UNITED STATES PATENT OFFICE

2,681,721

WIRE STRINGING DEVICE FOR PAPER MACHINERY

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Application April 23, 1955, Serial No. 284,432

12 Claims. (Cl. 198—1)

1. This invention relates to a device for use in stringing the continuous forming wire on a Fourdrinier paper machine.

It is a primary object of the invention to provide a wire stringing device of such construction and mode of operation that it will unreele the wire completely in the aisle beside the paper machine, carry the wire into properly strung position on the machine, and then deposit the wire on the supporting parts of the machine and withdraw from the machine in such manner as to give maximum assurance against damage to the wire.

This object is accomplished in accordance with the invention by means of a wire stringing device composed of a plurality of operatively connected carriage units each of which includes one or more rigid supporting members for receiving the wire thereon. These units are connected for relative collapsing movement transversely of their length to compact form for storage and also for initially receiving the wire loosely thereon at the start of the wire stringing operation, and then when the device is expanded by moving the units apart lengthwise of the wire, the latter is progressively stretched into fully unreeled condition to form the complete loop ready for mounting on the paper machine. In addition, these supporting members are mounted for movement on the base portions of the device in the direction of their lengths to project into overlapped relation with the paper machine and thus to carry the wire onto the machine in its unreeled condition, after which the supporting members are retracted free of the wire to leave the wire in strung position.

It is accordingly an object of the invention to provide a wire stringing device for a paper machine which includes a plurality of supporting members for the wire mounted for movement lengthwise of the wire between a collapsed position for receiving the wire thereon and an expanded position in which they support the wire in a fully unreeled loop, and also for movement in the direction of their length and thus transversely of the length of the wire to carry the unreeled loop into proper position on the paper machine.

Another object of the invention is to provide a wire stringing device for a paper machine wherein the wire is initially supported apart from the machine in unreeled form on a plurality of main supporting members mounted for movement in a direction transverse of the wire to advance the wire onto the machine and thereafter to retract out of supporting relation with the wire, and wherein also the main supporting members for the wire carry supplemental supporting members which retain the wire in advanced position during retraction of the main supporting members and thereafter withdraw from engagement with the wire to deposit the wire on the machine.

An additional object of the invention is to provide a wire stringing device as outlined above wherein each main supporting member for the wire is equipped with a belt which lies between the wire and the supporting surface of the main supporting member and which during retraction of the supporting member is effectively peeled away from the wire without sliding movement relative thereto in order to support the wire out of sliding engagement with the retracting supporting member and thus to deposit the wire on the supporting parts of the machine with maximum assurance against damage thereto.

It is also an object of the invention to provide a wire stringing device for a Fourdrinier paper machine which is capable of power operation and requires minimum manual effort on the part of the operators in order to give further assurance against accidents tending to damage the wire during stringing thereof.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings—

Fig. 1 is a somewhat diagrammatic view looking towards the front side of a Fourdrinier paper machine and showing the wire stringing device of the invention in operative position;

Fig. 2 is a view generally in section on the line 2—2 of Fig. 1 illustrating the operation of one of the carriage units of the device in conjunction with a fragment of the paper machine;

Figs. 3 and 4 are sections on the lines 3—3 and 4—4 respectively of Fig. 1 showing other units of the wire stringing device;

Fig. 5 is a fragmentary plan view showing several units of the device in both collapsed and expanded positions;

Fig. 6 is a fragmentary view illustrating one of the bracing connections between adjacent units of the device;

Fig. 7 is a diagrammatic view in the nature of a perspective illustrating the relative arrangement and operation of the several belts and cables which operate one of the units of the wire stringing device;

Fig. 8 is an enlarged fragmentary view partly...
in side elevation and partly broken away in vertical section to show the construction and operation of the upper part of one of the carriage units of the device;

Fig. 9 is a fragmentary view similar to Fig. 5 showing the corresponding portion of the lower part of the carriage unit;

