

[54] **DEVICE FOR MANUFACTURING A NON-WOVEN, RETICULATE TEXTILE STRIP**

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[51] Int. Cl. **D04h 3/04**

[58] Field of Search **28/1 CL; 156/181, 430, 156/439, 440, 441**

[56] **References Cited**

UNITED STATES PATENTS

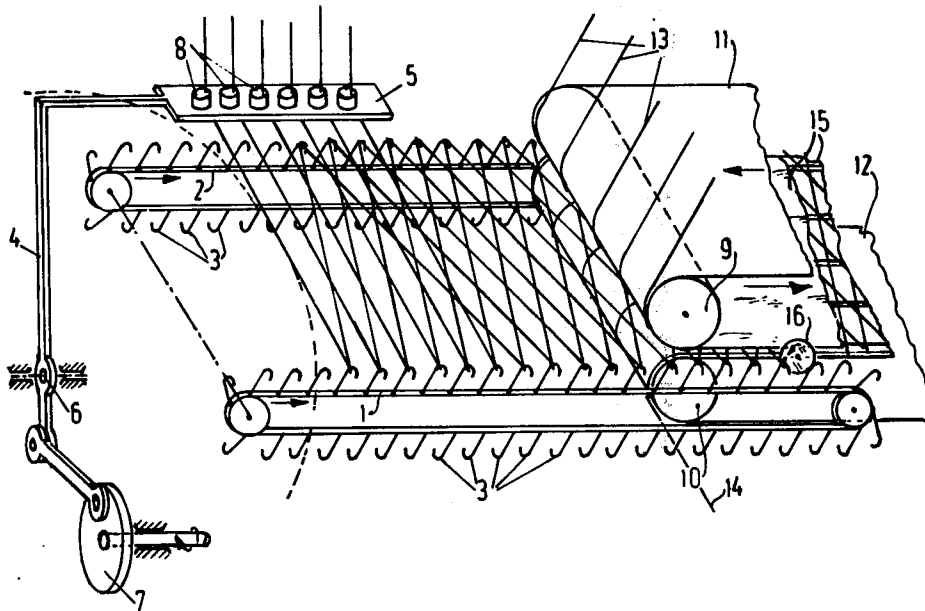
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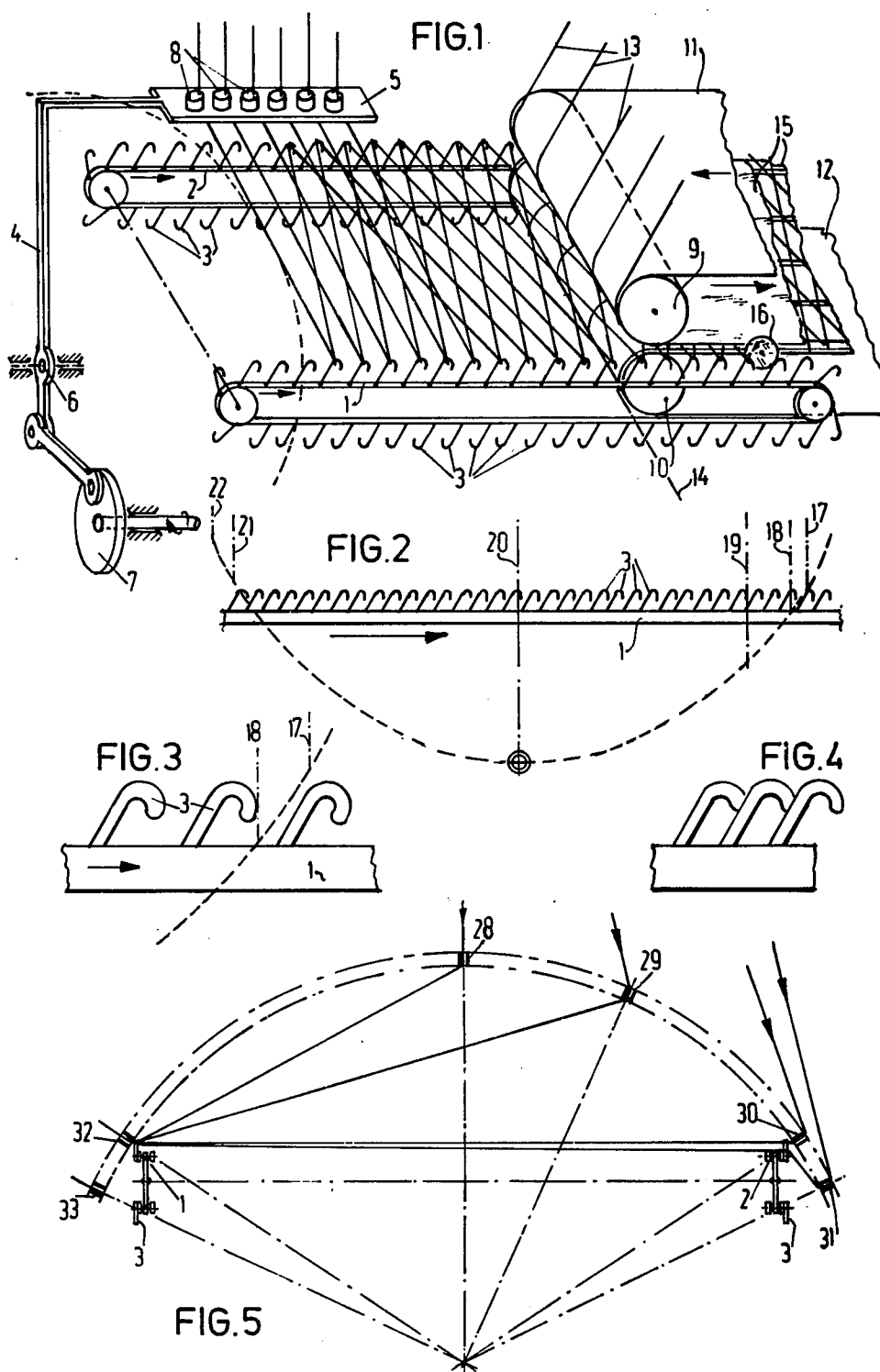
[57] **ABSTRACT**

