May 17, 1966 NORIAKI HARADA 3,251,340

MACHINE FOR BONDING FIBERS OF A WEB AT GIVEN INTERVALS

Original Filed Aug. 29, 1962 2 Sheets-Sheet 1

FIG. 1

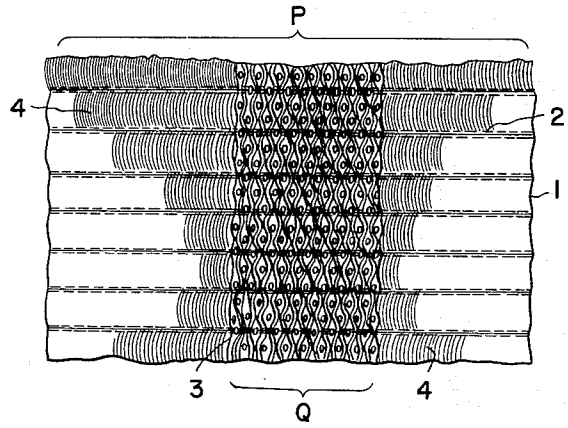


FIG. 2

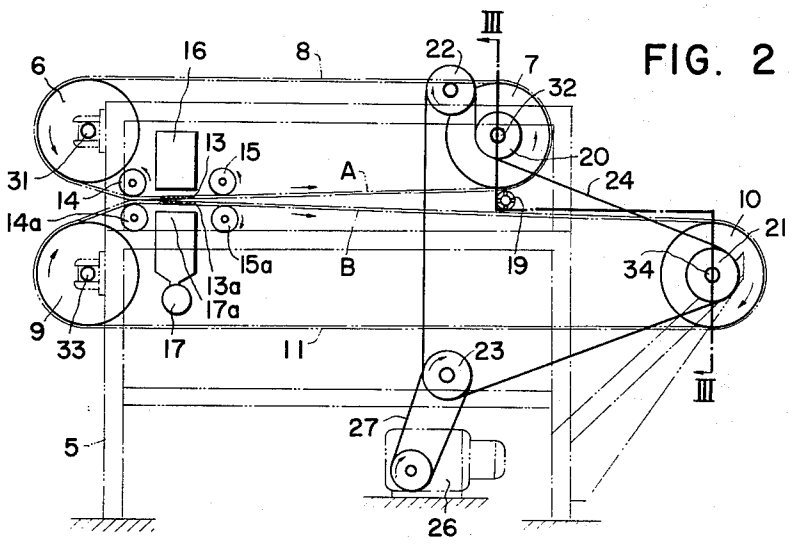
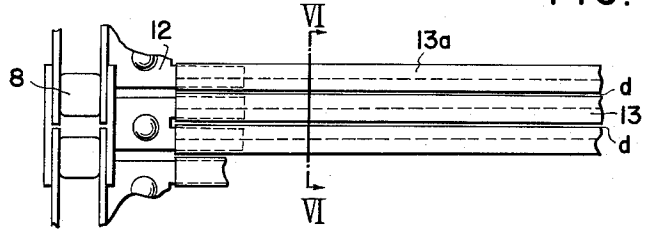


FIG. 4



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FIG. 3

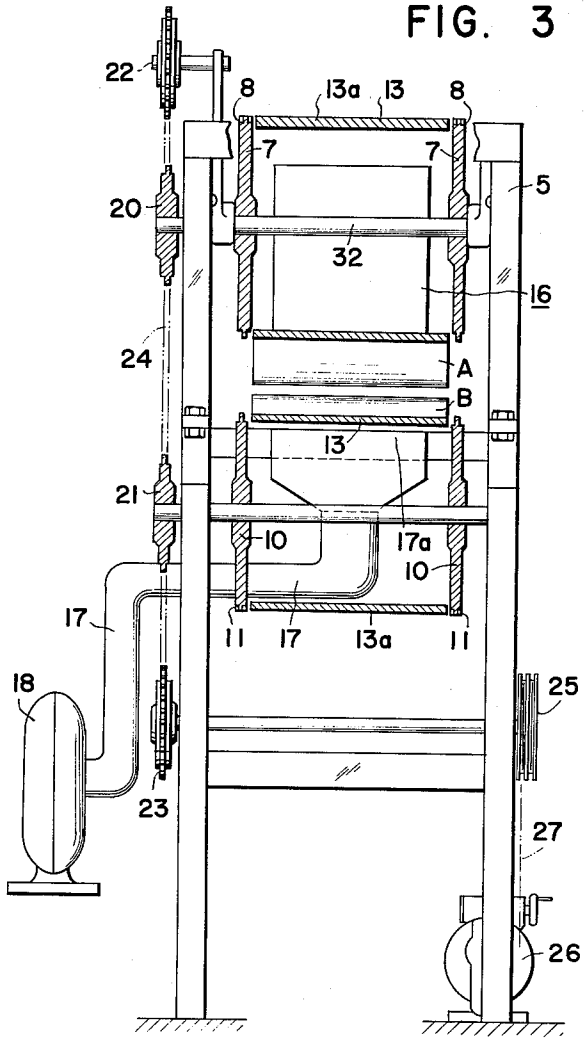


FIG. 6

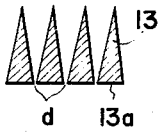
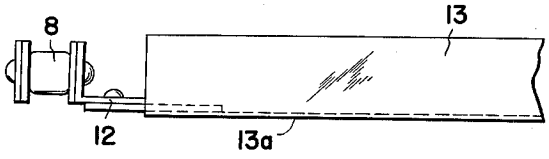


