

March 22, 1966

NORIAKI HARADA

3,242,030

MACHINE FOR PERFORATING FIBER WEBS

Original Filed Aug. 29, 1962

2 Sheets-Sheet 2

FIG. 3

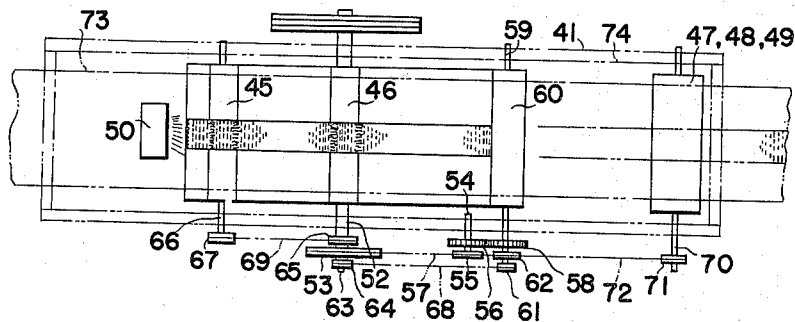


FIG. 4

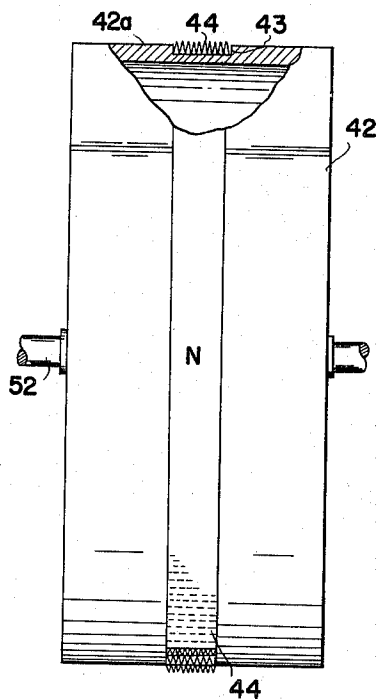


FIG. 5

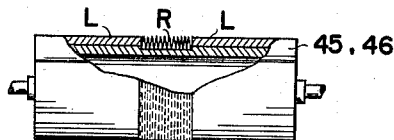
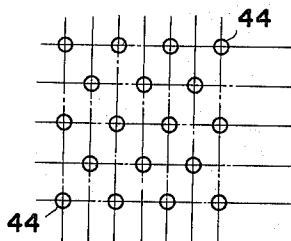


FIG. 6



INVENTOR.

Noriaki Harada

BY

Western + Western
Atts.

1

3,242,030

MACHINE FOR PERFORATING FIBER WEBS

Noriaki Harada, Shibuya-ku, Tokyo-to, Japan, assignor to Otafuku Wata Kabushiki Kaisha, Fukuoka, Japan, a joint-stock company of Japan

Original application Aug. 29, 1962, Ser. No. 220,169.

Divided and this application Aug. 14, 1963, Ser. No. 302,191

Claims priority, application Japan, Sept. 21, 1961,

36/48,046

2 Claims. (Cl. 156—513)

This invention relates to a machine for perforating fiber web at certain parts of said web and, more particularly, it relates to a machine which is particularly suitable for carrying out perforation of a perforated sanitary fiber web. It is a division of my co-pending application Serial No. 220,169, filed August 29, 1962.

It is an object of the present invention to provide a new and improved machine for perforating a fiber web at certain part or parts thereof.

The nature and details of the invention will be most readily understood from a consideration of the following description in conjunction with the accompanying drawings, in which:

FIG. 1 is a plan view showing one embodiment of the perforated sanitary fiber web to whose manufacture the machine can effectively be applied.

FIG. 2 is a side elevational view, in diagrammatic form, showing the essential parts of an embodiment of the machine according to this invention;

FIG. 3 is a plan view, in diagrammatic form, projectionally corresponding to FIG. 2;

FIG. 4 is an elevational view, with a part cut away, showing a needle cylinder suitable for use in the apparatus shown in FIGS. 2 and 3;

FIG. 5 is an elevational view, with a part cut away, showing an auxiliary roll suitable for use in the apparatus shown in FIGS. 2 and 3; and

FIG. 6 is a diagrammatic view showing one example of a pattern of distribution of the imbedded needles on the needle cylinder shown in FIG. 4.

Referring first to FIG. 1, which shows one embodiment of the web which is effectively manufactured by the machine of the present invention, the basic material of the web is a rectangular fiber web P consisting of a web 1 over the surface of which an adhesive 2 has been distributed to certain parts thereof and caused to penetrate therein. This web P has, along its middle part, a perforated region Q having staggered or zigzag rows of holes 3 and having a suitable width in the longitudinal direction of the web P. The two end portions 4 which are not perforated are impregnated with a water repellent.