A device for the manufacture of a non-woven, reticulate textile strip comprising two longitudinally movable, at least partly parallel conveyors, bearing a plurality of hooks having free ends bent over forwardly and downwardly in the direction of movement of the conveyors and not exhibiting outwardly projecting parts with respect to the fastening point on the conveyors and at least one reciprocating thread feeder adapted to move between the outer sides of the two conveyors, the reciprocating thread feeder preferably being guided along an arc and driven by a driving means adapted for driving said thread feeder with a uniform acceleration and retardation along said arc in conformity with the natural oscillation of said thread feeder.

5 Claims, 11 Drawing Figures



SHEET 1 OF 2



DEVICE FOR MANUFACTURING A NON-WOVEN, RETICULATE TEXTILE STRIP

The invention relates to a device for the manufacture of a non-woven, reticulate textile strip comprising two longitudinally movable, at least partly parallel conveyors having a plurality of thread-retaining members secured thereto and at least one changing thread-feeder adapted to move between the outer sides of the two conveyors.

Such devices are known in various embodiments, but they have the disadvantage that after their movement outwards with respect to the thread-retaining members on one of the conveyors the changing thread-feeders have to be rapidly moved back in order to prevent each thread from hooking around more than one retaining member. Consequently, the movement of the thread-feeder is necessarily irregular or shock-like at the reversal of the movement. This reduces the production speed since the irregular movement gives rise to difficulties in driving and bearings, whilst it is furthermore difficult to keep the threads taut with an irregular thread feed.

The invention has for its object to provide a device of the kind set forth, in which said disadvantages are avoided so that a higher rate of production can be attained.

The invention has furthermore for its object to provide a device of this kind which permits of manufacturing in a simple manner a net-shaped textile strip comprising transverse threads at right angles to the direction of length.

For this purpose the invention provides a device of the kind set forth which is characterized in that the retaining members are formed by hooks having a free end bent over forwardly and downwardly in the direction of movement of the conveyor, which hooks do not exhibit outwardly projecting parts with respect to the fastening point on the conveyor. In a preferred embodiment the retaining members have their hook-like top ends bent over inwardly, which has the advantage that the threads passed behind the hooks are in a stable position around the top portion of each hook.

In such a device the threads are disposed near the hooks in two levels, which has the following advantage: the threads of one level can be cut at the side of the hooks on one of the conveyors, after which the speed of one of the conveyors in the initial transport direction can be changed so that the threads initially skewing to the direction of transport can be brought at right angles to said direction.

In a preferred embodiment of the device in accordance with the invention the hooks of one conveyor are, for this purpose, provided each with a slipping clamp, whereas those of the other conveyor are provided with a non-slipping clamp for the threads, a cutter for one level of the threads arranged in two layers between the hooks being arranged inwardly at the side of the latter conveyor, whilst beyond this cutter one of the conveyors partly follows a track directed away from the other conveyor moving along a straight line.

