A novel machine to produce non-woven fabric which employs an improved weft yarn guide arm to more accurately lay down the weft yarn onto the warp yarns.

1 Claim, 9 Drawing Figures
YARN FEED GUIDE ARMS

It is an object of this invention to provide a double weft machine which will more efficiently produce a non-woven fabric.

Other objects and advantages of the invention will become clearly apparent as the specification proceeds to describe the invention with reference to the accompanying drawings, in which:

FIG. 1 is an overall schematic view of the new improved machine;

FIG. 2 is a schematic view like FIG. 1 showing the offset relationship of the weft yarn package support;

FIG. 3 is a perspective view of the new and improved yarn feed guide tube arrangement;

FIGS. 4 and 5 show blow-up views of the weft yarn guide members mounted on the rotating flyer;

FIG. 6 is a view taken on line 6—6 of FIG. 3 of the flyer with the weft yarn guide members removed;

FIG. 7 is a view taken on line 7—7 of FIG. 3 with the yarn guide members removed from the flyer;

FIG. 8 is a view taken on line 8—8 of FIG. 3 showing the flyer hub and flyer connection; and

FIG. 9 is a schematic representation of the weft yarn guides and flyer during certain points of rotation.

Referring now more particularly to the drawings and in particular to FIGS. 1 and 2, an apparatus is shown for continuously forming non-woven net fabrics which generally includes a thread winding section 10, a weft sheet forming section 12, a warp and weft sheet combining section 14, a section 16 for securing the sheets in contiguous coplanar relation to form a non-woven net fabric and a creel section 18.

As shown in FIGS. 1 and 2, thread winding section 10 includes thread winding means comprising a pair of hollow tubular thread guide arms 20 and 21 secured to a hollow central shaft 22 for rotation therewith. Shaft 22 is suitably supported for rotation about its central axis and is rotably driven by motor 24 through endless belt 25 and gear box 26. During rotation of thread guide arms 20 and 21 continuous threads or weft yarns 28 and 30 are continuously passed from the creel section 18 and yarn package 32, respectively, through the hollow shaft 22 with yarn 28 passing outwardly through guide arm 20 and yarn 30 passing outwardly through guide arm 21 through their respective outlets 34.

The weft sheet forming section 12 includes a pair of spaced thread support members 36 which supportably receive the threads or weft yarns 28 and 30 passing from the outlets 34 of the guide arms 20 and 21 in a plurality of generally parallel thread reaches therebetween. Thread support members 36 are preferably, of substantially identical construction and each comprises an elongated helical member or spring 38 of high strength, rigid material such as spring steel. If desired, one of the thread support members 36 may use a double wound helical spring. The elongated helical member 38 is removably mounted in and rotatable with a frusto-conical collar member 40 which facilitates placement of the thread or yarn in the spaces of the helical members 38 and is connected to rotatably driven shaft 42. Stubb shaft 42 is rotatably mounted on the end of cross arm 44 which is supported by a suitable bearing surrounding the drive shaft 42. Each thread support member 36 is rotated about its horizontal axis. To facilitate positional support of the helical members 38, suitably supported blocks or stop members 46 are positioned beneath each helical member and abuttingly engage the same to prevent rotation of the cross arm 44 and helical member 38 about the shaft 22 during its rotation and thereby positionally stabilize the same.

As best seen in FIG. 1 the warp and weft sheet combining section includes a pair of nip rolls 48 and 50 which are rotably supported by suitable means, not shown, between the free or open ends of the helical members 38. As seen in FIG. 1, as the helical members 38 rotate to advance the thread or yarn reaches in spaced parallel relation therealong to form the weft sheet, the thread reaches leaving the open ends of the members 38 pass between and are engaged by nip rolls 48 and 50. One or more sheets 52 and 54 of warp threads or yarns from the warp beams 56 and 58, respectively, are supplied continuously to the nip portion of the rolls 48 and 50 from the beams and, during their movement therethrough, the warp and weft sheets are brought into contiguous coplanar relation. As shown in FIG. 1 the loop ends of the weft thread or yarn reaches are released from the rotating helical members 38 and the combined sheets pass over a guide roller 60 to the sheet securing section 16.

The securing section 16 includes an adhesive bath 62 through which the composite sheet of warp and weft yarns is passed by rotatable squeeze rolls 64 and 66 to apply a suitable adhesive thereto. The sheet therefrom passes about the surface of a plurality of heated drying rolls 68 where the warp and weft yarns are secured together and the thus formed non-woven net fabric 70 is collected on a take-up roll. Although not shown, one or more of the rolls in the securing section 16 may be suitably driven to move the warp and weft sheets through the apparatus.

Looking again at FIG. 1, the stub shafts 42 and their respective helical members 38 have aligned central passageways through which selvage threads or yarns 73 from the yarn packages 75 continuously pass during formation of the weft sheet to be positioned within the loop ends of the weft thread or yarn reaches as the reaches leave the open ends of the helical members 38. The selvage threads not only strengthen the composite non-woven net fabric product 70 but provide additional support to the weft sheet during its passage through the securing section 16 of the apparatus.

