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3,015,223

APPARATUS FOR AND METHOD OF THE HEAT TREATMENT
OF THERMOPLASTIC HIGH PILE FABRICS

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2 Sheets-Sheet 1

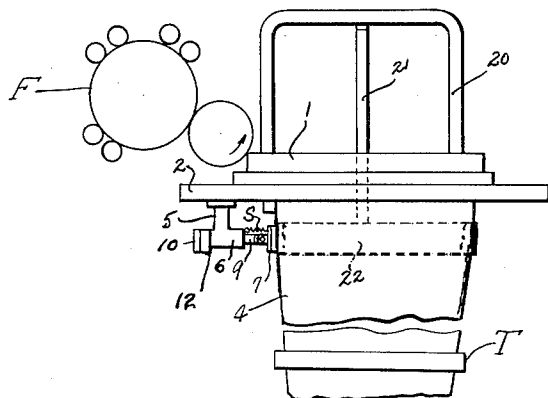


Fig. 1

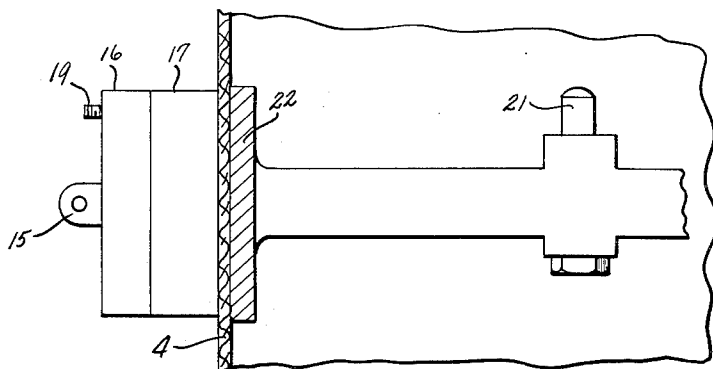


Fig. 3

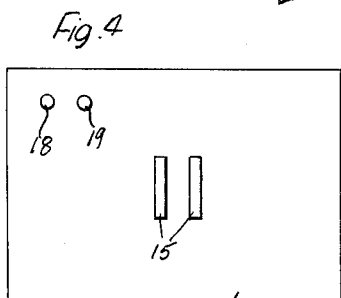


Fig. 4

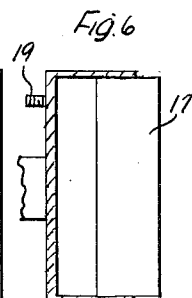


Fig. 6

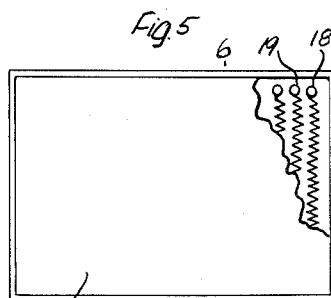


Fig. 5

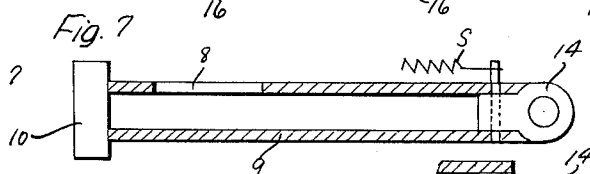
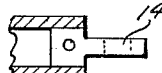


