Sept. 16, 1947. S. W. ALDERFER 2,427,334

PROCESS OF MAKING ELASTIC THREAD OR FABRIC

Filed July 1, 1944 2 Sheets-Sheet 1

Fig. 1.

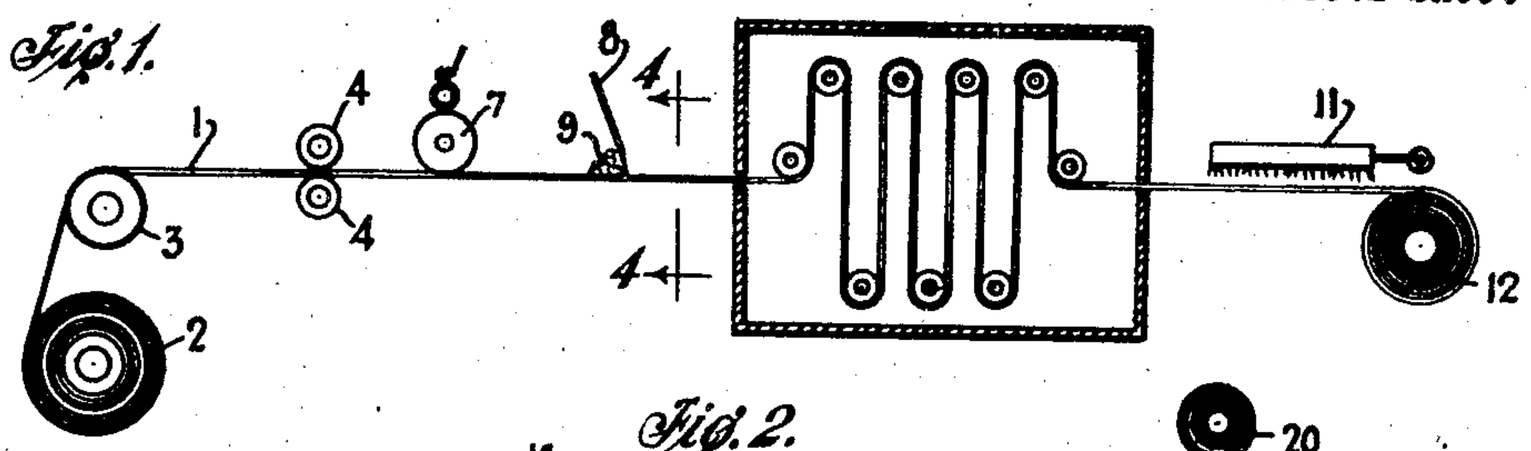


Fig. 2.

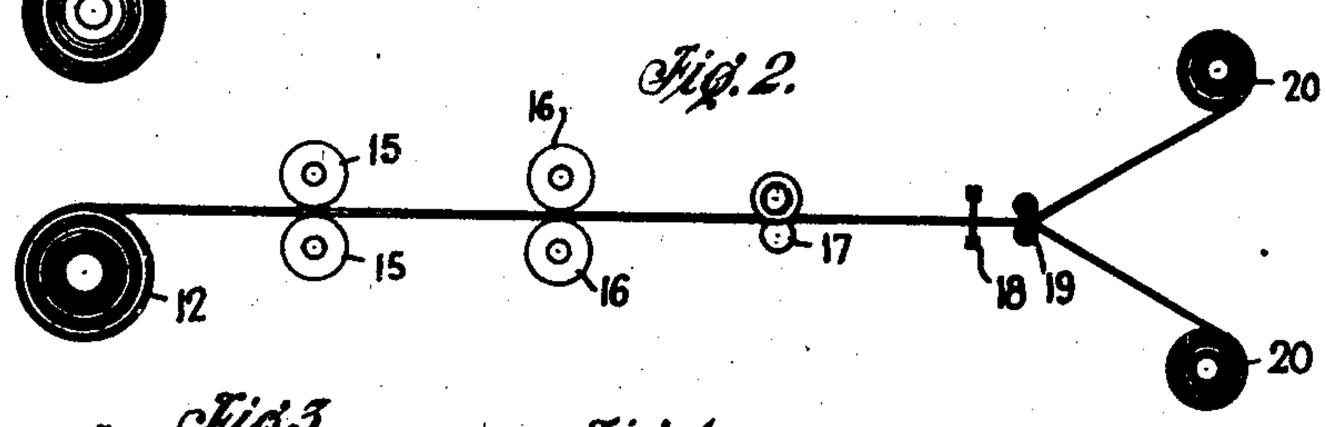


Fig. 3.

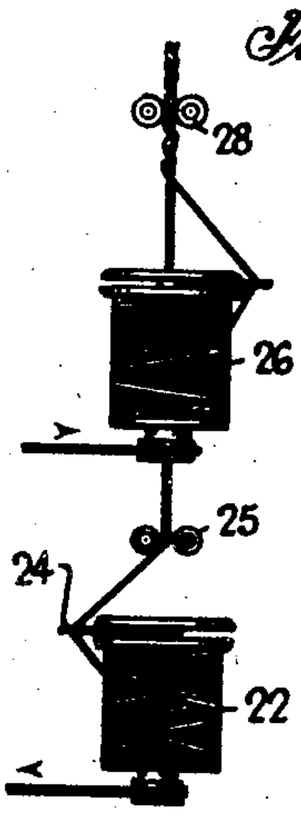


Fig. 4.

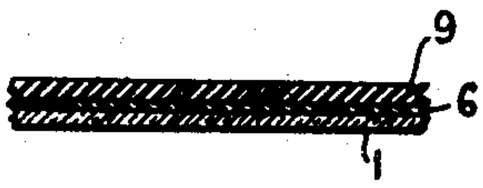


Fig. 5.