As discussed briefly before, it is desired to run more than one weft strand so as to provide increased production and efficiency in the manufacture of non-woven fabric. In the preferred form of the invention the apparatus is shown running two strands of weft thread or yarn but it is understood that it is contemplated that any number of strands can be run within the scope of the invention. To this end and to reduce the overall length of the apparatus, the offset creel section 18 is employed. In conventional types of non-woven fabric producing machines the creel section would be located in direct line with the weft yarn laydown mechanism thus requiring the warp beams to be located beyond the creel section because of the ballooning of the weft yarn. In FIG. 2 it should be noted that the creel section 18 is offset from the rest of the apparatus allowing the warp beams 56 and 58 to move closer in toward the weft sheet forming section 12, thereby reducing the amount of floor space required to erect and operate the apparatus. This basically has been accomplished by utilizing a commercially available universal drive shaft transmission 75 between the sprocket 74, driven from the hollow shaft 22, and the shaft 76 to which is at-
tached a sprocket 78 which transmits the drive to sprocket 79 via chain 80 to rotate hollow shaft 82 to which are attached radial hollow arms 84 and 86.

Cree1 section 18 is supported on a base plate 88 to which is attached an upright support 90 which rotately supports the hollow shaft 82, slidably supports the cage members 92 and 94 and the weft package support 96. The weft package support consists basically of a pair of plates 98 attached to the upright support 90 and support the rod 99 therebetween to the L-shaped arm 100. Rotately supported at the end of arm 100 is a shaft 102 to which is fixed a collar member 104 which rotates therewith and has a plurality of radially extending arms 106 to support the weft yarn packages 32. The packages 32 are connected to one another through the use of a transfer tail so that when one runs out the next package will automatically be unwound. This is accomplished by tying the tail of one package 32 to lead end of the next adjacent package 32.

In operation continuous weft threads 28 and 30 are supplied from their respective packages 108 and 32, respectively, through the hollow shaft 22 to hollow guide arms 20 and 21 to wind the threads or yarns about the ends of the spaced-aparte guide members 36. The threads or yarns 28 and 30 are guided by the frusto-conical member 40 into the spaces between the first and second helices of the springs 38. As the outlet ends 34 of the guide arms 20 and 21 pass about the springs 38, the threads or yarns 28 and 30 are laid in a plurality of reaches extending therebetween. The looped ends of the yarn engage the springs 38 and the springs are continuously rotated to advance the reaches in spaced, generally parallel relation along the springs to form the weft yarn sheet. As the reaches of the yarn 28 and 30 approach the open ends of the springs, they engage the selvage yarns passing through the center of springs 38 and combine with the warp threads 52 and 54 as they pass through nip rolls 48 and 50. As previously pointed out, the combined weft and warp thread sheets are then impregnated with a suitable adhesive, dried and cured and thereafter collected.

The thread or yarn 30 is delivered from the package 32 to the hollow shaft 22 through the hollow shaft 82 and the rotating hollow arm 84. The thread or yarn 28 is delivered to the hollow shaft 22 from the package 108 through the hollow nose portion 110, hollow shaft 82 and the radial hollow arm 86. To control the balloon configuration of the yarns 28 and 30 as they rotate rings 112 and 114 are mounted on the housing of the transmission 75 by suitable supports 116 and 118.

Looking now to FIGS. 3-9 a modified version of the threading winding section 10 is shown wherein the tubular thread guide arms 200 and 210 are solid, rather than hollow and employ a plurality of thread guides 120 of plastic or like material and having a ceramic eyelet 122 for the passage of yarn therethrough. The guides are secured to the arms 200 and 210 by suitable means such as screw 124, on the side of the arms 200 and 210 away from the direction of rotation of the flyer. The arms 200 and 210 are secured to the hollow shaft 22 by means of a collar 126 connected to the circular plate 128 via plate 130 to which the arms 200 and 210 are connected.

The arms 200 and 210 are so formed so as to be bent toward the thread support members 36 and in a direction away from the direction of rotation of the arms 200 and 210 (note FIGS. 6 and 7) to provide a lay down pattern of the yarn like that shown in FIG. 9 wherein the angles of bend and inclination are such at positions E, D and C where there is maximum tension on the yarn being laid down the yarn is in a substantially straight line configuration from the outlet of the arm to the thread support member 36. FIG. 9 illustrates only the movement of one of the arms 200 or 210.

Although we have described in detail the preferred embodiment of our invention, we contemplate that many changes may be made without departing from the scope or spirit of the invention and we desire to be limited only by the claims.

That which is claimed is:

1. Apparatus for producing non-woven fabric comprising: yarn guide means including a first pair of yarn guides spaced from each other, means for supporting a plurality of yarn packages, rotatable yarn guide means operably associated with said first pair of yarn guides to supply yarn simultaneously from each of said yarn packages and to wind the yarn about said first pair of yarn guides to form reaches therebetween, said rotatable yarn guide means including a radially directed yarn guide member, a portion of said yarn guide member being bent toward the axis of said first yarn guide means for combining a sheet of yarns with the yarn reaches between said first pair of spaced yarn guides to form a non-woven fabric, means to rotate said rotatable yarn guide means in one direction and a portion of said radially directed yarn guide member is bent in a direction opposite to said direction of rotation of said rotatable yarn guide means.

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