Fig. 7

Fig. 8



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Fig. 2

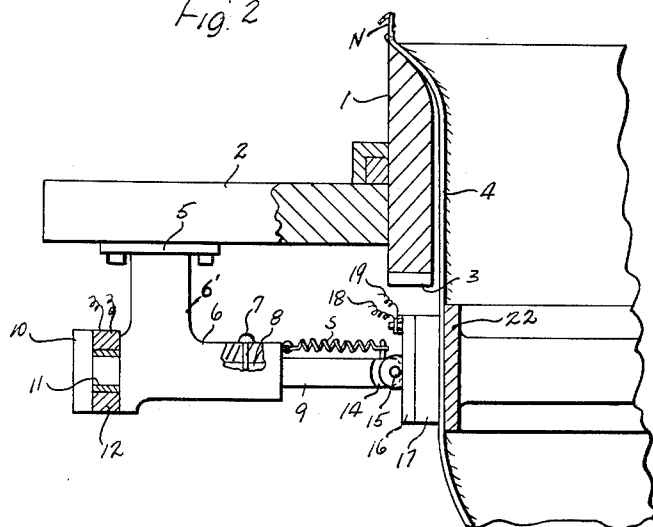


Fig. 11

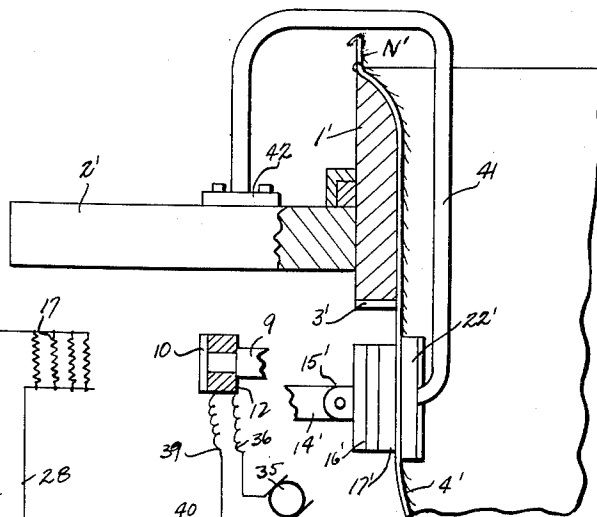


Fig. 9

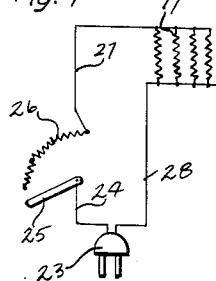
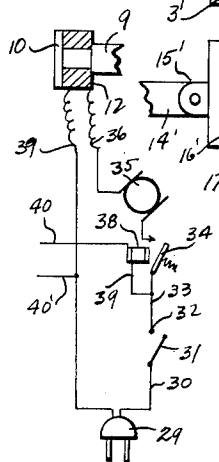


Fig. 10



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APPARATUS FOR AND METHOD OF THE HEAT TREATMENT OF THERMOPLASTIC HIGH PILE FABRICS

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This invention relates to improvements in apparatus for and methods of the heat treating of thermoplastic high pile fabrics and this application is a continuation in part of the application filed December 16, 1958, Serial No. 780,701, now abandoned but clarified by the present application.

After the knitting of thermoplastic high pile fabrics on circular rotatable knitting machines, on Raschel knitting machines, straight or flat knitting machines, the base web is sometimes heat treated in a very expensive machine to install and use, with the fabric passed through an oven like structure, with the base web of such high pile thermoplastic fabric exposed to the heat, to thus physically shrink such base web.

One object of this invention is the provision of electrically heated means, acting in the nature of a dry heat distributing iron that while the fabric is being knitted the base web is subjected to dry heat at the proper temperature commensurate with the speed of movement of the fabric while being formed, thus dispensing with the above noted shrinking oven.

Another object of the invention is the provision of a method of heat shrinking the thermoplastic fabric during the movement of the fabric in the knitting machine whereby the base web by an ironing action, is physically shrunk to the desired degree, the temperature used being commensurate with the speed of movement of the fabric in the machine.

Still another object of the invention is the provision of a supplemental means that holds the portion of the web of the fabric being formed so that a flat portion of the fabric is disposed to permit the heat applicator proper surface contact to insure the desired heat to physically shrink the base web of the high pile thermoplastic fabric.

As is well known the knitted high pile fabrics, now being made to simulate furs, employ such thermoplastic staple fibers composed of Orlon and dynel, principally, and sometimes Acrilan. Thus the present device is designed to be used on a rotary cylinder high pile knitting machines, such as the Wildman Hi-Pile machine, using four to six fiber blenders and feeders or card attachments.