Fig. 10 is an enlarged section on the line 10—10 of Fig. 9 and also of Fig. 2;

Fig. 11 is an enlarged fragmentary view in side elevation of a portion of the wire stringing device;

Fig. 12 is an enlarged fragmentary section on the line 12—12 of Fig. 11;

Fig. 13 is a detail view of one of the multiple pulleys mounted on the drive shaft of each unit of the wire stringing device;

Fig. 14 is a section similar to Fig. 10 taken approximately on the line 14—14 of Figs. 2 and 8;

Fig. 15 is a fragmentary and diagrammatic view further illustrating the operation of the device;

Figs. 16 and 17 are enlarged sections similar to Fig. 10 and taken on the lines 16—16 of Fig. 3 and 17—17 of Fig. 4, respectively;

Fig. 18 is a perspective view showing the wire in coiled condition in a supporting device for use in conjunction with the wire stringing device of the invention;

Fig. 19 is a detail view of a portion of the wire supporting device of Fig. 16;

Fig. 20 is a somewhat diagrammatic view illustrating the initial step in unreeling the wire onto the wire stringing device of the invention;

Figs. 21 and 22 are views similar to Fig. 20 showing intermediate steps in the unreeling operation;

Fig. 23 is a view similar to Fig. 20 showing the wire fully unreeled on the device of the invention in readiness for stringing on the paper machine;

Fig. 24 is a somewhat diagrammatic view similar to Fig. 2 illustrating the operation of a modified form of the wire stringing device of the invention; and

Figs. 25 and 26 are fragmentary views illustrating diagrammatically the use of the wire stringing device of the invention with a non-cantilevered paper machine.

Referring to the drawings, which illustrate a preferred embodiment of the present invention, Figs. 1 and 2 show generally the operation of a wire stringing device constructed in accordance with the invention for stringing the forming wire W on a Fourdriner paper machine indicated fragmentarily and diagrammatically as including a breast roll 28, table rolls 21, a suction couch roll 22 and guide rolls 23. The wire stringing device of the invention is especially advantageous for use with a Fourdriner machine having the wire section thereof provided with a cantilevered mounting, and Fig. 2 shows a fragment of such a machine constructed as disclosed in the co-pending application of Joseph Baxter, Jr., Serial No. 294,088 filed December 29, 1951, and assigned to the same assignee as this application. This machine is indicated as including multiple truss members 25 having a cantilevered mounting at the back side of the machine and each secured at the front side of the machine to a post 26 which carries the front end of one of the guide rolls 23 and also the shake rail 27 supporting the front ends of the table rolls 21. The post 26 normally rests on a base or foot member 28, and the part 29 is a roof for receiving the water draining from the wire and table rolls and directing such water to the back of the machine as described in the above noted Baxter application.

The wire stringing device as a whole is composed of multiple single carriage units 30 each of substantially identical construction, two similar end carriage units 31 and 32 of modified construction, and two other similar carriage units 33 each of the same further modified construction and stationed next to the end units 31 and 32 respectively. The several units are connected together for movement transversely of their length between a folded or collapsed compact form as shown at the upper part of Fig. 8 and in Fig. 20, and an expanded position in which they extend slightly beyond both ends of the paper machine as shown in Fig. 1. For example, adjacent units may be connected as shown by means of several pairs of pivoted links 35 operating with a scissors-like action. In order to brace the several units with respect to each other when the device is expanded, the links 35 may be connected with an over-center locking action as shown in Fig. 6, with one link extending beyond its pivotal connection 36 to the other and carrying a stop such as a turned over lug 37. The two links may be yaddably held in the resulting braced relation by means of a spring such as the torsion spring 38 as shown in Fig. 6.

