United States Patent

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[54] **APPARATUS FOR FORMING A NONWOVEN WEB OF CRISS-CROSS THREADS**
5 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **28/1,** 156/439
[51] **Int. Cl.** **D04h 3/05**
[50] **Field of Search** ..... 28/1 CL; 156/439, 440; 26/57

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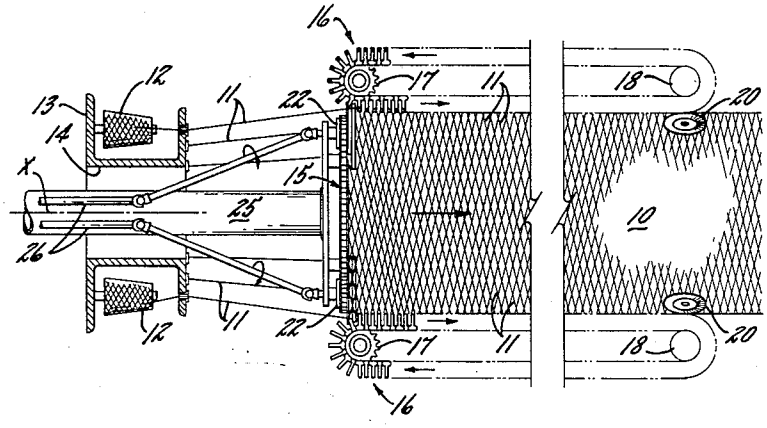
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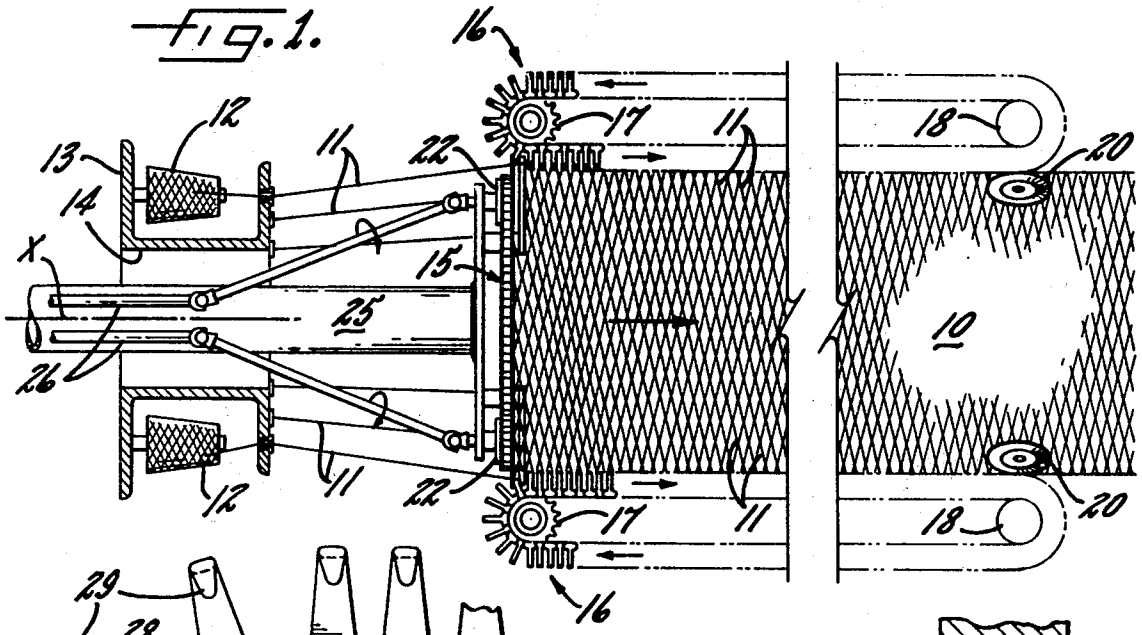
ABSTRACT: An apparatus for forming a nonwoven web is disclosed in which a web carrier is formed by a pair of endless chains in which each link carries a thread-engaging hook. Individual threads fed from respective supply cones on a rotating serving ring are guided and engaged with the carrier hooks by means of an endless guide chain disposed on sprockets spaced on opposite sides of the web to be formed, and having eyes through which the threads pass. The guide chain is supported and driven in unison with the serving ring by elements extending through an opening in the center of the rotating serving ring.



