section on the line 9—9 of Fig. 7.

Fig. 10 is a plan of the cement-holding receptacle shown in Fig. 7.

Fig. 11 is a plan of one of the completed elastic strands having a single covering, and

Fig. 12 is a plan of one of the completed elastic strands having a double covering.

Referring to the drawings:—

1 represents the frame of the machine. Secured to this frame are brackets 2 on which are mounted rotary thread-bearing spools 3 and 4 respectively. These spools are arranged in vertical alignment one above and spaced from the other, the spool 4 being arranged above the spool 3.

Each spool is mounted upon its bracket by a connecting base piece 5 fixed to the bracket and on which turns a spindle 6 driven by a whorl 7. The spool fits upon the spindle and is driven by the whorl to turn with the spindle by a pin connection 8 between the spool and the whorl. Loosely arranged on the end of each spindle is a collar 9 carrying a flyer 10 and held in place by a nut 11 which nut is fixed to the spindle. This spool mechanism with attending flyer is of a type commonly employed in the winding of covered elastic cores, the flyer being operated by the thread as it unwinds from the spool.

In connection with the arrangement of the spools and their operating mechanism it will be observed that the spool 4 and its attending mechanism are arranged in an inverted position with relation to the spool 3. In

other words, the spool 3 and mechanism associated with it lie above its supporting bracket, while the spool 4 and its associated mechanism lie below its supporting bracket depending therefrom.

The spools are both turned by an endless belt 13 passed around their respective whorls in a manner to rotate the spools in reverse directions. To this end the belt passes around a driven pulley 14; thence extends downward around an idler pulley 15; thence around the whorl of the spool 3; thence returning passes round an idler pulley 16 and upwardly around an idler pulley 17 and thence around the whorl of the spool 4 and back to the pulley 14 and point of beginning. The various idler pulleys are mounted on the frame of the machine. The driven pulley 14 is mounted upon a shaft 18 which turns within suitable bearings on the frame. The shaft 18 is driven from a driven shaft 19 by means of a belt 20 which runs around pulleys 21 and 22, respectively, fixed to the respective shafts. The shaft 19 is driven from any suitable source of power.

25 is the thread carried by the spool 3 and 26 is the thread carried by the spool 4.

27 is the elastic core. This core consisting usually of a common elastic thread is arranged upon a spool 28 suitably mounted on the frame. From this spool the core extends around a pulley 29 and thence upwardly through the spindles of both spools where it continues over an idler pulley 30 and a series of pulleys 31, 32 and 33 respectively forming part of a take-up mechanism commonly employed in similar connections. The arrangement is such that the elastic core will be tensioned in its passage by and between the spindles of the respective spools and to this end the spool 28 on which the core is wound may be provided with any suitable tension device (not shown) by which tension may be imparted to the core as it is drawn off its spool by the take-up mechanism.

Located in the space between the spools is a receptacle 35 holding cementing material 36 and through which cementing material the tensioned elastic core is directed to pass. The cement-holding receptacle is supported by means of a bracket 37 fixed to the frame. The core is directed to pass through the cementing material by passing it first over an idler pulley 38 fixed to the under side of the receptacle, thence over idler pulleys 39 and 40 respectively fixed to the side of the receptacle and by which the core is directed to pass over the top side edge of the receptacle downward into the cementing material within it. There the elastic core passes over an idler pulley 41 which is carried by a support 42 consisting of a bar secured to the bracket 37 and bent to extend upward over the side of the receptacle and downward into the interior thereof for supporting the pulley 41. After passing around the pulley 41 the core extends upward through an opening 43 in a crossbar 44 which spans the chamber of the receptacle and is fixed to the opposite sides thereof.

Fixed to the crossbar 44 is a scraper 45 having through it a passage 46 through which the core is directed to pass. The scraper is preferably made in two halves to avoid the necessity of threading the core through it. The two halves are combined in proper co-ordination to form the passage 46 by pins 47 and are securely held together by means of a spring clip 48 which is fastened to the crossbar 44 and the opposite jaws 49 of which embrace the respective halves of the scraper, being bent to fit within grooves 50 therein, thereby holding the two halves of the scraper securely in place for forming the complete scraper and fixing it to the crossbar 44. Thus the scraper is built around the elastic core to avoid the necessity, as explained above, of threading the elastic core through it. The body of the spring clip 48 fixed to the crossbar 44, lies above the opening 43 in the crossbar through which the elastic core extends, and accordingly is itself provided with an opening 52 through which the core passes. The passage 46 through the scraper is one only large enough to permit of the passage of the core through it or passage of the core having an initial thread covering upon it when such covering is employed. Accordingly the action of the scraper is to remove from the core all surplus cementing material. The scraper, it will be observed, is so arranged that the lower end thereof through which the core first passes will lie at all times within the cementing material. Therefore as the surplus cement is removed from the core it simply remains as a part of the bath of cementing material and there is no opportunity for it to accumulate or harden in the scraper. The only other place where the cementing material might accumulate or harden and so be picked off by the running core is at the top end of the scraper which lies above the body of cementing material and accordingly is exposed to the atmosphere. The top end of the scraper is, however, provided with a sharp edge 53 on which no cement can accumulate and harden so as to be picked off by the running core. This sharp edge is formed simply by inclining or beveling the top end of the scraper.

