United States Patent

Stoebener

[15] **3,645,079**

[45] **Feb. 29, 1972**

[54] STRANDING MACHINE

[72] Inventor: **Rolf Stoebener,** Hannover, Germany

[73] Assignee: **Kabel-und Metallwerke Gutehoffnungshutte Aktiengesellschaft,** Hannover, Germany

[22] Filed: **May 8, 1970**

[21] Appl. No.: **35,857**

[30] **Foreign Application Priority Data**

May 12, 1969 Germany ..... P 19 24 093.4

[52] **U.S. Cl.** ..... **57/34 AT,** 57/91

[51] **Int. Cl.** **H01b 11/04,** H01b 13/04

[58] **Field of Search** ..... 57/34, 34 AT, 59, 60, 62, 63, 57/64, 91, 94

[56] **References Cited**

UNITED STATES PATENTS

3,025,656	3/1962	Cook	57/34
3,052,079	9/1962	Henning	57/34
3,169,360	2/1965	Corrall et al.	57/34
3,367,097	2/1968	Menasoff	57/34
3,373,550	3/1968	Symonds	57/34
3,373,549	3/1968	Shaw	57/34
3,507,108	4/1970	Yoshimura et al.	57/34

Primary Examiner—Stanley N. Gilreath
Assistant Examiner—Werner H. Schroeder
Attorney—Smyth, Roston & Pavitt

[57] **ABSTRACT**

An accumulator stranding machine for twisting strands at a reversing twist, wherein the stranding nipple moves in unison with the strands, towards the accumulator whenever the accumulator changes speed; the stranding nipple moves in the opposite direction during regular rotation of the accumulator.

4 Claims, 2 Drawing Figures

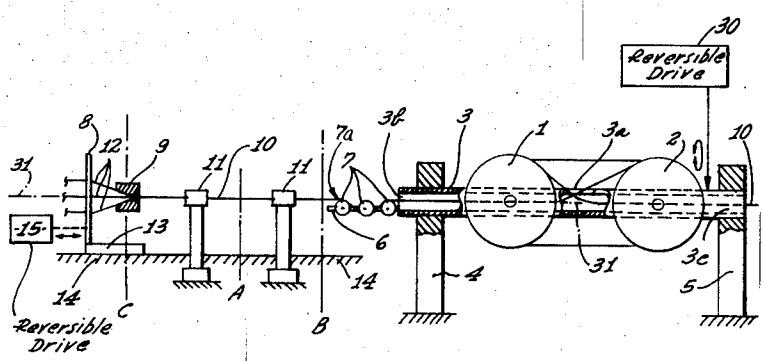


Fig. 1

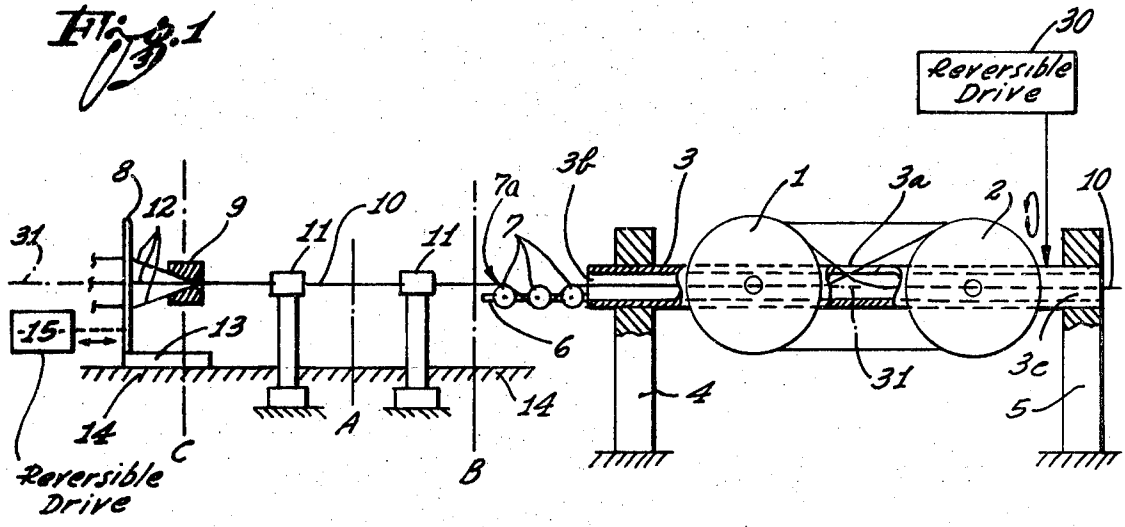
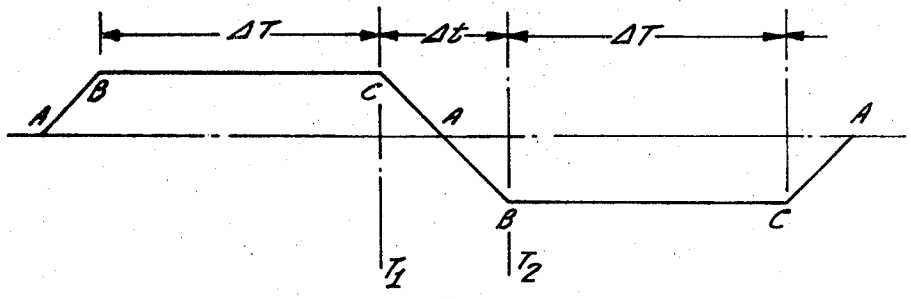