The several carriage units 30—33 are all preferably connected with a common drive for power operation as described hereinafter. As shown, each unit includes a drive shaft 40, and these shafts are all adapted to be connected by intermediate shafts 41 each having a hinged coupling 42 at one end and a resealable coupling at the other end to facilitate disconnection when the device is collapsed. The shaft 40 in the end unit 32 is adapted for connection to a source of drive power, represented by the pulleys 44 and motor 45 (Fig. 7) to cause simultaneous rotation of all of the shafts 40.

One of the carriage units 30 is shown in detail in Figs. 2 and Figs. 7—14. It includes a generally C-shaped frame composed of a main back member 50 and a pair of upper and lower members 51 and 52 shown as T-beams. The upper beam 51 is supported in cantilevered relation with back member 50 by means of the sides 53 of back member 50 and a truss comprising struts 54 and a diagonal brace 55, the latter being shown in Figs. 11 and 12 as formed of a pair of tubular members 56 and 57 secured together by the parts 53 at their lower ends and by a bracket 58 at their upper ends. The entire carriage unit 30 is mounted for movement transversely of its length by means of wheels 60 mounted on the underside of the lower beam 52. The area 61 represents an opening in one or both of the side portions 53 of back member 50 which provides ready access to the parts within the carriage and may if desired be fitted with a suitable removable cover plate.

Each of the beams 51 and 52 forms a track for one of the supporting members or guides which receives the wire and is movable lengthwise on the beam to carry the wire onto the machine during stringing, the upper guide being identified as 65 and the lower guide as 66. As shown in Figs. 10 and 14, each of these guides 65 and 66 is formed to extend up the upper portion of its supporting beam as a convenient means of retaining the guides thereon, especially when their forward ends are protected beyond the ends of the beam as shown in Fig. 2, in which position their rearward ends are thus supported in cantilevered relation by the beams. Figs. 10 and
14 also show each of beams 51 and 52 as provided with multiple roller bearings 61 on both the upper and undersides of their top portions to facilitate free movement of the guides thereon.

The guides 65 and 66 are effective during operation of the device to carry the wire in advanced position on the paper machine and thereafter to retract and thus to leave the wire on the machine.

In order to prevent the wire from retracting with the guides, supplemental supporting means are provided which act in conjunction with the guides to retain the wire in an advanced position as the guides retract. In addition, these supplemental supporting means operate in timed relation with the retraction of the guides to withdraw from engagement with the wire and thereby to cause the deposit of the wire on the machine.

The supplemental supporting means for the guides 65 and 66 are shown as continuous belts which extend along the surfaces of these guides adjacent the wire and thus maintain the wire out of directly supported relation with the guides.

Referring to Figs. 7 and 8, the belt 70 for upper guide 65 extends along the upper surface of the guide and around a pulley 71 in a bracket 72 at the front end of the guide, and from pulley 71 the belt passes over a guide pulley 73 into the space between guide 65 and the upper surface of beam 51. At the rearward end of beam 51, the belt passes around a pulley 75 and then down and around a pulley 76 on the frame to a pulley 77 on a shaft 78 extending through a carriage 80 mounted for sliding movement along the diagonal brace 55. From pulley 77, the belt 70 passes back to a guide pulley 81 on the main frame and then up and around a pulley 82 adjacent pulley 75 to the upper surface of guides 65.

As shown in Fig. 3, this arrangement forms the belt 70 into a generally C-shaped loop having the guide 65 received within one end thereof in such manner that an advancing flight portion 70a of the loop lies along the guide while the corresponding return flight portion 70b extends along the opposite side of the guide from the wire. The other end of the wire loop is carried by the carriage 50, and the belt 70 is thus free to move with and in any action with respect to the guide 65, but provision is made at some point along the belt for limiting the movement of its flight portion 70a to the single direction indicated by the arrow 83 in Fig. 8. This may be done conveniently by mounting a pulley 82 in pressure roll relation with one of the other pulleys, shown as pulley 82, and by providing the resulting pair of pulleys with means such as ratchet wheels 86 and spring biased pawls 87 for preventing their rotation in the undesired direction. This arrangement thus makes it possible for both flights of the belt to travel with guide 65 when the latter advances out from the frame but holds the flight 70a against retraction with the guide so that all retraction is taken up in the flight 70b.