The web of the above-described construction can be used in a number of ways, for example, by placing a separate sanitary web or cotton pad against the reverse surface of the perforated portion Q, or suitably folding said sanitary web of the invention itself, fitting said pad in place so that the perforated portion Q covers the external genital parts of the wearer, and suspending the two end of said pad by means of a sanitary belt or holding the entire pad by means of a sanitary belt or supporter.

The use manner and advantages of one above-illustrated perforated sanitary web are concretely described in my co-pending U.S. patent application Serial No. 220,169 filed on August 29, 1962.

The present invention relates to a machine which is particularly suitable for perforating a sanitary web such as described in connection with FIG. 1. However, this invention can effectively be utilized for perforating fiber web and other like products.

The machine for forming perforations on a web will

2

now be described with reference to FIGS. 2 through 6. This machine, which is designed to form a perforated band along the center of a web of suitable blanket thickness in which the fibers are mutually bonded with an adhesive, such as a web produced in a web fiber bonding machine as described in the above-named co-pending application, consists essentially of a machine frame 41, a cylinder 42 of large diameter supported rotatably at its center by the frame 41, auxiliary rolls 45 and 46, stretch rolls 47, 48 and 49, and means for driving the moving parts.

As shown in FIG. 4, the cylinder 42 is provided along the center portion of its outer cylindrical surface 42a with a groove 43 of a required, constant width and depth which extends completely around the circumference of the cylinder. In this groove 43, needles 44 are imbedded at their root portions in a suitable pattern, for example, in a zigzag, or staggered-row, pattern as indicated in FIG. 11, the said needles 44 being so made that their extreme tips protrude slightly outwardly from the surface 42a of the cylinder 42, whereby about the center periphery of the cylinder 42, an imbedded needle zone N is formed.

The auxiliary rolls 45 and 46 are affixed, respectively, to shafts 66 and 63, rotatably supported at positions which are above and almost touching the cylinder 42, the roll 45 being at the web feeding section, and the roll 46 being at the web discharging section. Each of these rolls 45 and 46 has, about the central part of its cylindrical surface, a zone R with imbedded bristles of the same width as the imbedded needle zone N of the cylinder 42. The cylindrical surface portions of each auxiliary roll other than the imbedded bristle zone R are covered with rubber liners L of the same thickness as the layer of bristles.

The stretch rolls 47, 48 and 49 are disposed in a vertical row at the discharge end of the machine frame 41, the rolls 47 and 49 pressing, respectively, downwardly and upwardly on the roll 48 disposed therebetween. Positive driving power is imparted to the roll 49 by a mechanism, which will be described hereinafter, and the remaining two rolls 48 and 47 are also compelled to rotate by the above-described relative dispositions of the three rolls 47, 48, and 49.

A spraying device 50 is installed near the web-feeding end of the machine and confronting the center of the cylindrical surface of the cylinder 42 at a position below and to the left (as viewed in FIG. 2) of the auxiliary roll 45. This spraying device 50 is adapted to project a spray of water which is of the same width as, or a slightly greater width than, the imbedded needle zone N of the cylinder 42.

The cylinder 42 is provided with suitable drying means, which, in the embodiment illustrated in FIG. 2, is a hot-air drying device having an air hood or air duct 51 which encompasses the lower part and much of the upper right part of the cylindrical surface of the cylinder 42, beginning at a point below the spraying device 50 and extending at an angle of approximately 250 degrees about the cylinder to a point near the top thereof. This air duct 51 is adapted to supply hot air to the imbedded needle zone N of the cylinder 42.

The moving parts of this machine are driven by a power transmission system of the following description. Driving power is derived from any suitable means (not shown) to drive a shaft 52 to which the cylinder 42 is affixed. A chain wheel 53 is also affixed to this shaft 52 and is coupled by an endless chain 57 to a chain wheel 55 which is affixed, together with a gear 56, to a rotating shaft 54 supported at the upper part of the machine frame. The gear 56 is meshed with a gear 58 which is fastened to a rotating shaft 59 on which a discharge roll 60 is fixedly

supported. Two more chain wheels 61 and 62 are also fixed to this shaft 59. Thus, positive driving power is transmitted to the roll 60 and chain wheels 61 and 62.

The chain wheel 61 is coupled by an endless chain 68 to a chain wheel 64 fixed to the shaft 63 of the auxiliary roll 46. Another chain wheel 65 fixed to the same shaft 63 is coupled by an endless chain 69 to a chain wheel 67 fixed to the shaft 66 of the auxiliary roll 45. Driving power is thus transmitted to the auxiliary rolls 45 and 46.

