July 9, 1968 C. W. WALL 3,391,526

METHOD AND APPARATUS FOR COVERING CORE YARNS

Filed May 19, 1964 3 Sheets-Sheet 1

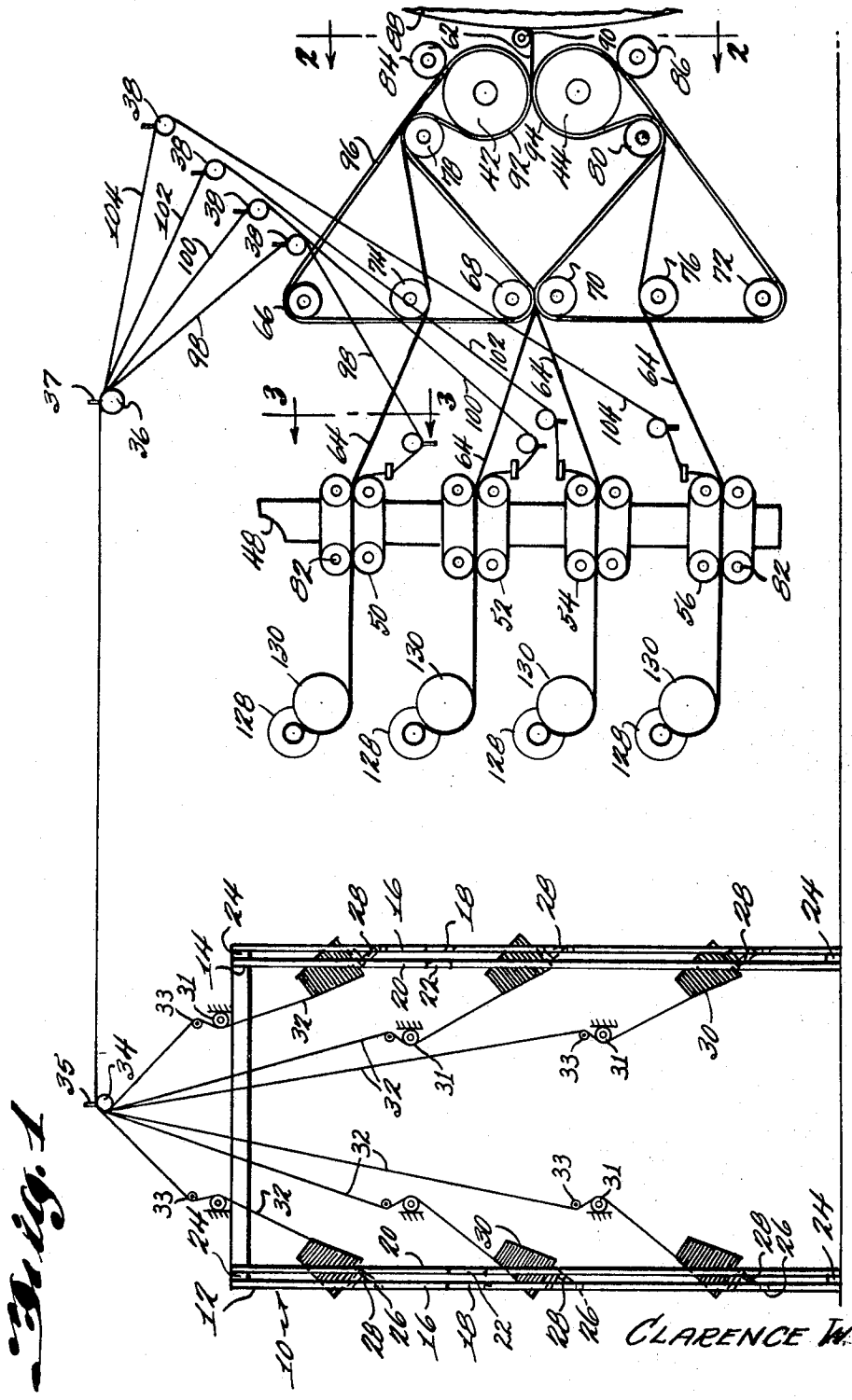


Fig. 1

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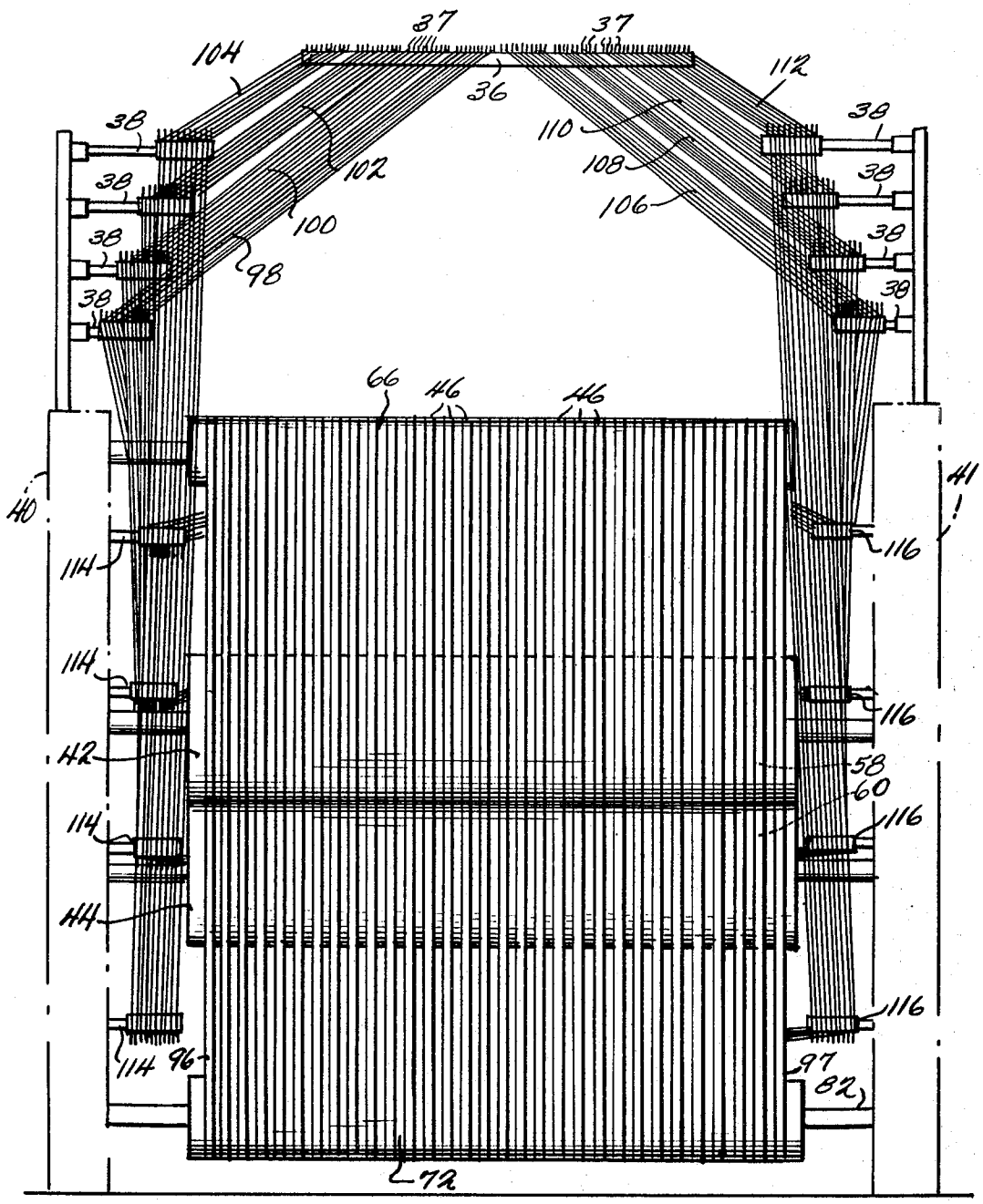