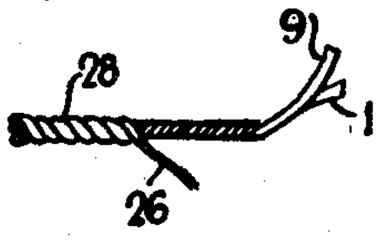


Fig. 6.

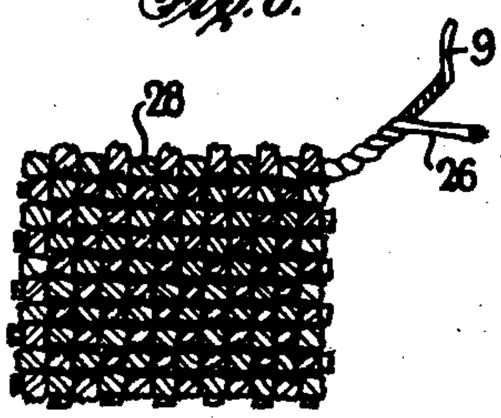


Fig. 7.

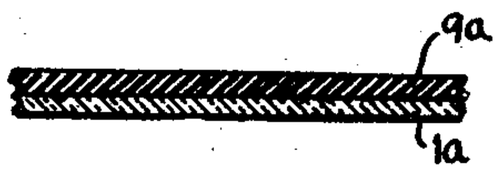
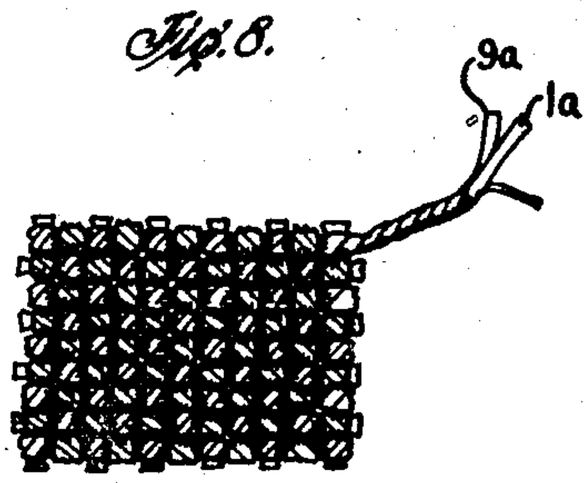


Fig. 8.



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PROCESS OF MAKING ELASTIC THREAD OR FABRIC

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Fig. 9.

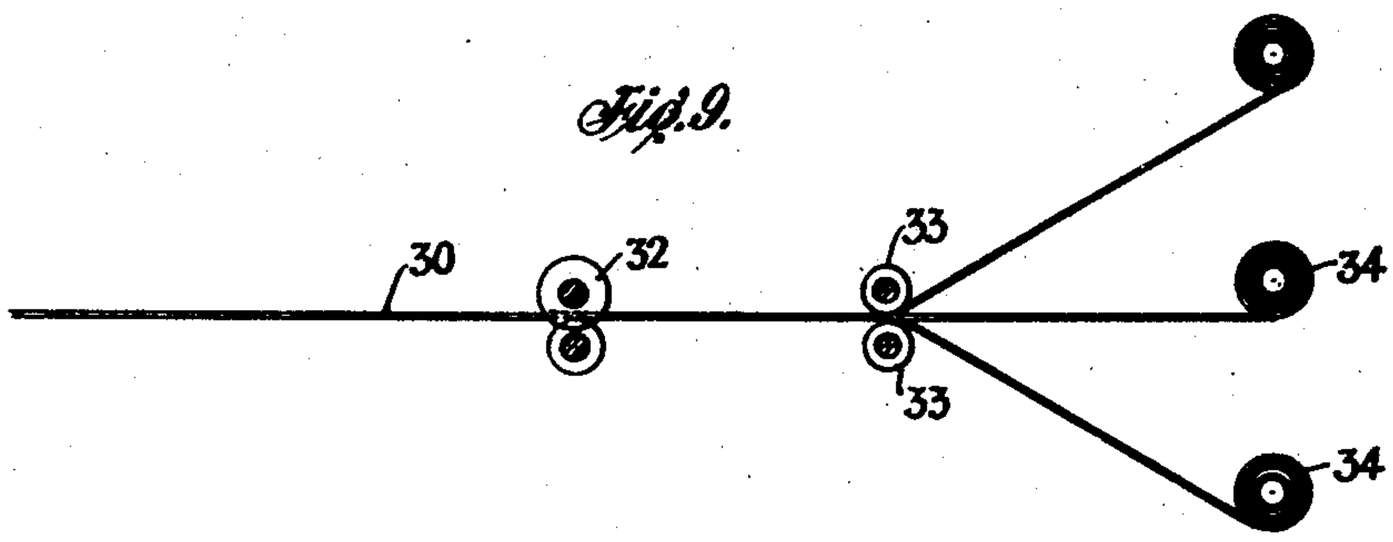

Fig. 10.

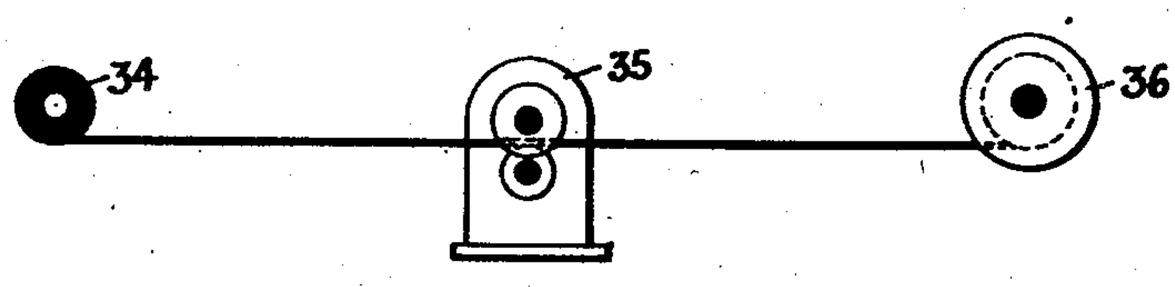

Fig. 11.