The mechanism for effecting movement of the guide 65 during the stringing includes a cable 98 which is secured at one end to the forward end of the guide 65, as by means of a bracket 81. The cable 90 extends from bracket 81 forward and around a pulley 92 in a bracket 83 at the forward end of the beam 51. From pulley 92 the cable passes back on the opposite side of the beam to a pulley 94 on the beam and thence downward to a drum 95 secured to the shaft 40. An additional cable 99 which forms an integral part of the drive is secured at one end to the carriage 80, and the other end of cable 99 is secured to a drum.

100 secured to the shaft 40. At the upper end of brace 55, the cable 98 extends around an idler pulley 101 carried by the bracket 98. As shown in Fig. 12, the upper flight of cable 98 passes through the tubular member 56, and the lower flight similarly passes through the tubular member 57, the latter being slotted to receive an inwardly projecting lug or fin 102 on carriage 80 to which the two ends of cable 98 are secured.

Figs. 7, 8 and 15 best illustrate the operation of these several parts in moving guide 65 back and forth along beam 51. Figs. 7 and 8 show the guide in fully retracted position, and in this position of the guide, the carriage 80 is in its uppermost position on brace 55 and the cable 98 will be wound on drum 100. If now the shaft 40 is rotated in the direction to wind cable 98 on drum 85, the guide will be pulled from left to right as viewed in Fig. 7 as a result of the attachment of cable 98 thereto. The upper end of the belt loop will accordingly move out with the guide, and in order to provide slack for this movement, the other end of the loop, which is on carriage 50, will move inwardly, thus drawing the carriage 80 downwardly along brace 55 as the cable 98 unwinds from drum 100. During wire changing, the wire will rest on the belt flight 70a, and its weight will prevent relative movement of the belt and guide so that thus both of belt flight portions 70a and 70b will travel with the guide while the necessary slack in the belt will pay out around both of pulleys 75 and 82.

After the guide 65 has moved out to the limit permitted by travel of carriage 80 and brace 55, the direction of rotation of shaft 40 is reversed, which will cause cable 98 to wind on drum 100 and thus draw carriage 80 up brace 55 while at the same time cable 99 will unwind from drum 95. The reversed movement of carriage 65 will cause the part of the belt 70 on guide 65 to be drawn back towards the back of the machine. Since the belt in effect forms a single elongated loop having its ends located at the pulleys 71 and 77 respectively, this movement of carriage 65 will cause guide 80 to be pulled back by the belt along beam 51. However, the locking action of pulleys 82 and 83 will prevent rearward movement of the advancing flight portion 70a of the belt, i.e., movement in the opposite direction from arrow 83 in Fig. 8, as well as movement of the belt portion extending from pulley 82 to pulley 77, and therefore the only portion of the belt which takes part in the return movement is the return flight 70b on the opposite side of guide 65 from the wire and extends around pulley 71, 73 and 75 to pulley 77. This movement continues until carriage 80 reaches its uppermost position on brace 55, at which time guide 65 will be fully retracted.

In stringing the wire on the paper machine, the wire is supported on the guide 65 and the similar guides on all the carriage units, and these guides are caused to move simultaneously in order to carry the wire into place on the machine.

Thereafter the guides are retracted to leave the wire in place, and the movement of the guide 65 and belt 70 as described provides the desired result of the invention in preventing direct sliding engagement between the wire and any portion of its supporting structure during the retracting movement of the guides. This result is obtained directly from the fact that during retraction of the guide 65, there is no movement of the wire with respect to any portion of the belt 70, with which the wire is in actual contact. Instead,
while the guide 65 does slide back below belt 70, the belt does not slide with respect to the wire but rather is peeled away from below the wire around pulley 71 as the guide retracts.