Fig. 2

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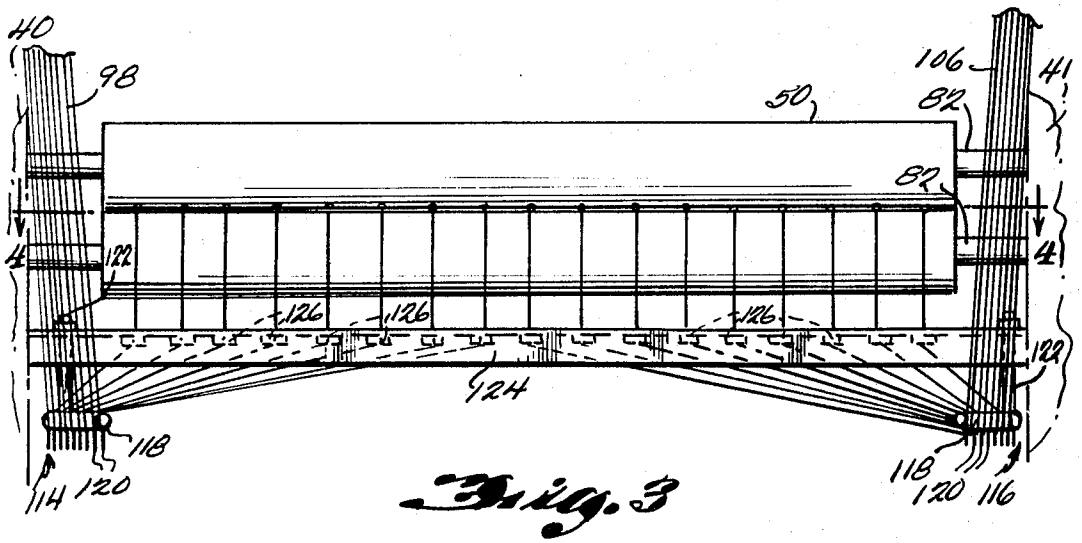


Fig. 3

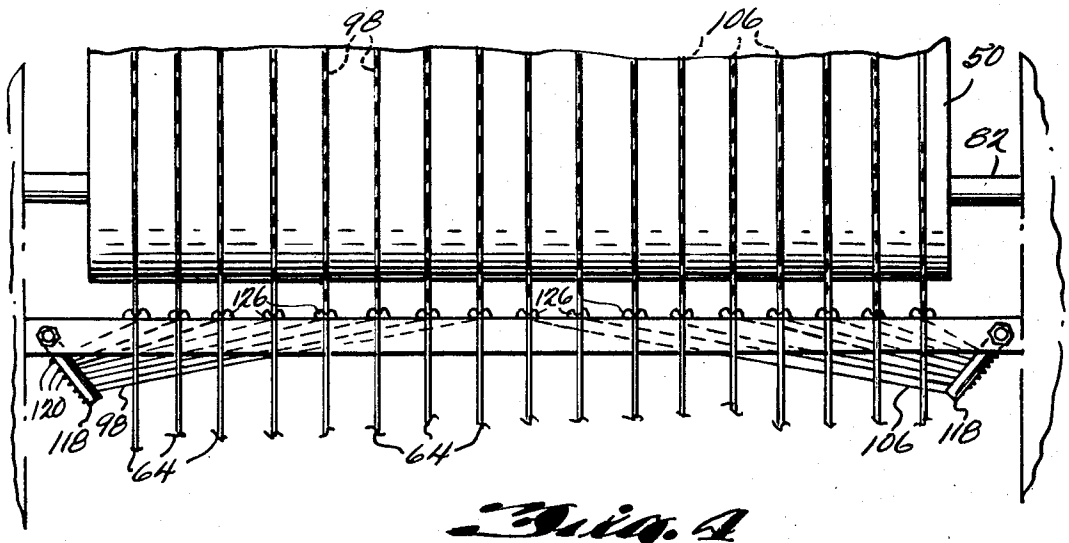


Fig. 4

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METHOD AND APPARATUS FOR COVERING CORE YARNS

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ABSTRACT OF THE DISCLOSURE

Elastomeric core yarns are covered by withdrawing them from a group of creel supported bobbins, leading the core yarns upwardly, rearwardly, and then downwardly to a point forward of a tape condenser. The tape condenser in the form of cooperating bands trained over a series of grooved rollers divide the cover yarn into an appropriate number of cover yarn strips which are aligned with the core yarns and united therewith by rub aprons and subsequently wound onto spools as a composite yarn.