FIG. 5



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MACHINE FOR BONDING FIBERS OF A WEB AT GIVEN INTERVALS

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Original application, Aug. 29, 1962, Ser. No. 220,169. Divided and this application Aug. 14, 1963, Ser. No. 302,029

1 Claim. (Cl. 118—213)

This invention relates to a machine for bonding web fibers at certain parts of the web, more particularly it relates, to a new machine which is suitable for manufacturing a sanitary fiber web with novel and highly desirable constructional features. It is a division of my co-pending application S.N. 220,169, filed August 29, 1962.

It is an object of the present invention to provide a new and improved machine for bonding web fibers at certain parts of the web.

It is another object of the present invention to provide a new machine which is particularly suitable for bonding web fibers at certain parts of a sanitary web.

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

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

FIG. 2 is a diagrammatical side elevational view, showing the essential parts of an embodiment of the machine of this invention;

FIG. 3 is an elevational view of a section taken along the line III—III shown in FIG. 2;

FIG. 4 is a fragmentary plan view, showing a portion of a conveyor of the embodiment shown in FIGS. 2 and 3;

FIG. 5 is an elevational view corresponding to FIG. 4;

FIG. 6 is an elevational view of a section taken along the line VI—VI shown in FIG. 4.

Referring first to FIG. 1, which shows one embodiment of the sanitary web which is suitably 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 thereinto. 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 the said sanitary web itself, fitting the said pad in place so that the perforated portion Q covers the external genital parts of the wearer, and suspending the two ends of the 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 the 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 bonding web fibers of the sanitary pad such as described in connection with FIG. 1. However, this invention can be effectively utilized for bonding web fibers for other objects and usages.

An example of the web fiber bonding machine according to this invention will be described with reference to FIGS. 2 through 6. Referring to FIG. 2, the rigid structure of the machine is a machine frame **5**, which rotatably supports rotating shafts **31**, **32**, **33** and **34**. The rotating shafts **31** and **32**, which are disposed horizontally and transversely with respect to the machine at its upper part at substantially the same height, have, respectively, chain wheels **6**, **6** and chain wheels **7**, **7** fixed to their two ends. The chain wheels **6**, **6** and **7**, **7** are coupled by endless chains **8**, **8** stretched thereover.

The rotating shafts **33** and **34**, which are disposed horizontally and transversely with respect to the machine at substantially the same height at the positions lower than those of the shafts **31** and **32**, have respectively, chain wheels **9**, **9** and chain wheels **10**, **10** fixed to their two ends. The chain wheels **9**, **9** and **10**, **10** are coupled by endless chains **11**, **11** stretched thereover.

Referring particularly to FIGS. 3, 4, 5, and 6, a plurality of identical, elemental bars **13** are supported transversely across and between each of the pairs of opposed chains **8**, **8** and **11**, **11** by angle-shaped brackets **12**. (Refer: FIGS. 4, 5) secured to the inner sides of the said chains. These elemental bars **13**, each of which has a cross section of the shape of an isosceles triangle and is disposed with its base surface **13***a* facing outward, are supported in parallel arrangement with slight gaps *d* (for example, of the order of 1 mm.) between adjacent bars, whereby endless conveyor belts A and B for operating co-operatively with coincident centerlines to move a web (not shown) are formed. For greater effectiveness of these bars **13**, their surfaces are preferably made smooth by such measures as chromium plating.

The spacing between the conveyors A and B at their working section is adjustably established and maintained by two pairs of opposed, upper and lower, rollers **14**, **14***a* and **15**, **15***a*, which are rotatably supported on the machine frame **5** in positions near the feeding end (left end as viewed in FIG. 2) of the conveyors. An adhesive spreading device **16** is mounted on the machine frame at a position between the rollers **14** and **15** and above the conveyor belt A, its tank being adapted to contain a suitable adhesive (for example: an emulsion of vinyl acetate). A duct **17**, the suction opening **17***a* of which is disposed between the rollers **14***a* and **15***a* and confronting the spreading device **16** from below the conveyor belts A and B, is supported on the machine frame, the other end of the duct **17** being connected to a suction fan **18**. A multiple-hole pipe **19** is disposed below the chain wheels **7**, that is, at the outermost end part in the direction of movement of the conveyor belt A, and one end of this pipe **19** is communicative with a suction blower (not shown).