The chain wheel 62 on the rotating shaft 59 is coupled by an endless chain 72 to a chain wheel 71 fixed to the shaft 70 of the aforementioned stretch roll 49, whereby the roll 49 is positively driven.

The perforating machine of the above-described construction has the following operation. When the machine is started, the cylinder 42 and rolls 45, 46, 47, 48, 49 and 60 rotate in the directions indicated by arrows in FIG. 2, and a web material of suitable thickness, the fibers of which have been mutually bonded with an adhesive, is caused thereby to move through the machine. First, when the web 73, which is fed from a conveying device (not shown), reaches the auxiliary roll 45, and is caught between the said roll 45 and the cylinder 42, the imbedded needle zone N of the cylinder 42 acts on the center portion of the web 73, and only the sharp tips of the needles 44 protruding outwardly beyond the cylinder surface 42a penetrate into the web, thereby forming holes in a staggered row pattern as indicated, for example, in FIG. 6.

The web with needles thrust therein rotates together with the cylinder 42 and, at a position where it has separated from the auxiliary roll 45, is subjected to spraying by the spraying device 50, which sprays water on only the portion of the web with needles thrust therein. The web which has thus received a certain amount of dampness is then subjected to hot air and dried as it continues to rotate together with cylinder 42 and reaches the top part of the cylinder 42, that is, it reaches the auxiliary roll 46. Accordingly, the preferred web 74 is gradually peeled off the cylinder 42 by the positive rotation of the said roll 46, passes over the discharge roll 60, is forcibly pulled as it is bent into an S shape by the stretch rolls 47, 48, and 49, and is discharged.

The perforating machine of this invention, which is principally for forming perforations in webs for sanitary use by women, has the advantageous feature whereby the web, while in the condition with needles 44 thrust therein, is subjected to a water spray and subsequently dried by hot air. Accordingly, the holes made by the needles 44 in the center portion of the web retain their size and shape even after the web separates from the cylinder 42 and is completed in the form of a finished product.

Although this invention has been described with respect to particular embodiments thereof, it is not to be so limited as changes and modifications may be made therein which are within the full intended scope of the invention, as defined by the appended claims.

I claim as my invention:

1. A machine for perforating a web which comprises, in combination, a machine frame; a cylinder rotatably

supported by said frame and having, throughout the central part of its surface, a straight lengthwise groove; a plurality of sharp-tipped web-perforating needles imbedded in said groove in a suitable pattern and extending radially so that their sharp tips protrude slightly above the cylindrical surface of said cylinder thus forming an imbedded needle zone about the cylinder; an auxiliary roll for web feeding and an auxiliary roll for web discharge installed in close vicinity to each other above said cylinder and adapted to hold the web against said cylinder as the web moves with the surface of said cylinder; each of said rolls also being provided with a straight lengthwise groove corresponding to the groove in said cylinder; a plurality of bristles imbedded in the grooves of said rolls, the tips of said bristles extending radially just to the surface of said rolls and forming zones of the same width as said imbedded needle zone; means for spraying water onto the web as soon as it passes said feeding roll; means for drying of the web after spraying, said means encompassing the cylindrical surface of said cylinder from a point near said spraying means to a point near said web discharge roll; a plurality of further rolls for leading out the web after passing said discharge roll; and driving means for positively driving said cylinder in synchronization with said rolls for web feeding and web discharge and at least some of said plurality of further rolls at like peripheral speed as the speed of said web.

2. A machine for perforating a web which comprises, in combination, a machine frame; a cylinder rotatably supported by said frame and having, throughout the central part of its surface, a straight lengthwise groove; a plurality of sharp-tipped web-perforating needles imbedded in said groove in a suitable pattern and extending radially so that their sharp tips protrude slightly above the cylindrical surface of said cylinder thus forming an imbedded needle zone about the cylinder; an auxiliary roll for web feeding and an auxiliary roll for web discharge installed in close vicinity to each other above said cylinder and adapted to hold the web against said cylinder as the web moves with the surface of said cylinder; each of said rolls also being provided with a straight lengthwise groove corresponding to the groove in said cylinder; a plurality of bristles imbedded in the grooves of said rolls, the tips of said bristles extending radially just to the surface of said rolls and forming zones of the same width as said imbedded needle zone; means for spraying water onto the web solely at the imbedded needle zone as soon as it passes said feeding roll; means for drying of the web after spraying, said means encompassing the cylindrical surface of said cylinder from a point near said spraying means to a point near said web discharge roll; a plurality of further rolls for leading out the web after passing said discharge roll; and driving means for positively driving said cylinder in synchronization with said rolls for web feeding and web discharge and at least some of said plurality of further rolls at like peripheral speed as the speed of said web.

No references cited.

EARL M. BERGERT, *Primary Examiner*.