The present invention relates to the preparation of core yarns, i.e. composite yarns comprising a core of continuous filament or spun yarn covered with any desirable type of cover yarn. More particularly, the invention is concerned with a method and apparatus for preparing core yarns on a woolen system using a conventional type of wool card and tape condenser.

In the past, core yarns have been primarily prepared by introducing the core into the cover yarn on a spinning frame either above or below the twister tube of the frame. This is essentially a twisting operation and, as a result, the core may be considerably exposed on the surface of the finished yarn. This precludes the use of a natural colored core with ingrain cover yarns. There are also other disadvantages in preparing core yarns on the spinning frame including the tendency to reduce the loft of the finished product.

Other techniques for preparing core yarns have also been proposed which do not require the use of a spinning frame. However, these techniques also suffer from one disadvantage or another, preventing their use on any widespread or effective scale.

In view of the above, the principal object of the present invention is to provide certain improvements in the preparation of core yarns whereby said disadvantages are eliminated. A more specific object of the invention is the provision of a method and apparatus for producing core yarns wherein the tendency of the core to show through the cover fibers is eliminated or at least very substantially reduced while at the same time providing a product of optimum loft, hand and other desired characteristics.

A further specific object of the invention is to provide a core yarn which comprises a core, such as conventional or stretch nylon yarn or any other filament or spun yarn, including elastomers of the type exemplified by spandex, so buried within a cover yarn which may be of any desired composition, that the finished product has the characteristics of the core (e.g. stretch or strength) without undesirably affecting the appearance of the cover yarn (hand and cover).

Still another important object of the invention is to provide means, from the procedural and apparatus standpoint, for preparing core yarns using a wool system including, for example, conventional type cards and tape condensers.

Further objects will also be apparent from the following description of the invention and the accompanying drawings.

As well known in the art, the conventional woolen system includes a tape condenser located at the delivery end of the last wool card in a set of cards, the purpose of the condenser being to divide the full width web of carded fibers leaving the last card into a series of narrow strips. The number of such strips may range from about 60 to 200 depending on the type of condenser used. These strips of webbing are then condensed in a rubbing apron section, by the rubbing action of sets of endless aprons, into roving form, the resulting rovings being wound onto one or more jack spools for subsequent use. According to the present invention, core yarn is produced by providing a plurality of strands of the desired core, forming an equal number of narrow strips of cover yarn by means of the tape condenser located at the delivery end of the last wool card and feeding these strips superimposed on said strands, under proper alignment and tension, into the rubbing apron section of the tape condenser so that each strip of cover yarn is rubbed into and around each core strand, the resulting composite product being then collected on a jack spool. Particularly important to the success of the invention is the method and means of feeding the core strands into the rubbing apron section along with the strips of covering yarns so that the latter are in superimposed aligned relationship with the former. These features are described in detail below in connection with the accompanying drawings wherein:

FIGURE 1 is a schematic view of an apparatus for applying a cover yarn to a core to provide a core yarn, i.e. a composite yarn according to this invention;

FIGURE 2 is an end view taken substantially along the line 2—2 of FIGURE 1;

FIGURE 3 is a view taken along the line 3—3 of FIGURE 1; and

FIGURE 4 is a plan view taken substantially along the line 4—4 of FIGURE 3.

Referring to the drawings there is illustrated schematically a core supply comprising a creel **10** which preferably consists of a pair of spindle banks **12** and **14**. Each bank consists of four vertically extending angle irons **16**, **18**, **20** and **22** forming a rectangular skeleton, said angle irons being joined at the upper and lower transverse edges by cross bars **24**; angle irons **16** and **18** defining the rearward wall of each bank while angle irons **20** and **22** of each bank define the forward wall thereof. The forward wall of each bank face each other. Extending between rearward angle irons **16** and **18** of each bank are a plurality of longitudinally extending vertically spaced spindle support bars **26** each adapted to receive a plurality of spindles **28** disposed, preferably at a 45° angle to the horizontal and directed upwardly toward the forward edge of the bank. Each spindle **28** can carry one or more core cones **30**, depending of course, on the size of the cones and the transverse distance between the forward and rearward walls of each bank.