The operation of the lower guide 66 is substantially the same as that described in connection with the guide 65. The guide 66 is provided with an endless belt 110 which extends along its upper surface and around a pulley 111 in a bracket 112 at the front end of the guide, and from pulley 111 the belt passes over a guide pulley 113 into the space between the guide and upper surface of beam 52. At the rearward end of the beam, belt 110 passes around a pulley 116 carried by the carriage 50 on the opposite end of the shaft 78 from the pulley 77 for belt 70. From pulley 116 the belt 110 passes back to and around a pulley 117 located on beam 52 in front of pulley 116 and continues along the upper surface of guide 66. The pulley 116 is shown as cooperating with pulley 111 to form a one-way lock for the belt similar to that provided by the pulleys 82 and 85 for belt 70 as described.

The guide 66 is operated by a cable 120 which corresponds to the cable 90 for guide 65 and is similarly secured at one end to the rearward end of guide 66 as by the bracket 121. The cable 120 extends from bracket 121 forward and around a pulley 122 in a bracket 123 at the forward end of beam 52, and from pulley 122 the cable passes back along the opposite side of beam 52 to a pulley 124 from which it passes to a drum 125 secured to shaft 40 on the opposite side of pulley 100 from drum 95. This arrangement of the belt 110 and cable 120 operates in substantially the same manner as described for guide 65 to project the guide forward when cable 120 is wound on drum 125 and to retract the guide when the direction of rotation of shaft 40 is reversed, the locking pulleys 117 and 118 then operating to prevent movement of the advancing flight of the belt with respect to beam 52 and thus causing the belt to peel away from below the portion of the wire supported thereby on guide 66. It will also be noted, as shown in Fig. 1, that the beams 51 and 52 are preferably located on opposite sides laterally of the carriage for ready aligning of the belts 70 and 110 with the pulleys on carriage 60, and the cables 90 and 120 are similarly located on opposite sides of their respectively associated guides and beams.

The several other carriage units 30 may all be identical in construction to the unit just described, and the carriage units 31-33 are of similar construction but are modified in accordance with particular requirements resulting from the structure at the two ends of the paper machine. Thus referring to Figs. 1 and 3, the carriage unit 31 is specially constructed to support the end of the wire loop free of possible contact with the couch roll while the wire is being carried into position on the paper machine, and the unit 37 at the opposite end of the machine is similarly of special construction to support the wire with respect to the breast roll while it is being moved into position. The carriage units 33 which stand adjacent the units 31 and 32, respectively, are likewise of special construction for proper cooperative relation with units 31 and 32.

The carriage unit 31 is best seen in Fig. 3, and it includes a main back member 130 which may include side portions similar to the portions 52 of part 50, these portions being omitted in Fig. 3 for better clarity of illustration. The unit 31 includes an upper I-beam 131, but its lower portion is a bar or beam 132 which takes no part in the wire stringing operation except to act as a support for the remainder of the carriage. The upper I-beam 131 includes a movable guide 133 which controls in all essential respects the guide 65 except that either or both the beam 131 and guide 133 may be inclined laterally to position the upper surface of the guide at an angle to the horizontal, for example 45° as shown in Figs. 1 and 15, in order to avoid introducing a sharp turn into the wire loop. An I-beam 132, which corresponds with beam 52 is mounted near the middle of carriage unit 31, as by means of braces 135, 137 and 138. This beam 135 supports a sliding guide 140, but the latter is mounted along the underside of the beam in order to provide the proper support for the end of the wire loop as indicated in Fig. 1. Also, either or both the beam 135 and guide 160 may be inclined similarly to the upper guide but in the opposite direction and for the same reason, as indicated in Fig. 1.

The carriage unit 31 is provided with belts and cables similar to the corresponding parts described in connection with the carriage unit 30 and including a belt 144 and cable 145 for guide 135, and a belt 146 and cable 147 for guide 185. In order to support the wire out of contact with guide 135, the face of the guide 140 is shown as in Fig. 16 and also recessed to form a track 148 preventing lateral slipping of the belt.