The invention will be described more fully with reference to the drawings, which show schematically a few preferred embodiments of the invention and the products manufactured thereby.

FIG. 1 is a perspective view of a simple form of the device embodying the invention.

FIG. 2 shows part of a conveyor belt as shown in FIG. 1.

FIG. 3 is a side elevation of part of a conveyor belt. FIG. 4 is a side elevation of part of a conveyor belt in a different embodiment.

FIG. 5 is partly a front view of the device shown in FIG. 1.

FIG. 6 is an enlarged view of the part shown in FIG. 5.

FIG. 7 illustrates by way of example a product manufactured by the device shown in FIG. 1.

FIG. 8 is a plan view of a variant of the device embodying the invention.

FIG. 9 is partly a side elevation of the device shown in FIG. 8.

FIG. 10 is a cross-sectional view taken on the line X—X in FIG. 8.

FIG. 11 illustrates by way of example a product manufactured by the device shown in FIG. 8.

Referring now to FIG. 1, the perspective view shows a simple embodiment of the invention. The two endless conveyor belts 1 and 2 move at uniform speed. The conveyor belts are provided with retaining elements 3. A rocker arm 4, on which a thread feeder 5 is fastened, reciprocates around a stationary fulcrum 6. The thread feeder describes a track in the form of a segment of a cylindrical plane. The rocker arm is driven, for example, by means of a crank mechanism 7. The drive of the crank is coupled with the drive of the conveyor belts. The thread angle can be determined by the choice of the transmission ratio. In the event of a very long thread feeder 5 the free end may be arranged in a simultaneously rocking guide. As an alternative, a cage-like structure may be employed in which the thread feeder is fastened. The thread feeder comprises a large number of thread guides 8. By means of the two co-operating rollers 9 and 10 glued material strips 11 and 12 and longitudinal threads 13 and 14 can be supplied to form a composite product 15. The threads are cut loose from the retaining elements with the aid of rotating cutters 16, which are arranged between the product 15 and the retaining elements 3.

In FIGS. 2, 3, 5 and 6 the relative movement of a thread guide is indicated by a dotted line with respect to the conveyor belts.

FIGS. 2, 3 and 6 illustrate a number of relative positions 17 to 22 of a thread guide 8. FIG. 6 shows that the thread guide moves from position 17 in downward direction. The dotted line forms part of the arc of a circle. In position 17 the thread intersects the line formed by the top sides of the retaining elements. This position determines in which retaining element the thread is picked up.

FIG. 2 indicates a broken line forming part of a sine curve corresponding to the relative path of a thread guide with respect to the moving conveyor belt 3. The position 20 corresponds with the reversing position of the thread feeder. Thereafter the upward movement is performed as indicated by the positions 21 and 22. During this upward movement the thread is passed about the top side of the retaining element. The thread arrives at its final position at the instant when it is brought into contact with the next-following retaining element on the opposite conveyor belt. In this definite position a vertical opening 23 is formed in the thread pattern directly on the inner side of each retainer. At this area the thread pattern is divided into a layer of

lower threads (incoming threads) and a layer of upper threads (outgoing threads).

FIG. 6 illustrates the inward bend of the retaining elements. It is thus ensured that the thread sticks around the top side of the retainer and cannot shift downwardly. It will furthermore be apparent that the curved ends of the retainers are co-planar. As an alternative, these ends may be bent over towards the inner side of the device. It is, however, not possible to bend these ends towards the outer side of the device because with this gradual smooth motion of the thread feeder the thread would hook during the upward movement behind more than one of these ends. Moreover, if the curved end were bent completely to the outside, the thread could not longer be disposed so that in a vertical direction an opening is formed in the thread pattern.

FIG. 4 shows relatively overlapping retaining elements. The end of the curved portion overlaps the next-following element on the inner side. During the downward part of the stroke the thread is guided by the overlap. This arrangement has the advantage that the thread is, so to say, completely enclosed.

FIG. 3 shows that the lower sides of the retaining elements are inclined towards the conveyor belt. The optimum effect of the device is obtained when the angle of inclination approximately corresponds with the feed angle of the thread. The feed follows the broken line indicated.

At the instant when the thread guide passes position 17, it is determined in which retaining element the thread is picked up. The insertion of the thread, that is to say the movement from position 17 to position 18 is performed with a comparatively high speed. Subsequently the movement is very gradually braked and thereafter the direction of movement is reversed.

This shock-free, smooth movement is important not only for the sake of a simple mechanical structure of the device but also the withdrawal of thread from the feed rollers is thus materially improved. It has been found to be possible to work by this device even thin, breakable, rigid and tape-shaped yarns at very high rates.