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Fig. 1.



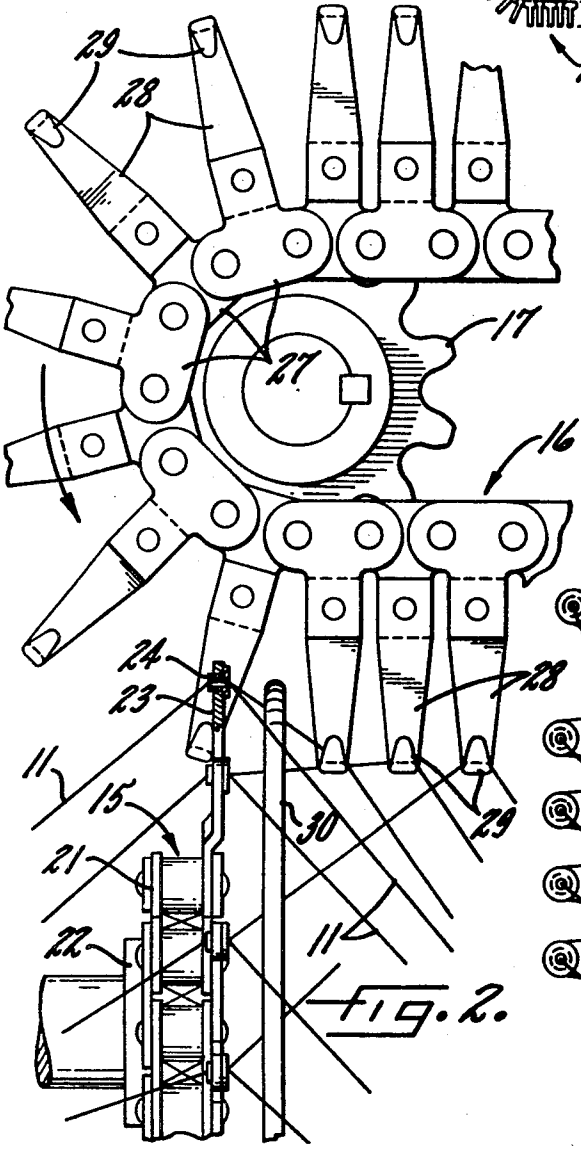


Fig. 2.

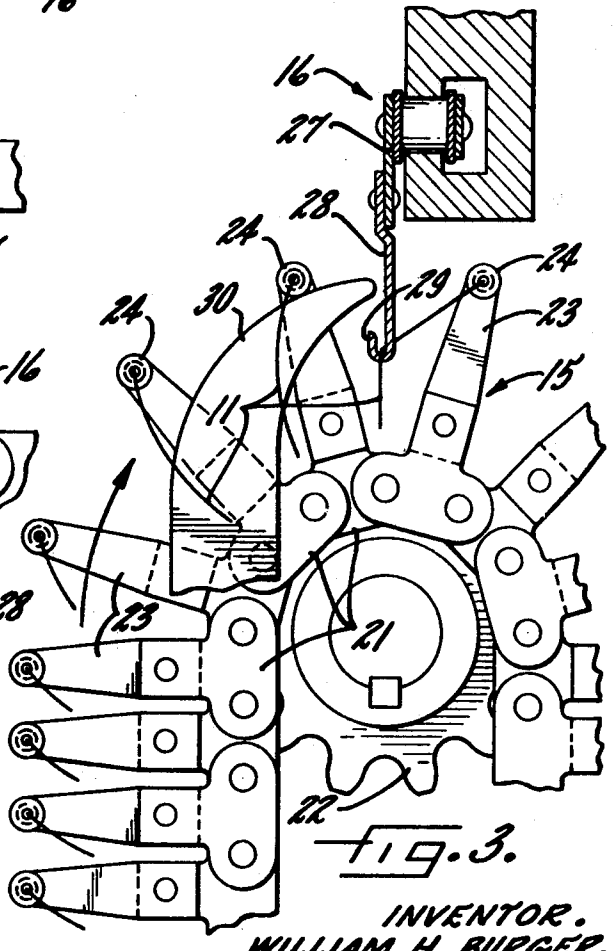


Fig. 3.