Fig. 2



INVENTOR.
Rolf Stöbener
Smyth, Roston & Pavitt
By Raef Siegemund
ATTORNEYS

STRANDING MACHINE

The present invention relates to a stranding machine with accumulator storage facilities and provided for twisting plural, individual strands or groups of strands.

U.S. Pat. No. 3,169,360 discloses a stranding machine using two relatively large rolls for accumulating and temporarily storing the strands. A pair of stranding nipples is provided, each comprised of a pair of pinch rolls. One pair of pinch rolls is disposed at the entrance to the accumulator, the other pair is located at the exit or withdrawal side thereof. The accumulator is mounted in a cradle. As strands are paid off a supply, they pass between the pinch rolls of the first pair and are wound upon the accumulator. The cradle rotates about an axis in the propagation path of the strands, so that they are twisted downstream from the entrance side pinch rolls and along the path leading therefrom to the accumulator. The axis of rotation of the accumulator is, thus, the stranding axis of twisting. The exit side pinch rolls twist strands leaving the accumulator, but at opposite twist.

More particularly, the cradle actually rotates about the twisting or stranding axis and halts in alternating sequence. A period of rotation is followed by an equally long period without rotation. Untwisted strands are wound upon the rolls of the accumulator when halting while previously twisted strands leave the accumulator without untwisting. As all of the previously twisted strands are withdrawn from the accumulator, the latter has been filled with untwisted strands in the meantime. Thereupon the cradle rotates and untwisted strands are paid off the accumulator and pass through the exit side pinch rolls. The strands drawn off the accumulator are twisted opposite to twisting imparted concurrently upon strands passing through the entrance side pinch rolls and toward the accumulator.

The purpose of this arrangement is to provide periodically reversing twist for the stranded product, the reversal point of the twist being spaced apart by a distance that is given by the capacity of the accumulator. Such twist reversal will also be produced if the accumulator alternates its direction of rotation about the stranding axis. In this case, only one stranding nipple, for example, one pair of pinch rolls is needed.

A problem arises when the cradle slows down to stop and when it starts up again, while strands are continued to pass into the machine. In either case, there is partial or complete untwisting of strands as extending between accumulator and either pair of pinch rolls. Thus, the system fails to establish definite *points* along the stranded material where the twist reverses; instead the finished product has lengthy portions of considerable slack, where the strands have been gradually untwisted, respectively followed by rather loosely twisted strands in the opposite direction. In fact then, there is a lengthy portion without significant twist. The same problem arises, if the accumulator does not alternate between rotation and halting periods but alternates as to its direction of rotation about the stranding axis. It should be mentioned, that binding of the twist reversing points has nothing to do with the inherent production of a loose twist during slowdown periods of the accumulator.

It has been suggested to provide freely rotatable guide sheaves in the plane of the axis of rotation of the accumulator; the sheaves rotate with the accumulator about its axis (their axes are transverse to the stranding axis). The sheaves are disposed close to the entrance of the accumulator so that the distance between the point of the stranding machine closest to the stranding nipple and undergoing rotation about the stranding axis is shortened. Accordingly, untwisting affects a shorter length of strand only. Nevertheless, it was found that the stranded product is still partially untwisted over significant lengths. This partial or even complete untwisting is to some extent dependent upon the speed of reversal or halting of the cradle of the accumulator, but the controlling factor is still the distance between accumulator and stranding nipple.

The problem to be solved, therefore, relates particularly to avoiding untwisting of strand as resulting from the providing of reversing twist. The stranding machine improved in accordance with the invention includes a strand accumulator, for example, as aforedescribed, and which has phases of particular rotation relative to a stranding nipple, about the stranding axis, alternating with phases of different rotation corresponding to the ultimate production of reversed twist. Transition phases are interspaced, each extending, for example, from beginning of terminating a phase of particular rotation to completion of establishing the next phase of different rotation. One of the phases of different rotation may be equivalent to zero rotation, or the two different phases of rotation may merely differ in the direction of rotation at particular speed. In the latter case, only one stranding nipple is needed, for example, at the entrance of the accumulator. A transition phase is, thus, the period from the beginning of a drop in speed of the accumulator about the stranding axis up to complete halting or up to completion of accumulator reversal.

