Sept. 15, 1964 R. A. HAVEMANN 3,149,014

APPARATUS FOR FORMING AND APPLYING STRAND REINFORCEMENT

Filed Sept. 1, 1960 2 Sheets-Sheet 1

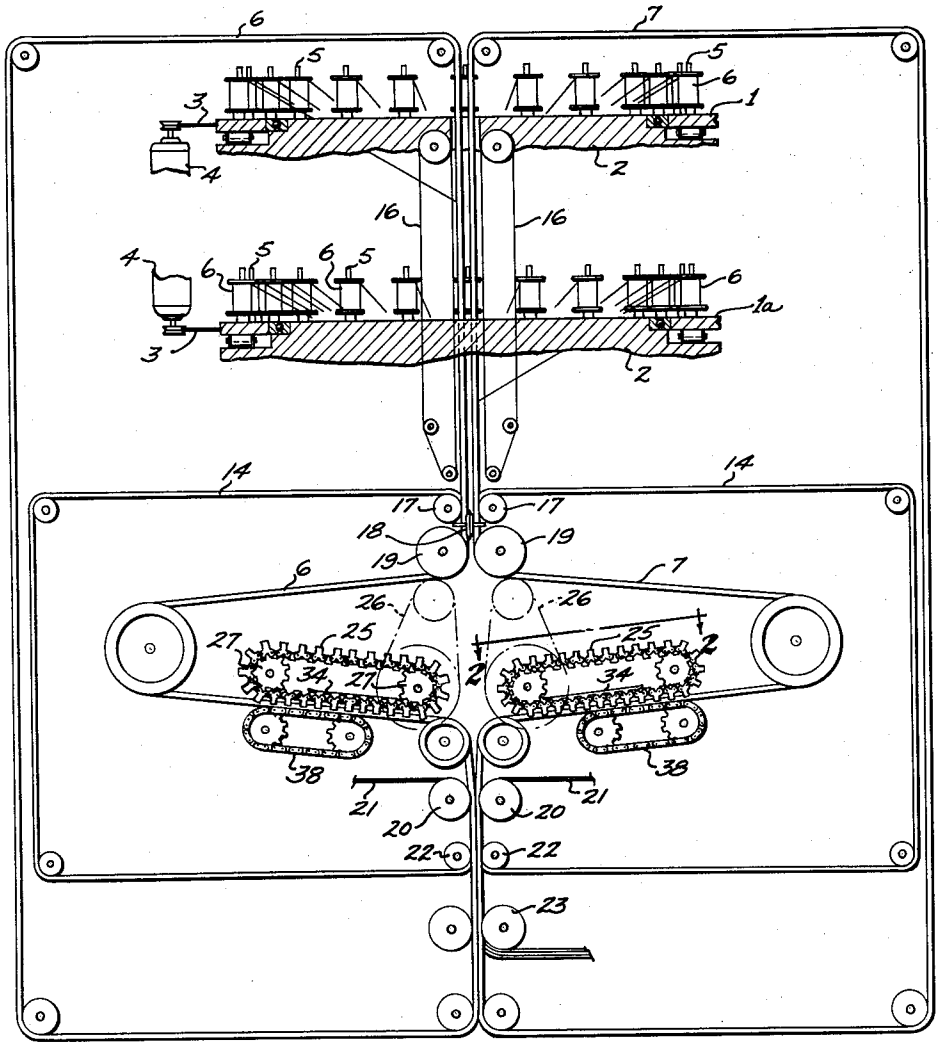

FIG. 1.

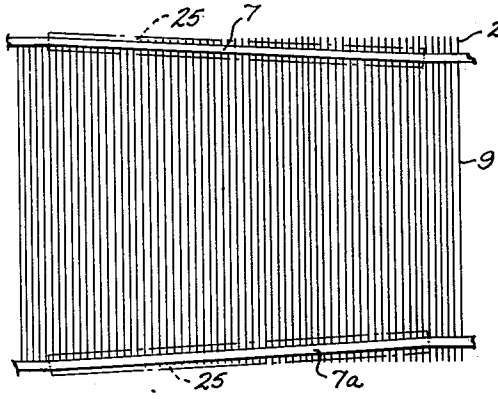

FIG. 2.

INVENTOR.
ROBERT A. HAVEMANN,
BY Allen & Allen
ATTORNEYS.