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APPARATUS FOR FORMING A NONWOVEN WEB OF CRISS-CROSS THREADS

DESCRIPTION OF THE INVENTION

This invention relates to apparatus for forming nonwoven webs, and more particularly concerns apparatus for positively laying threads in a crisscross fashion on an advancing web carrier.

A principal object of the invention is to provide apparatus for laying threads on a continuously advancing carrier means in which each thread of the web is positively placed on a corresponding portion of the carrier.

A further object is to provide a thread-positioning apparatus for use with a rotating server ring which is effective to positively guide each thread into its intended position in synchronism with both the serving ring and the web carrier.

It is a further object to provide a thread-positioning apparatus for forming diagonal crosslaid webs, which apparatus may be supported and driven in conjunction with a rotating serving ring.

Other objects and advantages of the present invention will become apparent upon referring to the drawings, in which:

FIG. 1 is a schematic plan view of a web-forming apparatus exemplifying the present invention;

FIG. 2 is an enlarged partial view of the thread-positioning means of the structure of FIG. 1; and

FIG. 3 is a view taken in a plane 90° to that of FIG. 2, illustrating the motion of the thread-positioning means with respect to the web carrier.

While the invention is described in connection with a particular construction and method of operation, it will be understood that it is not restricted to the embodiments and procedures disclosed; but is, on the contrary, intended to cover other alternate and equivalent apparatus in which positive thread control and location is necessary in a web-laying operation.

Turning now to the drawings, there is shown in FIG. 1 an exemplary apparatus for forming a bias crosslaid web **10** consisting of a plurality of spaced diagonal threads **11**. The threads are fed from spools or cones **12** on a rotating serving ring **13**, which is suitably journaled on a frame (not shown) for rotation about an axis *x* extending through a central opening **14** in the serving ring **13**. The individual threads **11** are directed to an endless guide chain **15**, and thereafter to a web carrier formed by a pair of endless carrier chains **16**. The guide chain **15** defines a loop lying in a plane spaced from and generally parallel to the serving ring **13** and the carrier chains **16** lie in a common plane substantially transverse to the plane of the guide chain. The carrier chains **16** are each trained around upstream sprockets **17** and downstream sprockets **18** for advancing the substantially parallel inner reaches of the carrier chains downstream away from the guide chain **15** and in synchronized relation thereto. At the end of the carrier reach, the web **10** is detached from the carrier chains **16** by slitter wheels **20**.

As a principal feature of the invention, the individual threads **11** are positively transferred by the guide chain **15** to the carrier chains **16** so that slipping and breaking of the threads **11** is substantially reduced or eliminated, and the threads are precisely located to assure uniformity in the finished web **10**. For this purpose the guide chain **15** is made of a plurality of interconnected roller links **21** driven by guide sprockets **22** spaced at approximately the width of the web **10** to be formed. Each roller link **21** is constructed in conventional fashion, except that a plurality of upstanding elements **23** are provided in spaced relation with each element defining an eye **24** or other opening at its tip end. The individual threads **11** from the serving ring **13** pass through corresponding ones of the eyes **24**, and are thereby carried from side to side in generally reciprocating fashion as the guide chain **15** rotates on its sprockets **22**.

As a feature of the invention, the guide chain sprockets are journaled for rotation on a support **25** passing through the opening **14** in the rotating serving ring **13**. The support **25** may thereby be fixed to the machine frame (not shown) and the guide chain **15** positively and securely located with respect to both the serving ring **13** and the carrier chain **16**. The guide chains **15** are also preferably driven through respective drive shafts **26** connected through universal joints to the guide sprockets **22**.

For the purpose of receiving the individual threads **11** from the guide chain **15**, the carrier chains **16** are constructed in a like manner with individual roller links **27** each having an upstanding element **28** terminating in a hook **29**. The hooks **29** are disposed with their openings generally parallel to the eyes **24** of the guide chain links **21** so that each thread may be engaged by a respective one of the hooks **29** as it is brought by in one of the eyes **24**.