In accordance with a particular feature of the invention, the stranding nipple moves at relatively slow speed during each of the principle phases, away from the accumulator entrance along the stranding axis, while during the transition phase the stranding nipple moves towards the accumulator, together with the propagation of the strands. If the stranding nipple is disposed at the entrance of accumulator it should move at the same speed as the strands during each transition phase. Thus, during the transition phase there is no (or hardly any) relative motion between stranding nipple and strands. There is an apertured guide plate in front of the stranding nipple guiding the several strands as they are paid off their respective supply. This guide plate is to move in unison with the stranding nipple along the stranding axis as described. As a consequence of the motion of the nipple towards the accumulator during slowdown and speedup phases thereof, production of lengthy portion without any or with insufficient twist is avoided.

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention, it is believed that the invention, the objects and features of the invention and further objects, features and advantages thereof will be better understood from the following description taken in connection with the accompanying drawings in which:

FIG. 1 illustrates somewhat schematically a side view of a stranding machine improved in accordance with the preferred embodiment of the invention; and

FIG. 2 illustrates an operational speed diagram plotted in relation to particular phases of operation of the improved structure as shown in FIG. 1.

Proceeding now to the detailed description of the drawings, in FIG. 1 thereof there is shown an accumulator comprised of two sets of wheels, 1 and 2 suitably journaled on a hollow tubular shaft 3 but at right angles to the axis 31 thereof. Shaft 3 has a lateral slot 3*a*, an entrance opening 3*b*, and an exit opening 3*c*. Twisted strand 10 enter tubular shaft 3 at opening 3*b*, pass through the tube towards slot 3*a*. Suitable guide means pass the strand through the slot for accumulation on the set of wheels 1 and 2 and thence back through slot 3*a* into hollow shaft 3 to propagate again along axis 31 for withdrawal from exit 3*c* and to be wound upon a drum or the like.

Hollow, tubular shaft 3 is journaled in bearing blocks 4 and 5, and, as schematically indicated, a reversible drive 30 imparts rotation upon the shaft about the central axis 31. Guide sheaves 7 are journaled upon a carrier 6 that extends axially from hollow shaft 3 near entrance 3*b* thereof. The sheaves run the stranded product 10 from a point 7*a* on axis 31 of rotation of shaft 3 along a meandering path, back into the axis 31, adjacent opening 3*b*. The point 7*a* can actually be regarded as the "stranding point" and may, thus, constitute the entrance of the accumulator.

Individual strands 12 are paid off and advanced from supply drums, reels or the like (not shown) and pass through apertures in a plate or disk 8. The disk 8 is mounted on a support 13 which can also be termed a carriage. A stranding nipple 9 is likewise mounted on carriage 13 and is particularly positioned to have its operating point on axis 31. Also, disk 8 has its apertures preferably arranged symmetrical to axis 31.

During operation, strands **12** advance continuously through disk **8** and to stranding nipple **9** so as to propagate further on axis **31** until reaching point *7a*. Concurrently, the accumulator assembly **1**, **2** and **3**, including also elements **6** and **7**, rotates about axis **31**, thereby twisting the strands **12**. The strands are twisted particularly between nipple **9** and point *7a*. The length of that path from head **9** to point *7a*, the speed of rotation of the accumulator and the speed of propagation of the strands, determine the extent of twisting. The accumulator continues to rotate about axis **31** until filled, whereupon its direction of rotation is reversed, and the previously twisted strands are now withdrawn while the strands, reeled onto the accumulator, are twisted in the opposite direction, etc. Withdrawal equipment (not shown) on the exit side of the accumulator inhibits untwisting of stranded product.

In FIG. **2**, ΔT denotes generally the periods during which the accumulator rotates at constant speed, and in either direction. Thus, each of these periods ΔT defines one of the main phases mentioned above. Δt marks the transition periods, beginning, for example, at a time T1, when the accumulator begins to slowdown. A transition period ends when the accumulator has reached rated speed in the opposite direction, such as at time T2. During this transition period Δt strands **12** continue to propagate into the machine. Take the instant T1, at that time the strands between stranding nipple **9** and point *7a* are in a particular state of twisting. As rotation declines, twisting is reduced, partially undone, before twisting in the opposite direction is resumed at full speed, so that without further measure a considerable length of strands is only partially twisted or not at all.