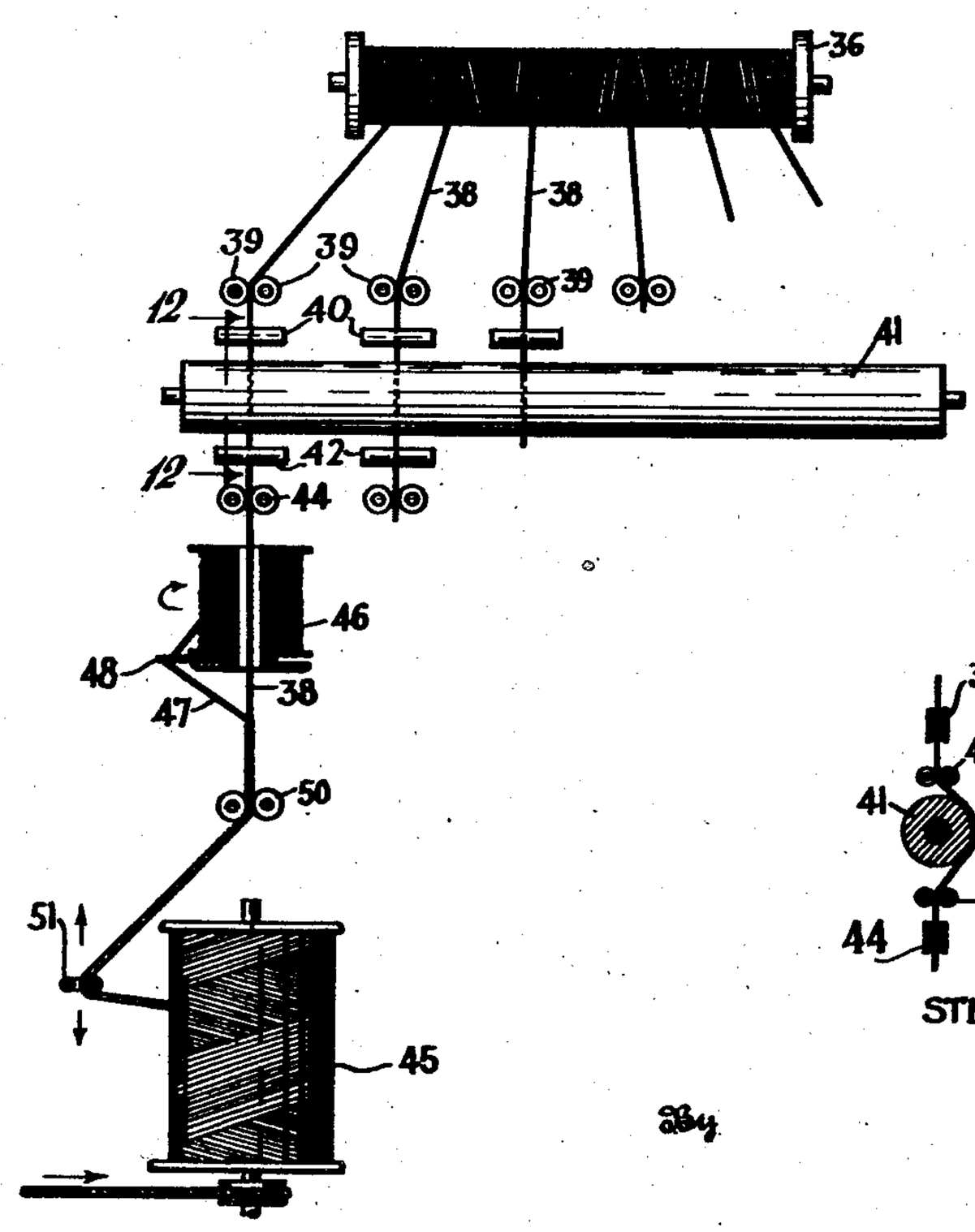

Fig. 12.

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2,427,334

PROCESS OF MAKING ELASTIC THREAD OR FABRIC

Sterling W. Alderfer, Akron, Ohio

Application July 1, 1944, Serial No. 543,132

31 Claims. (Cl. 57—163)

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This invention relates to a process for the manufacture of elastic threads or cords and also to the manufacture of elastic fabrics. In the manufacture of these materials it has been difficult to make an elastic fabric which is easily stretchable or, as it is termed in the trade, a "lazy" fabric. Fabrics of this type are especially desirable in the manufacture of articles of apparel which should have a relatively easy stretch, such, for example, as bathing suits or elastic garment bands. The reason for the difficulties heretofore encountered in the manufacture of fabrics and threads of this type is that in order to cover a thread or cord or to weave or knit such a fabric by machinery, the elastic threads must be stretched to a point where there is little or no residual stretch so that the elongation of the threads is limited during the covering of the thread or the making of fabric therefrom. Because of the substantial tension which is ordinarily maintained, the finished fabric has a very strong tendency to contract. The desired property of a mild tendency to contract, just sufficient to cause the garment to cling to the body without exerting excessive constriction, is impossible or difficult to obtain under existing processes for the reasons stated.

One of the objects of the process which is illustrated and described herein is to make a lightly tensioned elastic thread or cord from which a garment or tape may be fabricated on standard weaving, braiding or knitting machines without the difficulties due heretofore to the elongation of such a thread or cord. It is, therefore, possible by practising the invention to secure a moderate elasticity in a finished thread or in a garment made on the ordinary covering and knitting or weaving machines.