The mechanical power for driving the conveyor belts A and B at the same peripheral speed is derived from a prime mover **26** and transmitted by way of a belt **27**; a pulley **25**, over which the belt **27** is stretched; a chain wheel **23**, fixed to the same shaft as the pulley **25**: and an endless chain **24** stretched over the chain wheel **23**, an idler chain wheel **22**, and chain wheels **20** and **21** which are fixed, respectively, to the aforesaid rotating shafts **32** and **34** of the aforesaid chain wheels **7** and **10**, the power transmission system being so adapted as to drive the chain wheels **7** and **10** at the same peripheral speed in mutually opposite directions. It is necessary to adjust the conveyor belts A and B of this machine so that, at the working section below the spreading device **16**, the gaps *d* between the elemental bars **13** of the upper conveyor belt are vertically aligned with the gaps *d* of the lower conveyor belt B, that is, they are directly above the corresponding gaps *d* of the lower conveyor belt B, as indicated in FIG. 2, without any lag in the horizontal direction.

The web fiber bonding machine of the above-described construction has the following operation. When the ma-

chine is started, the conveyors A and B move in the directions indicated by the arrows in FIG. 2. A web which has been prepared beforehand by carding fibers to form a blanket of suitable thickness is guided to the space between the conveyor belts A and B, whereupon the web is clamped between the two conveyors and, in this condition, is conveyed from the left to the right as viewed in FIG. 2 until it reaches the position below the spreading device **16**.

The spreading device **16** spreads and applies the aforesaid adhesive at a suitable, steady rate onto the upper surface of the conveyor belt A. This adhesive is caused by the elemental bars **13** and gaps *d* therebetween of the conveyor belt A to adhere in a transverse striped pattern on the upper surface of the web and then to be drawn by the suction of the duct **17** with its suction opening **17***a* immediately below the lower surface of the lower conveyor belt B toward the corresponding gaps *d* between the bars **13** of the lower conveyor belt B. Accordingly, the adhesive applied in striped pattern onto the upper surface of the web is caused to penetrate directly downwardly to the lower surface of the web, still retaining its striped pattern with respect to the web.

The web which has thus been treated with adhesive moves on, and, by the time it leaves the machine, has absorbed the adhesive uniformly throughout its inner and outer layers. Then the web is dried in a suitable drier (not shown), whereupon a non-woven napkin to which an adhesive had been applied in transversely striped pattern and perpendicularly to the longer sides of the web (whose fibers had been carded) so as to establish mutual bonding of the fibers, is completed.

When the conveyor belt A, which, with the adhesive spread thereon, has moved together with the web, reaches a multiple-hole pipe **19**, said belt is caused to be in a state of negative internal pressure by a suction blower. The remaining surplus adhesive adhering to the surface of the conveyor belt A is thereby sucked away and recovered in a storage tank (not shown).

Although the above-described machine is intended principally to produce webs for sanitary use during female menstrual periods, the machine, in general, can be used to spread and apply an adhesive in a transversely striped pattern on parts of a web of suitable thickness, thereby producing, without sacrificing the softness of the web, a hygienic napkin which is not easiy torn apart, an in which raising of nap is prevented.

Furthermore, it is an advantageous feature of the above-described machine that conveyor belts A and B, on each of which a plurality of bars **13**, each having a cross section in the shape of an isosceles triangle, are transversely secured with slight gaps between adjacent bars, are provided above and below in mutually opposed disposition, and the adhesive which has been spread from above the conveyor belt A, after flowing along the inclined surfaces of the bars **13** to drop onto the web, is

caused immediately by the suction of the duct **17** to penetrate to the lower surface of the web, whereby, by the time the web separates from the conveyor belt A, almost all of the adhesive is adhering throughout the inner and outer layers of the web, waste thus being eliminated, and, even if a certain amount of adhesive should be remaining on the bars **13**, this adhesive would be recovered in the aforesaid storage tank through the multiple-hole pipe **19**. Accordingly, the web fiber bonding machine according to the invention has the advantage that the adhesive can be used effectively and, moreover, economically.

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 claim.

I claim as my invention:

A machine for bonding the fibers of a web at given intervals comprising, in combination, a machine frame; upper and lower cooperative endless conveyor belts, each including a plurality of elemental bars, said bars each having the same cross section of an isosceles triangle, their base surfaces facing outwardly, in parallel arrangement and having a slight gap therebetween; said belts being supported by said frame and corresponding of said bars in the directly opposite runs of said upper and lower conveyor belts disposed substantially horizontally one above the other, said corresponding of said bars having a spacing suitable to allow concurrent passage of the web, and said belts having an adhesive application section which said web traverses; means for spreading an adhesive onto the inner side of the lower run of the upper conveyor belt at said adhesive application section; suction means disposed below the upper run of the inner side of the lower conveyor belt and directly below said adhesive spreading means; a multiple-hole suction pipe for recovering excess adhesive from the upper conveyor belt after it has separated from the web; means for synchronously driving said upper and lower conveyor belts at like speed while maintaining the gaps between said elemental bars of said upper conveyor belt directly above the corresponding gaps of said lower conveyor belt.

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