In accordance with the invention, disk **8** and stranding nipple **9** are mounted on carriage **13** which is displaceable on a bed or pathway **14** for movement parallel to axis **31**, so that stranding nipple **9** remains on that axis. The carriage is moved by a controlled drive **15**, which positions carriage **13** and particularly the stranding nipple **9** thereon in accordance with the following rules.

Vertical dash-dot lines in FIG. **1** denote three different positions for stranding nipple **9**, respectively A, B and C. The stranding nipple **9** is illustrated to be currently in position C. During a main phase of constant speed rotation of accumulator assembly **1**, **2**, **3**, **6**, **7**, in either direction, drive **15** moves carriage **13** so that stranding nipple **9** is gradually displaced from position B to position C. Thus, the stranding nipple recedes slowly from point *7a*, and from the accumulator in general. Upon reaching point C, drive **15** stops, but that instant coincides with a time slowdown of the accumulator rotation begins. Therefor a transition phase begins. FIG. **2** illustrates the time-speed characteristic of the accumulator, and as stated above, slowdown begins at time T1 when nipple **9** is in position C while full speed in the reverse direction is reached at T2.

Concurrently to the accumulator reversing its rotation, drive **15** moves carriage **13** so that stranding nipple **9** moves from point C back to point B. In particular, nipple **9** moves at the speed of propagation of the strands **12**. At first stranding nipple **9** moves from point B to midpoint A. Concurrently thereto, the accumulator assembly reduces its speed before actually halting momentarily when nipple **9** arrives at point A. During this period the twisting length between nipple **9** and point *7a* has gradually shortened. Thus, even though the rotation of the accumulator producing the twist is reduced, the strands that passed through point *7a* into the accumulation will be completely twisted.

As the nipple reaches point A the accumulator actually halts and there is a remaining length of strands between nipple **9** in position A and point *7a*. It was found that length has actually been twisted more than normal. As nipple **9** continues to move towards point B, the accumulator accelerates for rotation in the opposite direction. The stronger twist previously obtained is now partially undone, so that the product now entering the accumulator is actually about normally twisted. As nipple **9** arrives at position B a rather instantaneous change in twist occurs affecting only the small length between stranding nipple **9** when in position B and point *7a*. The accumulator has reached rated speed when nipple **9** arrives at position B. Thereafter, carriage **13** recedes slowly to position C for the stranding nipple, as the accumulator rotates regularly.

Position C is, of course, spaced apart from position B by a distance which is at least approximately equal to the speed of strand propagation divided by the duration of the transition period Δt, which is the period required for completing reversal of rotation of the accumulator. On the other hand, reversible carriage drive **15** should be adjusted to recede from position B to position C at such a speed that the period it takes is equal to the period required to fill the accumulator with strands twisted in one particular direction. This is not too critical, but for reasons of avoiding irregular stranding lay this latter rule should be observed.

In order to avoid lateral whipping of the strands as they extend between stranding nipple **9** and stranding point *7a*, particularly when the stranding nipple is rather far from that point *7a*, it may be advisable to provide bracketlike elements **11**, which fold back when stranding nipple **9** approaches. As stranding nipple **9** recedes they gradually fold up and provide short guide ducts or tunnels for the strands. These elements **11** may be operated mechanically, hydraulically or electrically, for example, in response to sensing switches on bed **14**, responding to the position of carriage **13** thereon.

The invention is not limited to the embodiments described above but all changes and modifications thereof not constituting departures from the spirit and scope of the invention are intended to be included.

I claim:

1. In a stranding machine which includes an accumulator for strands, further including means for rotating the accumulator on a stranding axis, and at different particular speeds, there being transition periods during speed changes, there being additionally means for paying strands to be twisted, the improvement comprising:

a stranding nipple disposed for positioning and running the strands to be twisted into the axis, to obtain twisting of the strands upon relative rotation between the accumulator and the stranding nipple about the axis; and

means for moving the stranding nipple towards the accumulator on the stranding axis and at least approximately during each transition period, said means moving the stranding nipple in the opposite direction on the axis during periods of rotation of the accumulator at each of the particular speeds.

2. Stranding machine as in claim **1**, means for operating the means for moving the stranding nipple towards the entrance of the accumulator at essentially similar speed as the pay-in speed of the strands and during each of the transition periods, said operating means positioning the nipple close to the entrance of the accumulator at the end of each transition period.

3. Stranding machine as in claim **1**, there being a guide plate with plural apertures for guiding individual strands towards the stranding nipple, the guide plate disposed for moving in unison with the nipple.

4. Stranding machine as in claim **1**, there being displaceable strand guiding means disposed between nipple and accumulator.

* * * * *