In order that the invention may be fully understood and its numerous advantages appreciated, attention is invited to the accompanying drawings, in which:

FIGURE 1 is a more or less diagrammatic view of the head of a high pile rotary cylinder latch needle knitting machine and also the fiber blenders and feeders or card attachments with the present invention attached thereto.

FIGURE 2 is an enlarged sectional and side elevational view of the bed plate and needle cylinder with the shrinking device in heat applying position.

FIGURE 3 is an enlarged view showing the heat applicator or iron, a high pile thermoplastic fabric and the cooperative ironing board like member.

FIGURE 4 is a rear view of the heat applicator casing.

FIGURE 5 is a front view thereof, a portion being broken away to show the electrically heated unit.

FIGURE 6 is a section on line 6—6 of FIG. 5.

FIGURE 7 is a view of the slidable unit and armature carrying rod.

FIGURE 8 is a detail view of the unit carrying end of the rod.

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FIGURE 9 is an electrical diagram of one type of circuit used to energize the electrical heat applicator or unit.

FIGURE 10 is a similar view of a circuit for the motor of a rotatable cylinder knitting machine, showing the means for electrically moving and holding the applicator in operative position, or when idle.

FIGURE 11 is a view similar to FIG. 2, of a modified form of the present invention.

Referring to the drawings, the numeral 1 designates in FIGS. 1—10, a high pile needle cylinder of a rotatable cylinder knitting machine, having the usual bed plate 2, the cylinder being provided with the usual gear teeth 3 and with one or more fiber blenders and feeders F. Needles N carried by the cylinder are in this instance knitting a high pile thermoplastic fabric 4, the base web of which is to be dry heat treated during the knitting thereof.

To accomplish this, there is attached to the underside of the bed plate by a plate 5, a bracket 6, which carries a tubular arm 6, provided with a set screw 7, that enters a slot 8, formed in the slidable tube or rod 9. By this means the tube or rod 9 is permitted longitudinally limited movement, but is prevented from rotating in the arm 6.

Attached to the outer end of the tube 9, which tube is preferably of a non-magnetic metal, such as brass, bronze or aluminum, is a soft iron armature disk 10, while attached fixedly to the outer face of the bracket is an annular steel or iron core 11 of an electro-magnet 12, which as will later appear, is energized to attract the disk 10, and thus move and hold the tube 9, inwardly of the bed plate. An electrical unit carrying casing 16, is adjustably, attached to tube 9, by means of the connection 14—15, so that its unit 17, and the casing is carried by and is moved with the tube 9. To return the tube and unit to remove the unit out of heat contact with the fabric 4, a spring S, which is a coiled retractile spring, is employed. Conductor attaching posts 18 and 19 are shown, and may be placed in any position to properly conduct current to the unit 17, whose outer face is smooth and may have its forward end slightly curved to facilitate the passage of the fabric thereagainst during its movement when being knitted.

Although in all cases, that is when the knitting cylinders are from 30 inches to 48 inches in diameter and operated at the present speeds from 20 to 26 r.p.m., an ironing board like device may not be necessary to present that portion of the fabric being knitted to the heat applicator 17, it has been found that by having a superstructure 20 attached to and rising from the bed plate, a center rod 21 may be attached thereto and disposed to support or hold a flat band or hoop like member 22, against the inner face within the tubular fabric 4, so that when the heat applicator 17 is in heat applying position as in FIG. 2, sufficient resistance is offered and the fabric so disposed that the best possible heat shrinking action is afforded. However, in large diameter cylinder knitting machines, the applicator can be located almost within and not below the lower edge of the needle cylinder, where the fabric being of a larger diameter at this point is substantially circular in form and is held taut with a slight "give" to accommodate the ironing or heat application effect of the portion engaged by the applicator.

In FIG. 9, is shown one diagram of a circuit employed to energize the unit 17, and it consists of the plug 23, from which is led a conductor 24, to a variable rheostat 25—26, a conductor 27 connecting the rheostat to the unit 17, with a conductor 28 led from the unit to the plug.