In substantial alignment with the longitudinal axis of each spindle **28** is a guide means **31** through which is directed a core strand **32** from a cone **30**. Tension means **33** are provided for each continuous core filament or strand to maintain the core straight or taut. Conventional tension means can be employed such as gate or washboard devices, snubbing rods, pressure disks, magnetic brakes or drum brakes. The tension applied to the core, of course, will depend on a number of easily ascertainable factors the determination of which is within the purview of those skilled in the art. It can, for instance, depend on the type of core used, the rate at which the core yarn is produced, the operational speed of the rub aprons, etc. It has been found that a tension of or about 5 grams on each end of a continuous core filament leaving the ceramic or porcelain guide member positioned above the core creel has proved effective. The strands **32**, leading from each cone of each bank con-

verge overhead at guide means 34 and are separated into a plurality of sets by a plurality of comb guides 35, each set containing, for instance 15 core strands. The separated sets are then passed to distributor guide means 36 where the sets are maintained in spaced relationship by a plurality of comb guides 37. Preferably, eight sets are employed although it will be recognized that more or less can be utilized depending on a number of factors easily ascertained by those skilled in the art, for instance, the number of rub aprons and tapes employed in apparatus associated with the core supply of this invention.

From the distributor guide means 36 each set of 15 core strands is directed in an angularly downwardly direction and passes over comb guide means 38. Each set is then introduced into the tape condenser section of the apparatus, described more fully hereinafter. Four sets are introduced into the condenser section adjacent the interior vertical surface of frame members 40 and 41 thereof, the least downwardly and angularly directed distributed set of core yarns being introduced nearest the outside edge of the outermost tape of a plurality of tapes employed in the tape condenser section. The remaining sets are progressively disposed outwardly from the outside edge of the outermost tapes as their downward angle of direction cover guide members 38 increases.

In a preferred embodiment the tape condenser section comprises a tape roll frame having as stated above frame members 40 and 41 in which are mounted two metal dividing rolls 42 and 44 and the various rolls required for guiding the tapes. The dividing rolls are provided with circumferential grooves each of a width to accommodate a tape 46, the grooves in each roll being spaced by the width of a tape and the grooves alternating in the two rolls so that a groove in one roll faces the land intervening between grooves in the opposite rolls.

The side frames 48 form a rub apron frame supporting two sets of banks of endless condensing or rub aprons 50, 52, 54 and 56 which are driven by suitable mechanism so that their opposing runs travel rearward at the same time they are reciprocated laterally in opposite directions. The banks of rub aprons 50 and 52 constitute an upper set and the banks of aprons 54 and 56, a lower set.

The tapes, which separate a web of cover yarn into a plurality of strips and which are guided over a series of idler rolls, comprise a series of endless tapes 46 arranged in lateral succession. The web passes between the suitably driven top dividing roll 42 and the bottom dividing roll 44 turning oppositely so that their adjoining surfaces move together and progress the web forward.

The dividing rolls have cooperating annular grooves 58 and lands 60 so that the groove on one roll fits into the land of the other dividing roll as well known in the art and separates the web 62 into a plurality of cover yarn strips 64. Riding in the bottom of each groove of the dividing roll throughout the length of the roll, which makes said strips, is a tape 46. The tape 46, in the particular groove, passes around one dividing roll, around one of the smooth carrier rolls 66, 68, 70 and 72 at the top, upper middle, lower middle or bottom respectively, and then around a suitably driven grooved carrier roll, 74 and 76, at the top or bottom respectively, and back to the appropriate dividing roll, around idling tension rolls 78 and 80, as the case may be, which are also guide rolls for the tape entering the dividing rolls as well known. Thus, there are four different tape paths provided in a common type tape condenser and the tapes carry off cover yarn strips 64 to rub aprons 50, 52, 54 and 56 which turn around apron rolls 82 which oscillate axially back and forth in connection with conventional rub motions.