The guide 140 may be similarly formed as indicated diagrammatically in Fig. 1. If necessary, a retaining rib 145 may be provided for the return flight of the belt as shown in Fig. 16. The track 140 for carriage 151 corresponds to the similar part 55 in each carriage unit 30, but it is supported in generally horizontal position by reason of the relatively close spacing of the beams 131 and 135. The arrangement of pulleys and drums for the several belts and cables correspond functionally to that described in connection with Figs. 2 and 7, although the locations of some of these parts are changed by reason of the overall modified structure of this carriage unit, as will be apparent from Fig. 3 without detailed description. Further it will be noted that since the drive shaft 40 is mounted below the track 150, a supplemental drive belt or cable 154 may be employed from the pulley on shaft 40 to the pulley 155 on track 150 for the purpose of driving the cable operating the carriage 151.

The carriage unit 32 may be essentially identical with unit 31 as described in connection with Figs. 1 and 3, except that if desired, the relative spacing of the upper and lower beams and guides
may be changed in accordance with the diameter of the breast roll, and similarly these beams and guides may be inclined about a longitudinal axis as described in connection with unit 31. Otherwise the general arrangement and operation of the two end carriage units are effectively identical and will be readily understood without further detailed description.

The two carriage units 32 are of special construction by reason of the fact that it is desirable to cause the lower flight of the wire to pass under the lower guard on each thereof in order to hold the wire loop in properly expanded position in cooperation with the end units for free passage over the breast and couch rolls, as shown in Figs. 4 and 17. The general structure of these units is not materially different from the units 30 as already described, as is apparent from comparison with Figs. 2 and 4. In order to obtain the description, the corresponding parts in these two carriage units have been identified as 50', 51', and so forth. The lower part of these units, however, is somewhat different in that an additional lower frame member 160 is employed below the beam 52', in order to support the latter with its underside free for receiving the wire thereunder. The beam 52' is accordingly provided with a cantilevered mounting on the carriage frame at its rearward end, as indicated at 181, in order to provide space for guide 66' along its lower portion, and it is also connected at its outer end with upper beam 51' by a brace 162.

Figs. 18-23 illustrate the operations involved in initially unreeiling and depositing the wire on the wire stringing device. Fig. 18 shows the wire in the coiled condition in which it is commonly received at a paper mill, namely with two poles 200 and 201 in the center of the coil and a third pole 202 in the outer end loop. Transfer of the wire to the wire stringing device is facilitated if the poles 200 and 201 are supported in a rotatable mounting, which may be of any convenient type. For example, Figs. 18 and 19 show the ends of these poles supported in carriages 205 each of which forms a circular track for a pair of semi-circular clamp members 206 as shown to receive the two poles and secured together as by bolts 207. The carriages 205 may be joined as shown by a band 210 to form a sling readily transportable by a crane as indicated at 212, and the clamp members 206 are freely rotatable within in the carriages 205.

Fig. 20 shows the relation of the wire to the wire stringing device at the start of the unreeiling operation. The wire stringing device is indicated generally at 215 as in collapsed condition with one of the carriage units in close side by side relation, and the wire is unreeiled sufficiently to provide a downwardly hanging loop of substantial extent. Next, this wire loop is spread as indicated in Fig. 21 by means of the pole 202 and a similar pole 216 until it is opened up sufficiently to receive the collapsed wire stringing device therewithin, and the wire and device are then interlitted until the wire is in the proper position with respect to all of the several guides. In the next step, the wire supporting sling is lowered into close relation with the device, and it is convenient to deposit the carriage directly on one of the carriage units of the device, for example, by providing indexing holes in the top of one of the carriage units for receiving pins 217 on the underside of each carriage 205. This relation of the parts is shown in Fig. 21, and it may be convenient also to spread the wire stringing device part way as shown in order to take up the slack in the unreeiled portion of the wire.