In FIG. 10, the motor circuit, as well as lines to a stop-motion is shown, and has the magnet 12, so connected as to be energized only when the motor is operating, and to permit the spring S to take over when the motor is halted,

or the stop motion halts the motor. This circuit includes a plug 29, from which is led a conductor 30, through the motor control switch 31—32, conductor 33, a stop-motion control switch 34, motor 35, conductor 36, magnet 12, conductor 39 to the plug. Conductors 40—40' lead to the stop-motion, which has the electro-magnet 38 and conductor 39, to control the switch 34, which is energized when the switch 31—32 is closed. Thus the heat applicator 17 is held against the moving base web of the fabric only when the motor circuit is closed.

In the arrangement shown in FIG. 11, in lieu of the hoop like member 22, the parts similar to those of FIG. 1, being primed numerals, an attaching plate 42, secures the curved arm 41, so that the holder 22', rests against the inner face of the fabric 4', so that the applicator 17', has its individual ironing board like member. By this arrangement, the superstructure as in FIG. 1 is dispensed with, and this device can readily be attached to any rotatable cylinder latch needle knitting machine, in combination with the applicator 17'.

The rotary cylinder high pile knitting machines now in use, that is the Wildman Hi-Pile knitting machines, are the ones to which this attachment has been designed for. They usually carry four card attachments, with 10 cut cylinders, and using a modified 24 gauge needle, to make the high pile fabrics, and the yarn used may be dynel or cotton, or mixes thereof with the short staple fibers of dynel, Orlon and/or Acrilan, all of which are thermoplastic fibers. Therefore in view of the fact that high pile is set forth in this description, and as the fabrics 4—4' show high pile, and are mentioned as such, it is therefore apparent that fiber blenders and feeders or card attachments, or "heads" as they are known to the trade are here employed.

It has been found that to secure the best shrinkage results, that tests runs must be made, as heavier fabrics require greater heat than lighter thermoplastic high pile fabrics made at the same speed. That is the normal high pile Orlon, dynel fabric, made on a 22 inch diameter latch needle high pile knitting machine may at speeds varying from 15 to 20 r.p.m., have the rheostat adjusted to 275° F., with the heat applicator 5 inches long, and 3 inches wide, and if the applicator is wider and longer this temperature may be lowered. Also in large machines for making wider thermoplastic high pile fabrics, the temperature must be such as to cause proper shrinkage, even if a slight stiffness results in the base web, it being preferable to slightly over heat than to under heat.

A three to six stage rheostat may be used so that three to six different temperatures may be secured, and as above stated, tests must be made to obtain the desired shrinking temperature for the particular weight and type of high pile thermoplastic fabric.

This invention will properly act on nylon, dynel, Orlon, Acrilan, Dacron, and similar types of thermoplastic yarns and fibers, when formed into fabrics, to insure the proper shrinking of the base webs and thus lock in the knitted-in fibers.

In some cases, two to three of the heat applicators are disposed successively, to properly heat and physically shrink the basic web of the fabric when such high pile thermoplastic fabric is being knitted by a rotary cylinder latch needle knitting machine.

It has been found to secure best shrinkage, that the faces of the heat applicators shown in FIGS. 1, 2 and 11, should be 5 inches long by 3 inches wide.

What is claimed is:

1. The combination with a high pile thermoplastic fabric knitting machine having a fabric forming mechanism and a takeup for the formed fabric, of means for dry heat physically shrinking the base web of such fabric while being formed, including a movable support, an electrically heatable applicator carried by said support for movement into and out of contact with the base web of

the fabric, an electric motor for actuating the carrier to move and hold the applicator into fabric contact during the knitting of the fabric by the machine, a spring for moving the applicator away from the fabric when the fabric is at a standstill, and means for holding a portion of the fabric opposite to the contact of the applicator to assist in the application of heat to the fabric.

2. The combination with a rotary cylinder latch needle knitting machine for knitting high pile thermoplastic fabrics and having an annular bed plate and a gear driven needle cylinder, and a take-up, of a means for dry heat shrinkage of the fabric during the knitting thereof, including a bracket supported by the bed plate, a cylindrical member slidably mounted in said bracket, an electrically heatable applicator carried upon the inner end of the cylindrical member, a spring for holding the applicator and the cylindrical member so that the applicator is out of contact with the fabric being knitted, and an electrical motor operably connected to the cylindrical member to be energized when the fabric is being knitted and in motion and to move and hold the cylindrical member and the applicator toward the fabric and the applicator in contact with the base web of the fabric.