Under the action of the simultaneous movements of the conveyor belts and the thread feeder, the threads are constantly withdrawn with a positive speed from the feed rollers. The speed of thread withdrawal exhibits smooth variations without abrupt shocks during the movement of the device.

FIG. 7 is a plan view of a thread pattern obtained by means of the device according to the invention shown in FIG. 1, the pattern comprising threads extending crosswise askew to the direction of length of the product and threads extending in the direction of length.

FIG. 8 is a plan view indicating schematically that after the zone in which the threads are arranged crosswise one conveyor belt continues its straight forward movement and the other conveyor belt simultaneously diverges to a twice larger width. For this purpose part of the threads have to be cut by a cutter 26 for the diverging part.

As will be apparent from FIG. 10, the thread on the conveyor belt following the rectilinear part 1a is clamped with the aid of a ganged belt 24, one side of which consists of soft material, for example, rubber, which provides, upon a slight pressure, sufficient clamping force to hold the thread at this place.

From FIGS. 9 and 10 it will be seen how one of the two layers of threads is cut by means of the spacers or spreading element 25 and the cutter 26. A slight spread of the two layers of threads facilitates cutting. Either the lower layer or the upper layer may be cut, as desired. It is essential that the threads should be picked up by the retaining elements so that two separate layers of threads are formed.

As shown in FIG. 8 the conveyor belt 2a diverges relatively to the straight-travel conveyor belt 1a to an extent such that the positions of the points 27 and 28 shift relatively to each other, whilst at the same time the width between the two belts becomes more than twice the initial value, that is to say, substantially equal to the length of the thread over one reciprocating motion. Divergence occurs at positions 27a and 28a. The desired pattern is formed at positions 27b and 28b. The threads are then all at an angle of 90° to the direction of production parallel to each other. As a matter of course the parallel threads can be arranged at any other angle to the direction of production.

During divergence the thread slides through the retaining element which preferably has the overlapping form shown in FIG. 4. In this case the free thread is, so to say, enclosed in the element. In order slightly to brake the thread during its slide across the retaining element and to hold the thread in a fixed position, a bar, for example, of glass 29 may be arranged parallel to the belt 2a, as is shown in FIG. 10. The free end of the thread hangs freely across the bar, which provides a slight resistance, which is sufficient for stretching the thread.

At the level of the section 30 the desired product is ready. At the area of this section or, if desired, further downstream, an identical system of co-operating rollers of FIG. 1 may be arranged, by means of which a composite product can be formed from strips of material and longitudinal threads.

FIG. 11 illustrates an example of a product obtained by means of the device shown in FIG. 8 and to which longitudinal threads are added.

What is claimed is:

1. A device for the manufacture of a non-woven, reticulate textile strip comprising two longitudinally movable, at least partly parallel conveyors, on which a plurality of thread retaining members are fastened, and at least one changing thread feeder adapted to move between the outer sides of the two conveyors, characterized in that the retaining members are formed by hooks having free ends bent over forwardly and downwardly in the direction of movement of the conveyors, said hooks not exhibiting outwardly projecting parts with respect to the fastening point on the conveyors.

2. A device as claimed in claim 1, characterized in that the hooks are inclined inwardly by the bent-over ends.

3. A device as claimed in claim 1, characterized in that the reciprocable thread feeder is guided along an arc and is driven by a driving means adapted for driving said thread feeder with a uniform acceleration and retardation along said arc in conformity with the natural oscillation of said thread feeder.

4. A device as claimed in claim 1 characterized in that the hooks on one conveyor are each provided with a slipping clamp and those on the other conveyor are provided with a non-slipping clamp for the threads, a cutter being arranged inwardly at the side of the con-

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veyor having the non-slipping clamps for one layer of the threads arranged in two layers between the hooks, whilst beyond said cutter one of the conveyors partly covers a path diverging from the straight path of the other conveyor.

5. A device as claimed in claim 2 characterized in that the hooks on one conveyor are each provided with a slipping clamp and those on the other conveyor are

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provided with a non-slipping clamp for the threads, a cutter being arranged inwardly at the side of the conveyor having the non-slipping clamps for one layer of the threads arranged in two layers between the hooks, whilst beyond said cutter one of the conveyors partly covers a path diverging from the straight path of the other conveyor.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,878,591

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INVENTOR(S) : Willem Frederik Jense

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

---[30]

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Signed and sealed this 24th day of June 1975.

(SEAL)

Attest:

RUTH C. HASON
Attesting Officer

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