Sept. 15, 1964 R. A. HAVEMANN 3,149,014

APPARATUS FOR FORMING AND APPLYING STRAND REINFORCEMENT

Filed Sept. 1, 1960 2 Sheets-Sheet 2

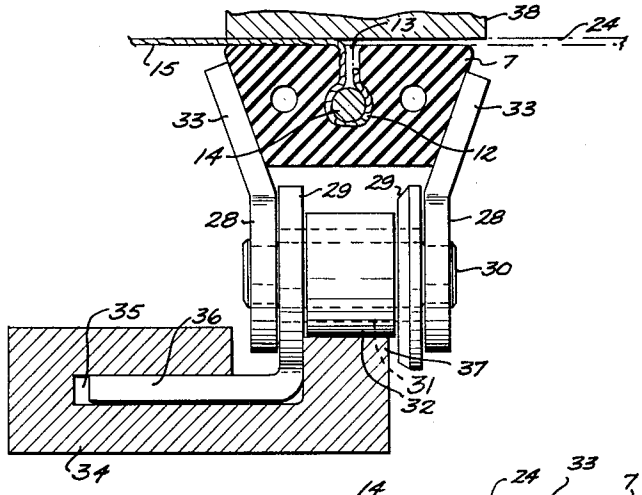

FIG. 3.

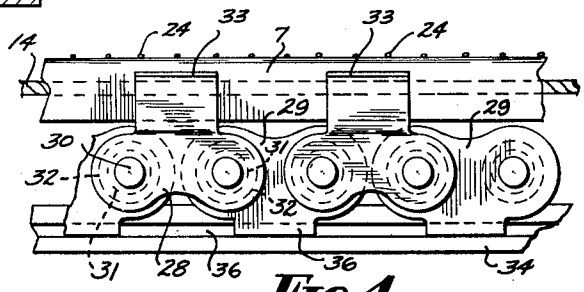

FIG. 4.

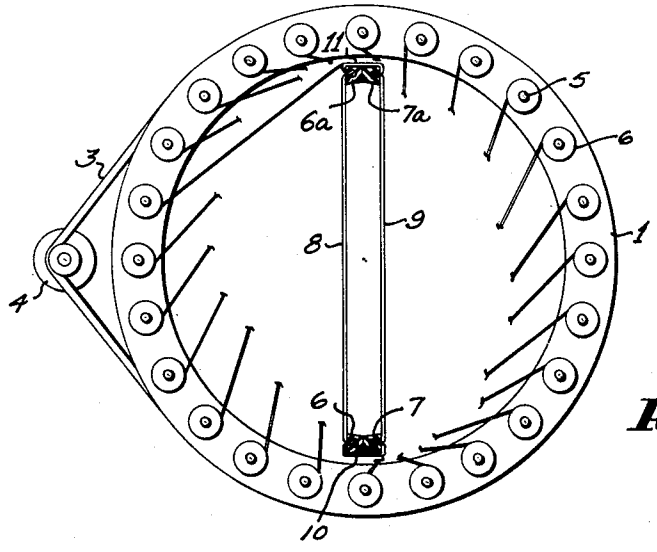

FIG. 5.

INVENTOR.
ROBERT A. HAVEMANN,
BY Allen & Allen
ATTORNEYS.

United States Patent Office 3,149,014 Patented Sept. 15, 1964

3,149,014

APPARATUS FOR FORMING AND APPLYING STRAND REINFORCEMENT

Robert A. Havemann, Troy, Ohio, assignor to St. Regis Paper Company, New York, N.Y., a corporation of New York

Filed Sept. 1, 1960, Ser. No. 53,442
4 Claims. (Cl. 156—496)

This invention relates to strand reinforcement of the character employed to reinforce paper webs, and relates more particularly to apparatus by means of which continuous lengths of strand material are formed into unit length for application to a sheet or web to be reinforced, or wherein the unit lengths are associated with additional angularly disposed strands to form an open mesh fabric, known as scrim, which may be directly associated with the sheet or web to be reinforced or wound into rolls for use at a later time.