The tapes 46 are subjected to pressure by grooved guide rolls 84 and 86, which are in front of the respective dividing rolls and out of line with the web 62. The tapes are under pressure as well known in the art. Further it will be evident that the dividing rolls, carrier rolls and guide rolls turn on suitable bearings and are driven by suitable drives not shown.

In the operation of the apparatus of this invention the cover yarn is stripped from the carding machine 88 by the doffer comb 90, enters between the dividing rolls 42 and 44 and is separated into a plurality of cover yarn strips, one being carried by each of the diverging runs 92 and 94 of the outermost tape 96 between these runs and the lands of the dividing rolls, and the other cover yarn strips being carried in a similar manner by the diverging runs of the other laterally succeeding tapes.

Each tape run diverging from the upper dividing roll 42 passes up over the idler 78 and thence directly around the grooved roll 74, and delivers its cover yarn strip to the upper pair 50 of the upper bank of rub aprons. Each tape run diverging from the upper dividing roll, passes over the idler 78 and thence directly over the smooth roll 68. The cover yarn strip is then delivered to the lower pair 52 of the upper bank of rub aprons before the tape passes upwardly in front of the rub aprons 50. Similarly each tape run, diverging from the lower dividing roll 44, passes over the idler 80 and thence directly over the grooved roll 76 and delivers its cover yarn strip to the lower pair 56 of the lower bank of rub aprons. The tape run diverging from the lower dividing roll 44 also passes over the idler 80 and then directly over the smooth roll 70 to deliver its cover yarn strip to the upper pair 54 of the lower bank of rub aprons.

The two upward runs of adjoining tapes, maintained longitudinally spaced by the grooved roll 74, accordingly deliver their cover yarn strips separately, i.e. in spaced side-by-side relationship to the lower pair 52 of rub aprons and to the upper pair 50 of the aprons. The two downward runs of adjoining tapes, similarly spaced, deliver their cover yarn strips separately, to the upper pair 54 and to the lower pair 56 of rub aprons.

As can be seen from FIGURE 2, eight sets of core strands 98, 100, 102, 104, 106, 108, 110 and 112, are introduced inside the tape condenser section, sets 98, 100, 102, and 104 between the frame 40 and the outermost tape 96 while the remaining sets 106, 108, 110 and 112, enter between outermost tape 97 and frame 41.

As shown in FIGURE 3, sets 98 and 106 pass between the frames 40 and 41, respectively, and each is directed over ceramic comb guides 114 and 116, respectively. Comb guides 114 and 116 comprise a guide rod 118 provided with a plurality of downwardly extending teeth members 120. Guide rods 118 are fixedly attached to the lower end of vertically and upwardly extending brace means 122. The upper end of brace 122 is fixedly attached to guide bar 124 extending transversely with respect to the tape condenser, the guide bar being fixedly attached at either end thereof to the frame 40 and 41. The guide rod 118, depending from brace 122, is mounted thereon at an angle of 45° away from the center line of the carding machine 88. For the two upper pairs of rub aprons 50 and 52, the guide bar additionally is positioned at an angle of 45° below the horizontal while for the two lower pairs of rub aprons 54 and 56, the guide bar is positioned at an angle of 45° above the horizontal. Thus the continuous core filaments passing under guide rods 118 are directed from a substantially downwardly and inwardly direction to a substantially angularly transverse direction. The core filaments are then directed in a substantially vertical direction through a plurality of guide means 126 fixedly attached to guide bar 124 positioned rearwardly of tapes and forwardly of the aprons to align each core strand with the center line of a complimental cover yarn strip being introduced into a pair of rub aprons, to position the core strands in a spaced side-by-side relationship and to insure that each of said core strands are superimposed by a cover yarn strip. As illustrated, each pair of rub aprons

condenses thirty core strands with thirty cover yarn strips. This particular feature of the invention substantially enhances the successful production of the improved core yarn of this invention.

The plurality of cover yarn strips and core filaments fed into the front end of each pair of rub aprons are, accordingly, rolled and condensed as they are fed between the rub aprons to produce a core yarn. The core yarns leave the rub aprons and pass respectively to jack spools **128** driven by friction rolls **130**.