So that a thread **11** is placed in each hook **29** of the guide chains **16**, movement of the guide chain **15** and carrier chains **16** are synchronized so that the guide links **21** and carrier links **27** pass in alternating sequence, with one thread **11** being picked up each time a guide link **21** passes by. To assist in the positioning of the threads within the hooks **29**, a guide plate **30** is positioned adjacent each guide sprocket **22**, with a smooth curving edge located adjacent the path of each thread **11** as it is carried by in its eye **24** toward its intended hook **29**. The thread **11**, having been previously hooked on a link **27** of the opposite carrier chain **16**, is drawn across the web in a diagonal fashion (FIG. 1) and upon reaching the tip of the guide plate **30**, is engaged and pulled away by a hook **29** of the other guide chain, and proceeds in an advancing direction between the inner reaches of the carrier chains in crisscross fashion to form the nonwoven web **10**.

It will be observed that by positioning the upstream carrier chain sprockets **17** adjacent the respective guide sprockets **22**, the carrier chains **16** and guide chain **15** are caused to intermesh at points where their respective links **27**, **21** are passing around their sprockets, thereby opening the spaces between the upstanding elements **23**, **28** of the links **21**, **27** to facilitate the synchronized intermeshing process by which the threads **11** are fed from the eyes **24** to the hooks **29**.

Modifications of the foregoing will be evident to one skilled in the art, but do not necessarily depart from the invention. For instance, the individual links **21** of the guide chain **15** can be provided with hooks rather than eyes **24**, or the eyes **24** may be fitted with a slotted opening for introducing a thread **11** when initially setting the machine up for operation. In a like manner the hooks **29** of the carrier chain **16** may be replaced with upstanding pins or pegs if desired, so long as the necessary hooking action is achieved as each thread **11** is brought into place by the guide chain **15**.

Once formed, the web **10** may be treated in any desired way; such as by applying adhesive and other materials. The web **10** may be thus treated prior to detaching it from the carrier chains **16**, or it may be transferred to another carrier means, such as opposed endless belts, and thereby transferred to further manufacturing steps.

I claim:

1. Apparatus for forming a nonwoven web comprising, in combination, a rotatable serving ring having a central opening and carrying a plurality of thread supply cones, a support extending through said opening, an endless guide chain carried by guide sprockets journaled on the support for movement in unison with the serving ring, said guide chain defining an elongated loop lying in a plane spaced from and generally parallel to said serving ring and including a plurality of spaced-apart, outwardly projecting elements respectively defining eyes each carrying a thread fed from a respective supply cone on the serving ring, and a pair of endless web carrier chains lying in a common plane substantially transverse to said first plane and movable about respective upstream and downstream carrier sprockets in synchronism with said guide chain, said web carrier chains each having a plurality of spaced-apart, outwardly

projecting hooks disposed to pass between respective ones of said eyes on said guide chain for alternately engaging threads carried by said eyes and for transporting said threads in crisscross fashion away from said guide chain, said upstream carrier sprockets each being located adjacent and at right angles to said guide sprockets so that said hooks and eyes are caused to intermesh at points where they are respectively passing around said sprockets thereby opening the spaces between adjacent ones of said projecting hooks and eyes to facilitate the engagement by said hooks of said threads fed from said eyes.

2. Apparatus as defined in claim 1 in which said carrier chains form elongated loops with parallel inner reaches extending away from the guide chain, and terminating in means for detaching the formed web of crisscross threads from the

carrier chains.

3. Apparatus as defined in claim 1 including a fixed thread deflector adjacent each of the guide sprockets for guiding threads onto the hooks of the carrier chains.

4. Apparatus as defined in claim 1 in which the guide chain consists of an endless roller chain having a plurality of interconnected links, with each link having an upstanding support member defining said eye.

5. Apparatus as defined in claim 1 in which each carrier chain consists of an endless roller chain having a plurality of interconnected links, each link having an upstanding support member terminating in said hook.