In my copending application Serial No. 562,376, filed January 31, 1956, and entitled Apparatus and Method for Reinforcing Sheet Material, now Patent No. 2,954,816, I have disclosed a device wherein continuous helical convolutions of strand reinforcement, such as glass fibers, nylon, rayon, and cotton, to name but a few, are formed and advanced in a path of travel, each convolution so formed being secured at closely spaced apart points to a pair of belt conveyors, whereupon the convolutions are severed in the areas between the belts and the belts thereafter moved apart to draw the strand length so formed into linear condition. The linear strands are then moved by the belts to a combining station where they are associated with one or more webs of sheet material and, if desired, lengthwise extending reinforcing strands may be associated with the linear strands as they pass through the combining station. Similarly, in my copending application Serial No. 689,626, filed October 11, 1957, and entitled Apparatus and Method for Forming and Applying Strand Reinforcement and Product Produced Thereby, now Patent No. 2,954,817, I have taught improved apparatus wherein pairs of spaced apart belt conveyors are arranged to pass through one or more spinners on which bobbins of strand reinforcement are mounted, the arrangement being such that the spinning units will cause the strand reinforcement to be wrapped around spaced apart pairs of belts to form elongated helical convolutions. The convolutions are secured to the belts and then severed in areas between the pairs of belts so that each convolution is severed into two strand lengths each secured adjacent its opposite ends to one of the pairs of belts. The sets of strand lengths so formed are then brought together in interdigitating relation and advanced to a combining station where they are associated with a web to be reinforced, either alone or together with additional angularly related strands.

In both of the above described devices the conveyor belts are formed from rubber or similar resilient material and provided with longitudinally extending channels in which the strand lengths are secured by means of cables inserted in the channels. The cables are arranged to be engaged in the channels immediately after the convolutions of strand material are wound about the belts, and the cables remain engaged in the channels until the strand lengths reach the combining station and are transferred to a supporting web or otherwise supported, whereupon the cables are disengaged from the belts and the strand lengths released. Due to the fact that the initial convolutions are severed at points intermediate adjacent belts, several inches of strand material extend beyond the belts at each end of the strand lengths; and these extending ends must be subsequently scrapped, i.e. cut off, since they will lie beyond the side edges of a paper web or the like to which

the strand lengths are subsequently secured. While such wastage may appear to be insignificant as respects a given strand length, it becomes extremely significant when it is considered that many millions of yards of strand material are involved and that a substantial savings in material would result if the wasted inches at each end of the strands could be utilized rather than scrapped.

Accordingly, a principal object of the instant invention is the provision of apparatus by means of which the usable portion of each strand length is effectively increased to the elimination of the strand ends which formerly projected beyond the conveyor belts.

A further object of the instant invention is the provision of apparatus capable of use in conjunction with the basic apparatus disclosed in my aforementioned copending applications, the instant apparatus serving to positively engage and force apart the pairs of strand engaging belts so that the points of engagement of the belts with the strand length will be moved outwardly to substantially the ends of the strand lengths, thereby effectively increasing the usable portion of the strand lengths lying between the belts.

The foregoing, together with other objects of the invention which will appear hereinafter or which will be apparent to the skilled worker in the art upon reading these specifications, I accomplished by that construction and arrangement of parts of which I shall now describe an exemplary embodiment.

Reference is now made to the accompanying drawings wherein:

FIGURE 1 is a vertical sectional diagrammatical view of strand forming apparatus incorporating the instant invention.

FIGURE 2 is an enlarged fragmentary sectional view taken along the line 2—2 of FIGURE 1.

FIGURE 3 is an enlarged vertical sectional view of a stretcher chain link in engagement with one of the conveyor belts.

FIGURE 4 is a fragmentary side elevational view of a link of stretcher chain in engagement with one of the belts.

FIGURE 5 is a plan view of one of the spinning rings.

Referring first to FIGURE 1 of the drawings, I have therein illustrated a strand spinning unit similar to that disclosed in copending application Serial No. 689,626, now Patent No. 2,954,817, there being a pair of circular spinning rings 1 and 1*a* arranged one above the other, the spinning rings each being mounted on a stationary platform 2 and driven by belts 3 from motor units 4. Preferably each of the spinning rings will be independently controlled so that the rings may be operated individually since, in many instances, it is desirable to first run one unit and then the other, the first being refilled while the second is in operation, thereby effecting an appreciable saving in "down" time. Of course, both units may be operated in unison for high speed operations or where the strands are to be closely spaced.

Each of the spinning rings mounts about its periphery a plurality of spindles 5 upon which are mounted bobbins 6 of strand reinforcements which, as the rings are rotated, is caused to be wrapped about spaced apart pairs of conveyor belts extending through the rings. Two such conveyor belts are indicated at 6 and 7, it being understood that coacting pairs of such belts will lie on opposite sides of the ring in the manner illustrated in FIGURE 5, the coacting belts being designated at 6*a* and 7*a*. It will be evident that as the spinners are rotated, the strand will be wound around the belt forming elongated convolutions each of which has linear lengths 8 and 9 joined together at their ends by connecting portions 10 and 11.