Thereafter the several carriage units of the wire stringing device are pulled further apart as shown in Fig. 22, and this operation may be readily effected by a power drive, for example by anchoring one of the end carriages to the floor in proper relation to the corresponding end of the paper machine and then pulling the opposite end carriage by a cable and drum as indicated at 220 and driven by a suitable motor 222. After the wire stringing device is almost fully expanded, and the wire thus fully unreeiled off its supporting poles, the clamp members 206 may be unbolted to release pole 201, and the sling may be lifted away by the crane. The remaining poles 201, 202 and 216 may be manually removed or may if desired be left within the wire loop on suitable brackets (not shown) on the adjacent carriages. Expansion of the device is then completed to the position shown in Fig. 23 in which the wire is fully unreeiled into an open loop of the proper proportions to be carried over the supporting structure therefof in the paper machine, and this operation is carried out as already described in connection with Figs. 2 and 15, with all of the guides advancing simultaneously to carry the wire into position and then retracting in conjunction with the several belts to deposit the wire on the machine.

It will be apparent from Fig. 2 that when the wire stringing device as described is operated in conjunction with a cantilevered paper machine, the guides carry the wire in place in approximately horizontal position whereas the table rolls and other supporting structure on the paper machine will be tilted. Ordinarily this is not material, particularly because the several carriages are readily designed so that the guides thereon will have as little clearance as possible for the wire at the near side of the machine in order to minimize the vertical space between the wire and the table rolls at the far side of the machine. Furthermore, with the several guides cantilevered as they advance with the wire, they are likely to sag sufficiently to compensate in large measure for the tilt of the machine so that there is no objectionable distance through which the wire must drop as it is deposited on the machine by the retracting guides and belts. If desired, however, the carriages of the device can be designed in such manner as to advance the wire in a direction substantially parallel with the tilted position of the machine, by inclining the several supporting beams on the carriages as is indicated more or less diagrammatically in Fig. 24, where in one of the carriage units is indicated generally at 230 while a fragment of the machine is indicated at 232, and with this arrangement the wire can be advanced with only a bare clearance around the machine and then deposited thereon as described. The tilt of the machine and wire stringing device is exaggerated in Fig. 24 for convenience of illustration, since ordinarily the side of the machine will be raised only a sufficient distance, for example 2 or 3 inches, to permit free passage of the lower run of the wire.

It should also be noted that the wire stringing device of the invention is not limited to the use of cantilevered paper machine, and on the contrary it can be used with any machine in which provision is made for temporarily removing the supports below the wire section at one side of the
machine. For such uses, it is merely necessary to equip the upper beams of a sufficient number of the carriage units with extension brackets capable of attachment to the machine for supporting the machine while its lower supports are removed to permit passage of the low run of the wire into position. This arrangement and operation are illustrated diagrammatically in Figs. 28 and 26, which show at 245 a fragment of one of the carriage units of the wire stringing device, and also a fragment of a conventional Fourdrinier machine including one of the side rails 242, a supporting post or block 243 for the side rail, and a fragment of one of the table rolls 244.

As shown in Figs. 25 and 26, the outer end of the upper beam on the carriage unit is provided with an L-shaped bracket 245 adapted to engage below the side rail 242, and it will be understood that similar brackets are provided on most if not all of the upper rails on the other carriage units. With this arrangement, stringing of the new wire is readily effected by first jacking the side rail 242 sufficiently to remove the blocks 243, as indicated by the jack 246. The wire stringing device is then advanced into a position of engagement of its brackets 245 below the side rail, and the jacks are released to deposit the side rail on these brackets. The wire stringing device will therefore support this side of the paper machine clear of the floor to permit the new wire to be advanced into position by operation of the several guides as already described. Thereafter it is merely necessary to jack the side rail again sufficiently to remove the brackets 245 and replace the regular supports.