As indicated above, a wide variety of materials may be used for the core and covering in preparing the core yarn of the invention. Thus, as noted, the core may be one or more continuous filaments or it may be a spun yarn. The core may comprise conventional or stretch nylon, polyester, acrylic or other synthetic or natural textile material, including elastomers such as spandex (e.g. Lycra). The covering yarn may comprise any type of carded fibers e.g. wool, cotton or synthetic fibers such as polyester, acrylic, rayon, etc.

The preparation of core to covering can be widely varied but usually the core will constitute from four (4) to fifty (50) percent of the weight of finished yarn. It has been found that complete coverage of the core yarn is accomplished with as little as six turns per inch where the core comprises about 15% of the weight of finished yarn. However by increasing the precent of core more turns per inch (e.g. up to 14 turns) will be desirable to completely cover the core.

It should be understood that various changes can be made in the present structure without departing from the spirit of the invention, such as the number of core strands fed into a given pair of rub aprons, the number of banks of rub aprons used as well as the number of tapes employed on a tape condenser unit and therefore the invention is not to be considered limiting except as set forth in the appended claims.

What is claimed is:

1. Apparatus for producing core yarn consisting of an elastomeric core and a cover yarn comprising in combination a core creel, a tape condenser and at least one pair of rub aprons, said core creel provided with a plurality of core cones, each of said core cones supplying a continuous core filament, tensioning means for maintaining each continuous filament under predetermined tension, first ceramic guide means for delivering each of said core filaments rearwardly and substantially horizontally to distributor means located forward of said tape condenser, said distributor means providing a plurality of spaced apart sets of core filaments and delivering said sets rearwardly and downwardly to second ceramic guide means, said second guide means delivering each set of core filaments downwardly and forwardly of said tape condenser to third guide means intermediate said tape condenser and adjacent either end of said rub aprons to direct said sets of core filaments obliquely toward forth guide means comprising a guide bar having a plurality of guide members spacedly and fixedly attached thereto, said guide bar being substanttially parallel to the rearward edge of said rub aprons to deliver said core filaments in spaced side-by-side relationship to said rub aprons, said tape condenser including top and bottom dividing rolls, said rolls having a plurality of circumferential grooves, each of said grooves receiving a tape proceeding thereabout, a cover yarn supply from which said dividing rolls deliver a plurality of cover yarn strips to said tapes, said tapes delivering said cover yarn strips in spaced side-by-side relationship to said rub aprons whereby each of said cover yarn strips is aligned with and engages one of said core yarns on delivery of said cover yarn strips to said rub aprons.

2. The method for producing a core yarn consisting of an elastomeric core and a cover yarn on at least one pair of rub aprons in combination with a tape condenser and a core creel, said tape condenser including top and bottom dividing rolls having a plurality of circumferential grooves with each of said grooves receiving a tape proceeding thereabout, and a cover yarn supply from which said dividing rolls deliver a plurality of cover yarn strips to said tapes, said core creel having a plurality of core cones and including a distributor member and a plurality of guide members in the path of travel of a core filament from said core creel to said rub aprons, the steps comprising feeding a plurality of continuous core filaments to the first of said guide members, resisting the movement of each of the continuous filaments from the core creel to maintain each continuous filament under a predetermined tension as it is fed to said rub aprons, guiding said filaments rearwardly and substantially horizontally to said distributor member located forward of said tape condenser, distributing said filaments into a plurality of sets of core filaments, delivering said sets rearwardly and downwardly to a second guide member, delivering said sets of core filaments from said second guide member downwardly and forwardly to third guide member intermediate said tape condenser and adjacent either end of said rub aprons, directing said sets of core filaments from said third guide member in a substantially transverse direction to a fourth guide member being substantially parallel to the rearward edge of said rub aprons, delivering said core filaments in spaced side-by-side relationship to said rub aprons, dividing the supply of cover yarn into a plurality of cover yarn strips, delivering said strips on said tapes in spaced side-by-side relationship to said rub aprons whereby each of said cover yarn strips is aligned with and engages one of said core filaments on delivery of said cover yarn strips to said rub aprons, condensing each of said cover yarn strips engaging and aligned with one of said core filaments and delivering said condensed yarn to a take-up roll to provide a core yarn.

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