As best seen in FIGURE 3, each of the conveyor belts, such as the belt 7 illustrated therein, has a cable receiv-

ing channel 12 opening outwardly in a narrow neck 13 into which a cable 14 is adapted to be inserted, thereby clamping a strand length 15 to the belt for movement therewith. Preferably, the cable 14 will be formed from braided wire coated or otherwise suitably encased in a plastic covering to provide a smooth even outer surface for contact with the strands.

Referring again to FIGURES 1 and 5, as the cables pass downwardly through the spinning rings to pick up the convolutions of strand material, spacing belts 16 driven in timed relation to the movement of the sets of belts 6, 6*a* and 7, 7*a* may be utilized to effectively lengthen the opposing strand lengths 8 and 9, if so desired, it being understood that the pairs of coacting belts will be caused to diverge outwardly once they have passed beyond the spinning rings so as to take up the slack upon passage of the convolutions beyond the lowermost ends of the traveling belts 16.

The cables 14 are adapted to be inserted into the sets of belts 6, 6*a* and 7, 7*a* by means of the grooved wheels 17, whereupon the connecting portions 10 and 11 are severed by means of the rotary cutters 18 (FIGURE 1). This acts to sever the convolution into individual strand lengths supported by the pairs of belts 6, 6*a* and 7, 7*a*, which may then be moved apart, as by passing around sheaves 19. It will be understood, of course, that the belts and cables will be driven in timed relation to each other and to the rotation of the spinning rings; and to this end any one or more of the sets of sheaves may be driven, as for example the sheaves 19. A single source of power may be utilized for all driven components of the device so that the application of the strand reinforcements may be maintained substantially uniform during both the starting up and the slowing down of the apparatus.

Ultimately the pairs of belts advance the strand lengths to a combining station composed of rolls 20 which serve to juxtapose webs of paper or similar materials 21 to one or both sides of the strand lengths in the area between the pairs of belts; and to this end it will be understood that the innermost surfaces of the webs 21 will be adhesively coated so that they will be adhered together with the strand lengths interposed therebetween. Subsequently, the pairs of conveyor belts are passed between stripper wheels 22 which will serve to strip the cables 14 from their respective conveyor belts, thereby releasing the ends of the strand lengths. The cables are then passed about suitable pulley wheels for return to the spinning section of the apparatus, as will be evident from the drawings. Subsequent to the release of the strand ends, the reinforced material may be led off to a wind-up station, the material passing about rollers 23. The pairs of belts 6, 6*a* and 7, 7*a* will then pass about suitable pulley wheels for return to the spinning section of the apparatus.

In accordance with the instant invention, means are provided intermediate the point at which the helical convolutions are severed into strand lengths and the combining station to expand the pairs of belts relative to each other, i.e. cause them to diverge sufficiently so that the severed ends of the strand lengths which extend beyond the belts will be caused to move relative to the belts so as to effectively lie therebetween. The diverging action of the pairs of belts can be seen in FIGURE 2 wherein it will be noted that as the belts are caused to diverge, the projecting end of the strand lengths, designated by the reference numeral 24, are caused to slip relative to the belts and cables so that substantially the entire length of the strands lies between the two belts. This is also illustrated in FIGURE 3 wherein the initial position of the strand end is indicated in dotted lines, and wherein its final position is indicated in solid lines. It has been found that the strands can be successfully pulled relative to the belts and cables without adversely affecting the gripping engagement between the belts and cables; but to do this it is necessary to securely hold the normally flexible belts during their diverging movement.

The belts are securely held in their paths of travel by means of the endless stretcher chains 25 which are adapted to be driven in synchronism with the pairs of belts through suitable driving mechanism indicated at 26, which may comprise a chain drive operated in timed relation to the rotation of any of the driven components of the apparatus, such as the sheaves 19. The stretcher chains 25 are arranged to pass around spaced apart sprockets 27 positioned so that one of the flights of each chain will be juxtaposed to one of the conveyor belts.