The individual threads and the completed fabrics have new and useful properties, but the claims to these articles are made in a divisional application hereof Serial No. 601,577, filed June 26, 1945.

Another object of the invention is to provide new and highly efficient methods for the manufacture of elastic threads or cords of general utility.

In the accompanying drawings and description, there are shown several forms of the invention, but it will be understood that the invention is not limited to the specific materials, details or steps shown, for, when the principles are understood, it is possible to devise modifications or improvements thereon without departing from the basic principles of the invention.

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Briefly stated or summarized, the invention consists in attaching or depositing the rubber constituent of the thread upon a backing or foundation which has some ability to elongate, but which will reach its maximum elongation at a point where the rubber portion of the composite material has reached the determined tension which will give desired elasticity to the finished thread or garment. There is little or no recovery in a sheet of this material after it has been stretched or "oriented," so that the rubber is held in tension by the backing material. As a result, when the composite rubber and plastic thread is covered with any suitable textile material, the thread has no stretch or an easily controlled stretch. Also, when the threads are placed in the knitting or weaving machine, this property of the thread permits the machine to operate with the ease and at speeds which are obtained in the manufacture of non-elastic fabrics.

When the thread is covered, if an elastic thread is the finished product, or when the fabric is completed, the thread (or fabric) is preferably put through a finishing bath to remove the dirt, oil or sizing which may be found thereon. Water soluble backing material will dissolve in the bath leaving a soft, mildly elastic fabric or thread. While a water soluble backing is preferred because it is readily destroyed in the usual finishing bath, any other fugitive backing may be employed with an appropriate after treatment which will remove the plastic material but is non-deleterious to the rubber or covering material.

In some aspects of the invention it may be desired to use as the backing material a non-fugitive plastic which has a certain amount of stretch and ability to move with the rubber element of the thread or cord. A backing of this type will be retained in the finished thread or fabric, and while it will perform the same function of giving to the thread the firmness which is so desirable for the covering and knitting or weaving operations, it does not unduly affect the elasticity of the finished product. An advantage of this form of the invention is that if the rubber element should be cut or broken during the subsequent manufacturing operations, the rubber thread will not retract and lose its elastic properties as is a common fault in ordinary elastic fabrics, but will be retained in position and, therefore, the elastic effect of the thread will be retained on either side of the break.

For the practice of the invention, the composi-

tion of the backing sheet is determined by a number of factors.

The backing layer should be one which will withstand the heat which is required to vulcanize the rubber. If the backing layer is to be eliminated by washing in a water bath, it must be readily water soluble. The backing material should have the ability to stretch or elongate and to reach its maximum elongation at the point where the desired elongation or tension upon the rubber is reached. There have been developed recently a number of plastics or synthetic resins which will answer these requirements, and while it is not wished or intended to limit the invention in any manner to one material or group of materials, it has been found that polyvinyl alcohol and its derivatives will operate satisfactorily.

For the rubber constituent of the thread it is preferred to employ a natural or artificial water-dispersion of rubber. Natural latex is admirably suited for the purpose as are the water-dispersions of natural or synthetic rubbers. It is also possible to employ solutions of natural or synthetic rubbers or rubber-like material in any suitable vehicle. The rubber contains the usual compounding and vulcanizing ingredients, or a vulcanized rubber latex or rubber dispersion may be employed, in which case the rubber layer does not require further vulcanization.

When the backing employed is water soluble and the rubber constituent is a water dispersion of rubber or similar elastic material, it is essential to protect the backing from the dispersion, and for this reason the side of the backing which is to receive the rubber will receive a light coating which will give an interposed layer of a water resistant adhesive which will adhere to the backing layer and also to the rubber. A cement suitable for this purpose may be made from any of the well known rubber hydrochlorides. Other materials having the properties suitable for the purpose are available on the market under a variety of trade names. If some other vehicle or solvent for the rubber is employed which will attack the backing layer, an appropriate change in the composition of the intermediate adhesive will be made.

For the modified form of the invention in which an insoluble or non-fugitive backing is employed, the backing material may be "nylon" or one of the several polyvinyl chlorides, vinylidene chlorides, rubber hydrochloride or any other orientable film, and in the use of any of these materials, it is not necessary to interpose a layer of adhesive.

Having set forth the invention in general terms, practical applications thereof are shown in the accompanying drawings in which:

Fig. 1 is a diagrammatic showing of the first several steps in the process in which a water soluble or other fugitive backing is employed and in which the rubber is applied as a water dispersion.

Fig. 2 shows the steps employed for the formation of the rubber thread when the backing material is elongated before the composite sheet is cut into threads.

Fig. 3 shows the twisting and covering of the thread on what is known as an "up-twister."

Fig. 4 is a cross-section on the line 4—4 of Fig. 1 showing the sheet from which the threads are cut.

Fig. 5 is a view showing the thread separated into its constituent parts.

Fig. 6 is a view of an ordinary cross-woven fabric made from the thread, one of the threads being unraveled. In this view the fabric is deemed to have been treated so as to remove the backing layer.

Fig. 7 is a cross-section of one modification of the invention in which a non-fugitive backing is employed.

Fig. 8 is a view showing a fabric made from the thread of Fig. 7.

Fig. 9 shows a modification of the process after the sheet of backing and applied rubber has been assembled.

Fig. 10 shows the second step in the modified process.

Fig. 11 shows the twisting and covering of threads, this view showing the stretching or elongation of the composite threads as taking place concurrently with the twisting and covering operations. In this view the thread is twisted and covered on a so called "down-twister."

Fig. 12 is a detail section on the line 12—12 of Fig. 11.