3. The combination the claimed in claim 2, wherein there is opposed to the applicator upon the opposite side of the knitted fabric means to hold a portion of the fabric opposite to the contact of the applicator to better assist in the heat distribution from the applicator.

4. An attachment for dry heat shrinking the base web of high pile thermoplastic fabrics, including a bracket having a right-angled hollow arm, a cylindrical member slidably mounted in said arm, an electrically heatable ironing member carried upon one end of the cylindrical member for movement therewith, an armature carried upon the end of the cylindrical member remote from the ironing member, an electromagnet carried by the bracket in attractive relation to the armature for moving the slidable cylindrical member and the ironing member in one direction, and a spring for moving the cylindrical member and ironing member in an opposite direction.

5. An attachment as claimed in claim 4, wherein means is provided to hold the cylindrical member against rotation but which permits limited longitudinal movement of such cylindrical member.

6. The combination with a rotatable cylinder knitting machine having a bed plate and a rotatable needle cylinder and take-up, of a device for physically dry shrinking the base web of a high pile thermoplastic knitted fabric during the knitting of such fabric, which includes a bracket attached to the bed plate, a cylindrical rod mounted for sliding movements in said bracket and radially disposed with relation to the needle cylinder, an electrically heatable applicator carried upon the end of the rod adjacent the knitted fabric and disposed to be moved and held into contact with the fabric during the knitting thereof, a spring mounted to hold the rod in position with the applicator out of contact with the fabric, and electrical means for moving the rod and the applicator inwardly in opposition to the spring action to place and hold the applicator in physical contact with the fabric.

7. The combination as claimed in claim 6, wherein a plate is disposed against the inner face of the fabric and opposite to the contact point of the applicator to present a portion of the fabric to the applicator parallel therewith.

8. The combination with a rotary cylinder high pile knitting machine, having an annular base plate, a rotatable needle cylinder mounted in the base plate, and a fiber feeder for feeding the thermoplastic staple fibers to the needles while in transit and before the needles receive the yarn of means for heat shrinking the base web of such fabric during the knitting thereof, including supporting bracket for attachment to the base plate of the knitting machine, an electrically heatable fabric contacting iron,

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slidably mounted iron supporting means mounted in the bracket, an electromagnet connected to the bracket and slidably mounted means, which when energized moves the iron in to fabric contact, and a spring for moving and holding the iron out of contact with the fabric.

9. An attachment for a rotary cylinder high pile knitting machine, including a supporting bracket, slidably mounted means mounted in the bracket, an electromagnet carried by the bracket and an armature carried by the slidably mounted means for moving the slidably mounted means in one direction, a spring for moving the slidably mounted means in a direction opposite to the action of the electromagnet, and an electrically heated iron carried upon the end of the slidably mounted means remote from the bracket.

10. The combination with a high pile rotary cylinder knitting machine having an annular bed plate, a rotary needle cylinder mounted in the bed plate, and a fiber feeder mounted upon the bed plate, of an attachment for the knitting machine including a bracket carried by the bed plate, a slidably mounted member mounted in the lower end of the bracket, an electrically heated iron carried upon the inner end of the slidably mounted member adjacent to the line of movement of the fabric when being knitted by the knitting machine, electrically operated

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means to influence the slidably mounted member to move and hold the electrically heated iron to contact the fabric being knitted, and a spring for moving and holding the iron out of contact with the fabric.

11. The method of heat treating the base web of a knitted thermoplastic high pile knitted fabric, comprising knitting such fabric on a rotary cylinder knitting machine, physically contacting the base web of such fabric during the knitting thereof with an electrically heated iron to shrink the base web to hold the pile elements from slipping, and when the machine is at a standstill removing the iron from contact with the base web of the fabric.

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