As seen in FIGURE 4, each of the stretcher chains is composed of alternately arranged pairs of outer side bars 28 and inner side bars 29 joined together in conventional link chain fashion by means of pintles 30. Bushings 31 extend between the inner side bars 29 and surround the pintles 30, the bushings mounting rollers 32. The outer side bars 28 are each provided with an upwardly extending flange 33 arranged to contact the opposite sides of the conveyor belt. To this end, the flanges 33 are preferably inclined outwardly to conform to the sides of the belts so that the belts will be securely gripped therebetween.

The stretcher chains are secured against lateral movement by means of the fixed guides 34. The guides 34 have elongated channels 35 therein in which tongue members 36 are slidably received, the tongue members forming integral extension of the inner side bars 29 along one side of the stretcher chains. Preferably, the guides 34 also will be provided with track sections 37 along which the stripper chains are adapted to move, the track section being of the size to fit between the inner side bars 29 with the rollers 32 contacting the tracks.

With the arrangement just described, the stretcher chains serve to restrain the flexible belts against lateral movement and enforce the diverging movement of the belts. The belts are thus placed under the substantially non-flexing control of the stretcher chains and the pulling movement of the strand lengths relative to the belts is thereby accurately controlled.

In order to assure that the conveyor belts will not slip from between the pairs of flanges 33, it is desirable to provide back-up or hold-down chains 38 which may be conveniently in the form of block chains or link belts juxtaposed to the faces of the belts during a portion at least of their diverging travel. The hold-down chain 38 will be driven in timed relation to the movement of the belts and stripper chains.

It will be understood, of course, that modifications may be made in the instant invention without departing from its spirit and purpose. For example, the use of the instant invention is not limited to the specific form of strand forming apparatus illustrated in FIGURE 1, but rather is applicable to any form of such apparatus wherein a pair of flexible conveyor belts are utilized to convey strand lengths of material and it is desired to effect relative movement between the belts and strands to effectively shorten the end edges of the strands lying beyond the points at which the strands are initially secured to the belts.

Having thus described the invention in an exemplary embodiment, what is desired to be secured and protected by Letters Patent is:

1. In apparatus for forming and conveying unit lengths of strand material and depositing the same transversely with respect to a longitudinally moving length of strand supporting material, wherein the lengths of strand material, as an incident of their formation, are releasably secured to a pair of spaced apart flexible conveyor belts by means of cables engaged in longitudinal channels in the front surfaces of the flexible belts, with portions of the strand lengths spaced inwardly from their opposite ends clamped between the cables and the channels in the belts, the improvement which comprises means for moving the

conveyor belts in diverging paths of travel relative to each other, said means comprising stretcher chains juxtaposed to the rear surfaces of the belts, means for moving said stretcher chains in timed relation to the movement of the belts, said stretcher chains mounting spaced apart pairs of flanges positioned to engage the opposite sides of the belts so as to retain the belts therebetween, hold-down means positioned to contact the front faces of the belts during engagement of the belts by the flanges on said stretcher chains, guide means for maintaining said stretcher chains and the belts engaged thereby in their diverging paths of travel, said guide means comprising fixedly mounted guide bars lying along the said diverging paths of travel, said guide bars each having a slot therein extending throughout its length, said stretcher chains also mounting aligned guide tongues fitted into said slots for sliding movement relative thereto, said guide bars and tongues coacting to maintain said stretcher chains and hence the belts engaged thereby against lateral and tilting movement, whereby upon diverging movement of the belts the strand lengths will be first drawn taut and, upon continued diverging movement of the belts the strand lengths will be caused to slip relative to the belts and cables so as to effectively increase the length of the portions of the strand lengths extending between the belts, the diverging movement of the belts relative to each other terminating when the free ends of the strand lengths approach the cables which secure the strand lengths to the belts.

2. The apparatus claimed in claim 1 wherein each of said stretcher chains is composed of a series of articulated links each of which includes a roller, and wherein said guide means includes tracks positioned to be contacted by said rollers.

3. The apparatus claimed in claim 2 wherein said chain links are composed of alternately arranged inner and outer side bars joined together by pintles, wherein said spaced apart pairs of flanges are integrally formed with said outer side bars, and wherein said guide tongues are integrally formed with said inner side bars.

4. The apparatus claimed in claim 3 wherein said hold-down means comprise link belts driven in timed relation to said conveyor belts and said stretcher chains.

References Cited in the file of this patent

UNITED STATES PATENTS

2,429,177	Young	Oct. 14, 1947
2,496,911	Green	Feb. 7, 1950
2,769,522	Pfeiffer	Nov. 6, 1956
2,954,816	Havemann	Oct. 4, 1960