Referring to Fig. 1, a sheet of polyvinyl alcohol or other soluble or fugitive material is indicated at 1 as it is passed from a supply roll 2 over a guide roll 3 and thence to a pair of stretching rolls 4. The rolls 4 are preferably driven at a substantially accelerated surface speed so as to stretch and partially orient the material, and to facilitate the elongation of the material the roll 3 and the rolls 4, or either of them, may be gently heated to soften the backing sheet. While any suitable degree of stretching may be performed at this point, a polyvinyl alcohol sheet or film which can be elongated 1000% before its complete orientation, i. e., when no further stretch can be imparted thereto, will be elongated say 500% between the rolls 3 and 4. It is possible to omit all stretching during this stage in the process and perform all of the stretching of the backing at a later stage in the process.

From the rolls 4 the material in its partially stretched condition has applied to one side thereof a water-resistant adhesive 6. The applicator roll 7 indicates one means by which this operation may be performed. After the intermediate or protective layer is applied to the backing, it is ready to receive the coating or layer of rubber or similar elastic material which is to form the body of the thread. In the drawing a simple form of spreader blade 8 is illustrated as merely an example of one means which may be used for the purpose. Behind this blade 8 is a bank 9 of elastic material in the form of latex or rubber dispersion which is spread over the protective adhesive coating to a thickness determined by the desired gauge or thickness of the finished rubber thread. In lieu of the spreading operation, the rubber may be applied by any suitable means, such, for example, as by calendering.

From the rubber application point, the sheet of backing with its overlying rubber layer now passes into a heated chamber 10 where the layer of rubber is dried and vulcanized. As the sheet, now carrying the vulcanized rubber layer, issues from the drier-vulcanizer it may receive a coating of soapstone or other material to render its surface non-adhesive. A dusting device for this purpose is indicated at 11. The sheet is then rolled up as shown at 12 and the roll permitted to stand until the material is cooled and sets.

A roll of the material 12 is then transferred to a location for the next series of steps. From the roll 12 the material is conducted to pairs of stretching rolls 15 and 16 which may be heated

and are driven at progressively accelerated speeds to impart the final stretch and orientation to the backing material. This operation also stretches the rubber to the desired degree. The distribution of the total elongation of the backing between preliminary stretching rolls 3 and 4 and the final stretching rolls 15 and 16 will be optional, depending upon the amount of elongation required to bring the backing to complete or substantially complete orientation and also upon the degree of stretch or tension which it is desired to impart to the rubber. In any event, the amount of stretch which is imparted to the composite sheet between rolls 15 and 16 should be considerably under the elastic limit of the rubber so as to impart the light, easy or "lazy" tension to the rubber constituent of the thread in order to obtain the "easy" stretch which is desired.

From the rolls 16 the composite material is passed between a pair of cutter rolls 17 which slit the material into a plurality of threads or ribbons. From the slitter 17 the sheet is passed through a comb 18 and thence to guide rolls 19 from which the threads pass to wind-up spools 20, or all the ends are wound on a single beam.

The composite threads obtained in the manner described are practically non-stretchable owing to the fact that the backing layer has been elongated up to the point where little or no further elongation is possible, or, in the terms commonly used in this connection, the backing layer is said to be fully oriented, i. e., the molecules have rearranged themselves so that no further elongation is possible. However, if the thread is relaxed, the rubber will tend to contract, throwing the thread into a series of closely spaced spirals, but as the oriented backing cannot contract, the rubber will remain in longitudinal tension. The thread will always assume a spiral formation with the backing layer on the outside of the rubber.

This property of the composite thread to assume a natural twist or spiral is a substantial merit of the thread because the twisted or spiral rubber is under compression. A rubber thread made from such a twisted rubber core, has much superior aging qualities because the twisted rubber is compressed laterally, although it is still under longitudinal tension. The fact that the backing layer is on the outside surface of the thread will protect the thread from the air and reduce or retard oxidation. The surface of the rubber which is next to the backing and at which point the rubber is under maximum tension is completely shielded from the air.

It will be seen that as the thread as now constituted is firm and has little or no stretch or elongation because of the presence of the oriented backing layer, it may be used in any standard type of textile machine with great ease and facility for the operator does not have to make any allowances for stretch in the thread. It may be placed directly in a loom or knitting machine if bare rubber thread is to be used. However, it is generally preferred to cover a rubber thread with a jacket or winding of cotton, rayon, nylon or other textile material before incorporating it in a garment.

For covering the material, the composite thread of rubber and backing may be placed on the beam or spools of an ordinary covering machine and one or more layers of the textile material wrapped about it. The covering operation may be performed while the thread is held in straight or taut condition. It is preferred, however, to twist the rubber thread during the covering operation so as to impart a certain degree of added elasticity to the thread. A device for this purpose is shown in Fig. 3.

The thread from the rolls 20 may be re-spooled on the ordinary package 22 such as used in standard "up-twist" covering machines. The package is rotated as shown and the composite thread passed through the well known flyer 24 to rolls 25, this operation imparting a twist to the thread. The amount of the twist may exceed the natural twist, in which case the rubber will be placed under increased compression. This is an especially valuable attribute of the invention, as rubber under compression has much superior aging qualities. From the rolls 25 the twisted thread passes through the center of the rotating package 26 which carries one or more strands of the covering material which are wrapped in close covering spirals over the twisted thread which now becomes the core of the covered elastic thread, now indicated by the numeral 28. The outer wrapping maintains the compression imparted to the rubber during the twisting operation. It will be observed that the direction of twists imparted by the operation of the packages 22 and 26 are in opposition so that a substantially balanced or non-kinking thread is obtained. The thread thus obtained has a certain degree of give or elasticity due to the fact that the rubber and its backing layer are twisted in spiral form. The amount of stretch of which this thread is capable is dependent upon the extent to which the spirals of the backing material may straighten out. If a very tight twist with a high order of twists per inch is imparted to the composite core at 22—24, the amount of elongation may be quite small, but if the twist is on a longer spiral with less twists per inch, the possible elongation is greater. As the rubber is compressed within the spiral outer backing layer, there is always a point at which no further stretch can be imparted to the composite thread. The controlling factor for the elongation is the oriented and non-stretchable backing layer or ribbon which will give a total elongation only to the extent to which the spirals of the backing may spread apart before they reach their limit. The rubber is still under a rather light tension when the composite thread has reached the limit of its extensibility.