Thus it will be seen that before receiving its outer thread covering after passing through the bath of cementing material, not only is all excess cement scraped from the core, but care is exercised that the coated core shall not contact with any surface on

which the cementing material might accumulate and harden so as to be picked off and adhere to the running core.

In Figs. 7 to 10, inclusive, there is shown a further and preferred example of a receptacle for holding cementing material through which the elastic core is directed to pass to become coated with the material within the receptacle, and which receptacle has combined with it means whereby excess coating may be removed from the elastic core. 55 represents this receptacle made in the manner of a cam and which is grasped and held in place by a support 56 which is fastened to a bracket 57 fixed to the frame. The receptacle is provided with removable bottom and top end closures 58 and 59 respectively. Each of these end closures is made to fasten onto the end of the receptacle by a turning movement for which purpose the receptacle is provided at either end with out-turned flanges 60 each having a slot 61 in it and presenting also inclined or cam surfaces 62 on its inner side or face. The end closures are also provided with inturned jaws 63 which are adapted to extend over the flanges on the respective ends of the receptacle to lie back of and have drawing engagement with the cam surfaces 62 on the inner sides or faces thereof, entrance being permitted by way of the slot 61. Thus connected the end pieces may be securely fastened to the ends of the receptacle forming tight jointed connection therewith, but permitting of the removal of the end pieces as occasion may require.

Interposed between the bottom end piece 58 and the bottom end of the receptacle is a rubber washer 64 which assists in making a tight connection between the receptacle and its bottom end piece. The bottom end piece 58 has an opening 65 in it which opening is extended through the rubber washer 64 and it is through the opening thus provided that the elastic core passes to pass upwardly through the cementing material 66 contained within the chamber of the receptacle. The rubber washer closes snugly around the elastic core at the point where the core passes through it forming at this point a tight joint preventing escape of cementing material at the point where the elastic core is entering. At the top of the receptacle the top end piece 59 is provided with a relatively large opening 67 around which the end piece is provided with an upturned flange 68. Covering this opening and bearing against the flange 68 is a rubber pad 69 which functions as a scraper as will presently be explained. The pad 69 is held in place crushed against the flange 68 to form a tight joint therewith by means of a plate 70 provided with out-turned ears 71 which lock under cams 72 arranged on posts 73 upstanding from the top end of the top end piece 59. The rubber pad 69 has an opening 74 through it through which the elastic core is directed to pass after having passed through the cementing material and which opening is continued through the top plate 70. The opening through the rubber pad is such as will permit the elastic core to pass through it, the pad, however, fitting snugly around the coated core and accordingly functioning as a scraper to remove from it all excess cementing material which when removed returns into the body of the cementing material contained within the receptacle. The receptacle forms substantially an airtight closure so that all cementing material is removed from the core before the coated core becomes exposed to the atmosphere and accordingly the removed cementing material will not accumulate and harden upon the scraper, but will remain in soft liquid condition and return to the bath of cementing material.

The operation is as follows: Assuming the elastic core is running under suitable tension through the spindles of the respective spools and through the bath of cementing material lying between the spools, the thread 25 carried by the spool 3 is first wrapped around the running core, the winding being such, as previously explained, that coils of the winding will be properly spaced from one another in order to permit of the relaxing of the core and also to permit of the cementing material entering between the coils of the thread covering and cementing them to the core. After the initial winding of the core by the thread 25 the covered core passes through the bath of cementing material after which the excess cement is wiped off by passing the covered core through the restricted opening or passage of the scraper and before exposure to the atmosphere; thence the covered core passes to receive the secondary or exterior covering provided by the thread 26 carried by the spool 4. No opportunity is given, as before explained, for the running core to have contact with any surface to which cementing material from the coated core may adhere and accumulate and harden to be picked off by the running core. The thread 26 is wound in precisely the same manner as the thread 25 with proper spaces between the coils but preferably in a reverse direction to the winding of the thread 25. It will be observed that the winding of the thread 26 or outer covering is provided before the initially covered core is allowed to pass through the spindle of the spool 4 and it is for this reason that this spool and its associated mechanism are arranged in an inverted position so that its flyer may lay the thread before the initially covered core has opportunity to pass through the spindle of the spool off which the thread is wound, as this would present a surface to which cementing mate-

rial from the coated core might adhere to accumulate and harden and be picked off by the running core. After the application of the outer covering the covered core passes through the spindle of the spool 4 and thence to the take-up mechanism.