What has, therefore, been accomplished is a thread shown in Fig. 5 which has exactly the same capacity for elongation as a highly tensioned rubber thread which may be used successfully and practically on standard elastic knitting, weaving or braiding machines. However, when the backing is eliminated, as has been stated, the rubber constituent of the thread will contract and there is, therefore, obtainable a softly yielding piece of elastic goods or fabric.

If, as suggested above, the twisting operation is omitted, the resultant composite thread will have a reduced elongation owing to the presence of the substantially non-stretchable backing, but when the backing is eliminated the latent tension in the rubber will be released and the thread will contract, giving a mild elasticity to the product. As the rubber is not twisted in this form, the thread will not have as much elasticity as in the preferred form.

In Fig. 6 is illustrated a simple, square woven fabric as an example of the product after the backing has been eliminated. This fabric will be considered to have been woven from threads 28 on an ordinary loom. After the fabric was com-

pleted, it was given the usual water bath or scouring treatment to remove dirt, oil, sizing and other extraneous matter and the water has attacked the soluble backing 1 and that is now completely eliminated. The material is an elastic fabric with a contractive property imparted by the tensioned and twisted rubber threads.

While for many types of fabrics it may be desirable or advantageous to remove the backing layer, in other fabrics this may not be so desirable and in that case any of the non-soluble, but orientable materials may be employed.

In Fig. 7 the rubber layer or constituent is indicated at 9ª and the backing layer at 1ª. In making this type of fabric or thread the same procedures are employed as in the one just described in full, except that the protective adhesive 6 is not necessary. The degrees of stretch required to give the preliminary and the final orientation will be determined from the character of the material and the results desired, it being desirable always to impart an elongation after the application of the rubber layer which will give the desired tension to the rubber constituent of the thread. As the backing is not eliminated, the amount of elasticity or stretch in this finished thread or fabric will be determined by the extent to which the spirals of the backing layer may be elongated before the limit of extensibility is reached.

The form of the invention shown in Figs. 9 to 12 differs from that shown and described hitherto mainly in the fact that the stretching of the composite material is performed after it is cut into threads and simultaneously with the twisting and covering of the threads.

In Fig. 9 a sheet of backing material and rubber is indicated at **30**, this sheet having been made by the procedure illustrated in Fig. 1 or by any of the modified processes. The backing material may have been given a preliminary and partial stretch or it may be without any elongation at this point. The material is first cut into a series of tapes or relatively wide ribbons by the slitting knives **32** and thence passed to a pair of guide rolls **33** from which the ribbons or tapes are wound upon a plurality of storage spools **34**. The rubber at this point is not under any tension whatever and the spools may be stored for a considerable period without deterioration of the rubber, and may be shipped to the thread maker in this condition.

For the manufacture of the finished thread a ribbon or tape is led from the roll **34** through a final slitter **35** where the composite material is cut into the narrow thread form, all of the threads being wound up on a beam indicated by the numeral **36**. This beam is then mounted in a covering machine.

The twisting and covering operation is performed in a down twister and as shown diagrammatically in Fig. 11, it being understood that the drawing is illustrative only and that the number of threads carried on a beam is limited only by the number of twisting units which may be carried on one twisting machine.

From the beam **36** each thread **38** is led to a pair of guide rolls **39** and thence to a group of rolls by which the thread is stretched to complete the orientation of the backing and impart the desired tension to the rubber element of the composite thread. This group comprises a pair of drawing and guide rolls **40** and an intermediate roll **41** which may be heated moderately to facilitate the orientation of the backing. Preferably this roll **41** extends the entire length of a twisting unit. From roll **41** the thread passes to a second pair of rolls **42**. The rolls **40** and **41** are preferably driven at the same surface speed as the drawing rolls, but the rolls **42** are driven at an accelerated surface speed so that the composite material is given the stretch which is necessary to elongate it.

From the rolls **42** the thread passes to the pair of guide rolls **44** and is attached to the rotating package or spindle **45** which twists the composite thread into the desired spiral form. Between the rolls **44** and the spindle the thread passes through a spool or package **46** containing the covering material **47** which passes through the flyer **48** and is wrapped about the thread, it being noted that the twists imparted by the spindle **45** and the package **46** are in the reverse direction as indicated by the arrows. The covered thread passes through guide rolls **50** and to a traveling eye or layer **51** which winds the twisted and covered thread upon the rotating spindle.

The method illustrated in Figs. 9 to 12 has certain advantages for commercial practices. It is also advantageous because the order of the final thread slitting and stretching steps makes it possible to secure much smaller gauge threads than is practical where the stretching precedes the final cutting operation.

For the manufacture of very fine rubber threads a still further variation of the process may be employed. In such a case the backing material is coated with a layer of unvulcanized rubber which is dried and then the composite sheet of backing material and unvulcanized rubber is stretched which orients the rubber and the backing sheet simultaneously. While unvulcanized rubber will not orient uniformly, if stretched by itself, the presence of the uniformly orientable backing will cause the rubber to orient uniformly. This operation will give a rubber film of extreme thinness. The composite sheet will then be vulcanized. If desired the material may be given a further orientation after vulcanization either in sheet form or after the sheet is cut into threads. This will reduce the size of the threads still further.

It will be understood that where the term "rubber" is used, the intention is to cover any natural or synthetic rubber or elastic rubber-like material in any form. By the term "orientable" is meant any of the synthetic resins, vinyl compounds or any of the numerous plastic materials which have been developed in the arts which have the property of elongating to a definite or fixed degree, a result which is commonly attributed to an orientation of the molecules of the material. This property of stretching or orientation is frequently aided by the application of heat. By "fugitive backing" is meant a layer or sheet of this type of material which is soluble in a medium which does not affect the elastic constituent or the covering material employed. Ordinarily the fugitive material will be one which is water soluble so that it may be readily removed by merely washing the thread or the completed fabric in a water bath, although other materials may be eliminated by other non-deleterious treatments. It will also be appreciated that while it is desirable to orient the backing partially so as to give a light degree of tension to the rubber when the backing is fully oriented, in its broader aspects this does not exclude performing all the orientation after the rubber layer is applied. The orientation may be carried to the limit or it may approach that degree. It will, therefore, be under-

stood that the term "orientation" or "orienting" is intended to cover both partial and complete orientation. Nor is it necessary to stretch the backing before the slitting of the sheet into threads, as part or even all of the stretching may take place after the slitting operation. Where the term "threads" is employed, it will be understood to cover fine and heavy threads, cords and cables, and "fabrics" include all types of textile material.

What is claimed is:

1. The process of manufacturing an elastic thread comprising applying a layer of rubber to a sheet of orientable backing material to make a composite sheet, stretching the material to orient it and place the rubber under tension cutting the composite sheet during the process to form threads and thereafter eliminating the backing sheet.

2. The process of manufacturing a covered elastic thread comprising applying a layer of rubber to a sheet of orientable backing material to make a composite sheet, stretching the material to orient it and place the rubber under tension, during the process, cutting the composite sheet into narrow ribbons to form threads, twisting the threads to impart a limited elasticity thereto, covering the twisted thread with a textile material and treating the covered thread to release the backing material.

3. The process of manufacturing a covered elastic thread comprising attaching a layer of rubber to a backing sheet of orientable material, simultaneously elongating the backing material and the rubber until the former has substantially reached the limit of its elongation, cutting the sheet into ribbons during the process, covering the ribbons with textile material and treating the covered ribbons to eliminate the backing material.

4. The process of manufacturing a covered elastic thread comprising attaching a layer of rubber to a backing sheet of orientable material, cutting the composite sheet into ribbons and stretching the composite ribbons until the rubber and the orientable material have reached the desired degree of attenuation and removing the backing material.

5. The process of manufacturing an elastic thread comprising elongating a sheet of orientable material to partially remove the stretch therefrom, applying a coating of unvulcanized rubber to the sheet, vulcanizing the rubber on the sheet, stretching the sheet with the rubber thereon to substantially the limit of the elongation of the sheet, during the process cutting the sheet into ribbons to form threads and removing the orientable material from the threads.

6. The process of manufacturing an elastic thread comprising elongating a sheet of soluble orientable backing material to partially remove the stretch therefrom, applying a coating of unvulcanized rubber to the sheet, vulcanizing the rubber on the sheet, further stretching the backing material with the rubber thereon, cutting the sheet during the process into ribbons to form threads and treating the composite threads with a solvent to remove the backing material.

7. The process of manufacturing a covered elastic thread comprising elongating a sheet of a soluble orientable backing material to partially remove the stretch therefrom, applying a coating of unvulcanized rubber to the sheet, vulcanizing the rubber on the sheet, further stretching the backing material with the rubber thereon, cutting the sheet into ribbons during the process to form threads, twisting the ribbons to impart a limited elasticity to the threads, covering the twisted ribbons with a textile material and treating the covered ribbons with a solvent to dissolve the backing material.

8. The process of manufacturing an elastic thread comprising joining a sheet of unvulcanized rubber and a sheet of stretchable backing material to form a laminated sheet, vulcanizing the rubber on the sheet, cutting the laminated sheet during the process into narrow ribbons, stretching the ribbons until the backing material has approached its limits of extensibility and then eliminating the backing material so as to release the rubber ribbons.

9. The process of manufacturing an elastic thread comprising joining a sheet of rubber and a sheet of an orientable plastic backing material to form a laminated sheet, vulcanizing the rubber on the sheet, cutting the laminated sheet into narrow ribbons, stretching the backing material to place the rubber in tension and then treating the ribbons with a solvent for the backing material so as to release the rubber constituent from the restraining effect of said material.

10. The process of manufacturing a covered elastic thread comprising uniting a layer of rubber and a layer of a fugitive orientable plastic material to form a laminated sheet, stretching the laminated sheet to eliminate substantially any further stretch therein and to place a determined degree of tension in the rubber, cutting the stretched sheet into a plurality of narrow ribbons, covering the ribbons with a textile material, and removing the plastic material.

11. The process of manufacturing a covered elastic thread comprising uniting a layer of rubber and a layer of a fugitive orientable plastic material to form a laminated sheet, stretching the laminated sheet to eliminate substantially any further stretch therein and to place a determined degree of tension in the rubber, cutting the stretched sheet into a plurality of narrow ribbons, covering the ribbons with a textile material, and treating the threads with a solvent for the plastic material.

12. The process of manufacturing a covered elastic thread comprising uniting a layer of rubber and a layer of an orientable, water soluble plastic material to form a laminated sheet, stretching the laminated sheet to bring the plastic material to substantially complete orientation and at the same time to impart a predetermined tension to the rubber, cutting the stretched sheet into a plurality of narrow ribbons, covering the ribbons with a textile material, and washing the threads thus formed to remove the plastic material.

13. The process of manufacturing a covered elastic thread comprising uniting a layer of rubber and a layer of fugitive orientable plastic material to form a laminated sheet, cutting the laminated sheet into a plurality of narrow ribbons, stretching the material and its attached layer of rubber to place the rubber in tension, covering the ribbons with textile material, and removing the plastic material.