Instead of providing the elastic core with an initial thread covering before passing through the bath of cementing material, the initial covering or thread 25 may be dispensed with and the core passed directly through the bath of cementing material and afterward receive a thread covering as that provided by the thread 26 off the spool 4. In such case the cementing material employed is preferably the water-dispersed rubber or water emulsion of rubber the same as before, but any thin rubber cement might be employed provided its solvent would not injure the elastic core.

With those cores which are passed directly through the cementing material and afterward receive a single thread covering no secondary or outer covering is necessary. One may be added, however, if desired to give finish just as it is sometimes added to ordinary covered elastic strands.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States:—

1. The method of making elastic strands having an elastic core and a thread covering cemented to the core, which comprises running the core tensioned through a bath of cementing material capable of adhering to the core, removing excess cementing material from the core and afterward winding a thread covering on the coated core still tensioned and before it has contact with any surface to which the cementing material thereon may adhere and accumulate and harden and afterward be picked off by the running core.

2. The method of making elastic strands having an elastic core and a thread covering cemented to the core, which comprises running the core tensioned through a bath of cementing material capable of adhering to the core, removing excess cementing material from the core before exposure of the core with applied cementing material to the atmosphere, and afterward winding a thread covering on the coated core still tensioned with coils of the covering spaced from one another.

3. The method of making elastic strands having an elastic core and a thread covering cemented to the core, which comprises running the core tensioned through a bath of cementing material capable of adhering to the core, removing excess cementing material from the core before exposure of the core with applied cementing material to the atmosphere and afterward winding a thread covering on the coated core still tensioned with coils of the covering spaced from one another after the exposure of the coated core to the atmosphere and before the coated core has contact with any surface on which the cementing material may accumulate and harden to be picked off by the running core.

4. The method of making elastic strands having an elastic core and a thread covering cemented to the core, which comprises running the core tensioned through a bath of cementing material capable of adhering to the core, removing excess cementing material from the core to leave a relatively thin film of cementing material thereon before exposure of the core with applied cementing material to the atmosphere and afterward winding a thread covering on the coated core still tensioned with coils of the covering spaced from one another after the exposure of the coated core to the atmosphere and before it has contact with any surface to which the film of cementing material thereon may adhere to accumulate and harden and be picked off by the running core.

5. The method of making elastic strands having an elastic core and a thread covering cemented to the core, which comprises running the core tensioned through a bath of cementing material capable of adhering to the core and contained within a receptacle closed from the atmosphere, removing excess cementing material from the coated core before it has extended outside the chamber of the receptacle and afterward winding a thread covering on the coated core still tensioned with coils of the covering spaced from one another.

6. The method of making elastic strands having an elastic core and a thread covering cemented to the core, which comprises running the core tensioned through a bath of cementing material capable of adhering to the core and contained within a receptacle closed from the atmosphere, removing excess cementing material from the coated core before it has extended outside the chamber of the receptacle and afterward winding a thread covering on the coated core still tensioned with coils of the covering spaced from one another after the exposure of the coated core to the atmosphere and before it has contact with any surface on which the cementing material may accumulate and harden to be picked off by the running core.

7. The method of making elastic strands having an elastic core and a thread covering cemented to the core, which comprises winding an initial thread covering on the core tensioned with coils of the covering spaced from one another, running the core tensioned and initially covered as aforesaid through a bath of cementing material capable of being picked up by the initially covered core for cementing the coils of the initial covering to the body of the core, re-

moving excess cementing material from the core before exposure thereof with applied cementing material thereon to the atmosphere and afterward winding a secondary thread covering on the coated core still tensioned with coils of the secondary covering spaced from one another.

8. The method of making elastic strands having an elastic core and a thread covering cemented to the core, which comprises winding an initial thread covering on the core tensioned with coils of the covering spaced from one another, running the core tensioned and initially covered as aforesaid through a bath of cementing material capable of being picked up by the initially covered core for cementing the coils of the initial covering to the body of the core, removing excess cementing material from the core before exposure thereof with applied cementing material thereon to the atmosphere and afterward winding a secondary thread covering on the coated core still tensioned with coils of the secondary covering spaced from one another after the exposure of the coated core to the atmosphere and before it has contact with any surface to which the cementing material thereon may adhere to accumulate and harden and be picked off by the running core.

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