14. The process of manufacturing a covered elastic thread comprising uniting a layer of rubber and a layer of fugitive orientable plastic material to form a laminated sheet, cutting the laminated sheet into a plurality of narrow ribbons, stretching the material and its attached layer of rubber to place the rubber in tension.

covering the ribbons with textile material, and treating the threads with a solvent for the plastic material.

15. The process of manufacturing a covered elastic thread comprising uniting a layer of rubber and a layer of orientable, water soluble plastic material to form a laminated sheet, cutting the laminated sheet into a plurality of narrow ribbons, stretching the ribbons to place the rubber in tension, covering the stretched ribbons with a textile material, and washing the threads to remove the plastic material.

16. The process of manufacturing a covered elastic thread comprising applying a coating of a water resistant adhesive to one side of a sheet of orientable, water soluble plastic material, applying a water dispersion of rubber to the coated side of the sheet, drying and vulcanizing the rubber thereon, stretching the plastic material to bring it to an oriented condition and at the same time to impart a predetermined tension to the rubber, during the process cutting the stretched sheet into a plurality of ribbons, covering the ribbons with a textile material, and washing the threads to remove the plastic material.

17. The process of manufacturing an elastic thread comprising stretching a sheet of plastic material to an intermediate state of elongation, applying a layer of rubber to the sheet in that condition, stretching the composite sheet to further elongate the plastic material and to attenuate the rubber to a predetermined degree, cutting the sheet into a plurality of narrow ribbons and then removing the plastic material to release the rubber.

18. The process of manufacturing an elastic thread comprising stretching a sheet of plastic material to an intermediate state of elongation, applying a layer of rubber to the sheet in that condition, cutting the sheet into narrow ribbons, and stretching the ribbons to further elongate the plastic material to attenuate the rubber to a predetermined degree and then removing the plastic material to release the rubber.

19. The process of manufacturing an elastic thread comprising, applying a layer of rubber to a sheet of orientable plastic material and cutting the sheet into narrow ribbons, stretching the ribbons to elongate the plastic material and to place a predetermined tension in the rubber and then removing the plastic material to release the rubber.

20. The process of manufacturing a covered elastic thread comprising stretching a sheet of orientable, fugitive plastic material to an intermediate state of orientation, applying a layer of rubber to the sheet while in that condition, cutting the composite sheet into narrow ribbons, stretching the ribbons to further orient the plastic material and at the same time placing the rubber under a predetermined tension, covering the ribbons with a textile material, and removing the plastic material.

21. The process of manufacturing a covered elastic thread comprising stretching a sheet of orientable, water soluble plastic material to an intermediate state of orientation, applying a layer of rubber to the sheet while partially oriented, stretching the plastic material to further orient it and at the same time placing the rubber under a predetermined tension, during the process cutting the composite sheet into narrow ribbons, covering the ribbons with a textile material, and washing the threads to remove the plastic material.

22. The process of manufacturing an elastic thread comprising applying a layer of unvulcanized rubber to a temporary backing of orientable plastic material, simultaneously orienting the unvulcanized rubber and the plastic material, vulcanizing the rubber on the backing slitting the laminated material into threads and then eliminating the backing.

23. The process of manufacturing an elastic thread comprising applying a layer of unvulcanized rubber to a temporary backing of orientable plastic material, simultaneously orienting the unvulcanized rubber and the plastic material, vulcanizing the rubber on the backing, slitting the laminated material into threads, further orienting the threads and then eliminating the backing.

24. The process of manufacturing an elastic thread comprising applying a layer of unvulcanized rubber to a temporary backing of orientable plastic material, simultaneously stretching the unvulcanized rubber and the plastic material to orient the rubber and the plastic material, vulcanizing the rubber, slitting the composite sheet thus formed into threads and then eliminating the backing.

25. A process in accordance with claim 24 in which the material is further oriented after vulcanization.

26. A process in accordance with claim 24 in which the threads are stretched to further orient the backing material and to place the rubber under tension.

27. The process of manufacturing an elastic fabric comprising applying a layer of rubber to a sheet of fugitive, orientable plastic material, stretching the material to place the rubber under a predetermined tension, during the process cutting the sheet into narrow ribbons to form threads, fabricating the threads into a fabric, and thereafter treating the fabric to remove the plastic material.

28. The process of manufacturing an elastic fabric comprising applying a layer of rubber to a sheet of fugitive, orientable plastic material, during the process cutting the sheet into narrow ribbons to form threads, stretching the material to place the rubber under a predetermined tension, covering the threads with a textile material, fabricating the covered threads into a fabric, and thereafter treating the fabric to remove the plastic material.

29. The process of manufacturing an elastic fabric comprising applying a layer of rubber to a sheet of fugitive, orientable plastic material, cutting the sheet into narrow ribbons, stretching the ribbons to place the rubber under a predetermined tension, fabricating the threads into a fabric, and thereafter treating the fabric to remove the plastic material.

30. The process of manufacturing an elastic fabric comprising applying a layer of rubber to a sheet of fugitive, orientable plastic material, cutting the sheet into narrow ribbons, stretching the ribbons to substantially the limit of its elongation and at the same time placing the rubber under a predetermined tension, covering the threads with a textile material, fabricating the covered threads into a fabric, and thereafter treating the fabric to remove the plastic material.

31. The process of manufacturing an elastic fabric comprising uniting a layer of rubber to a sheet of water soluble, orientable plastic material, cutting the sheet into a plurality of narrow ribbons, stretching the composite ribbons thus formed to substantially orient the plastic mate-

rial and place the rubber under tension, covering the ribbons with a textile material to form threads, fabricating a fabric from the threads, and washing the fabric to remove the plastic material.

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