While the forms of apparatus herein described constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to these precise forms of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A device for stringing the continuous forming wire on a Fourdrinier paper machine comprising a plurality of carriage units each including at least one elongated guide longer than the width of said wire to serve as a support for the entire width of said wire, means connecting said carriage units in generally parallel and aligned relation for movement between a collapsed position of said device to receive said wire loosely on said guides and an expanded position wherein said wire is supported in unreeled position on said guides separately from said machine and forming an open loop, drive means on said carriages for causing said guides to move on said carriages in the direction of their lengths to advance said unreeled wire onto said machine, means on said carriages for retracting said guides from said machine, and means responsive to said retracting movement of said guides to cause said retracting guides to deposit said wire on said machine.

2. A device for stringing the continuous forming wire on a Fourdrinier paper machine comprising a frame adapted to be positioned beside said machine, a plurality of tracks on said frame and extending generally transversely of the length of said machine, a guide movably mounted on each said track and of sufficiently greater length than the width of said wire to serve as a support for the entire width of said wire, said tracks being spaced vertically and laterally on said frame to locate said guides in position to receive and support said wire thereon in unreeled condition forming a continuous open loop, a drive including driving connections between said guides and said frame for causing said guides to advance on said tracks in the direction of their lengths to carry said wire loop onto said machine and thereafter to retract from said machine, and means responsive to said retracting movement of said guides to cause said retracting guides to deposit said wire on said machine.

3. A device for stringing the continuous forming wire on a Fourdrinier paper machine comprising means forming a frame adapted to be positioned beside said machine, a plurality of guides on said frame each longer than the width of said wire to serve as a support for the entire width of said wire, said guides being spaced vertically and laterally on said frame to support said wire thereon in unreeled condition forming a continuous open loop, drive means on said frame for causing said guides to move thereon in the direction of their lengths to advance said wire loop onto said machine, means on said frame for retracting said guides from said machine, and means on said guides for retaining said wire against retracting movement with said guides to deposit said wire on said machine as said guides retract therefrom.

4. A device for stringing the continuous forming wire on a Fourdrinier paper machine comprising means forming a frame adapted to be positioned beside said machine, a plurality of guides on said frame each longer than the width of said wire to serve as a support for the entire width of said wire, said guides being spaced vertically and laterally on said frame to support said wire thereon in unreeled condition forming a continuous open loop, drive means on said frame for causing said guides to move thereon in the direction of their lengths to advance said wire loop onto said machine and thereafter to retract from said machine, supporting members for said wire extending between said wire and said guides for maintaining said wire out of directly supported relation with said guides, means for preventing said supporting members from retracting said wire guides to retain said wire in advanced position during retraction of said guides, and means for withdrawing said supporting members out of supporting relation with said wire without sliding engagement therebetween to cause said wire to remain on said machine following retraction of said guides.

5. A device for stringing the continuous forming wire on a Fourdrinier paper machine comprising means forming a frame adapted to be positioned beside said machine, a plurality of guides on said frame each longer than the width of said wire to serve as a support for the entire width of said wire, said guides being spaced vertically and laterally on said frame to support said wire thereon in unreeled condition forming a continuous open loop, drive means on said frame for causing said guides to move thereon in the direction of their lengths to advance said wire loop onto said machine, means on said frame for retracting said guides from said machine, supporting members on said guides for maintaining said wire out of directly supported relation with said guides during movement of said guides to prevent relative sliding engagement between said wire and said guides, and means cooperating with said guides during retraction thereof to hold the portions of said supporting members between said guides and the wire against movement relative to said wire.
and thereby to retain said wire in advanced position relative to said machine, and means for withdrawing said supporting members out of engagement with said wire to deposit said wire on said machine.

6. A device for stringing the continuous forming wire on a Fourdrinier paper machine comprising means forming a frame adapted to be positioned beside said machine, a plurality of guides on said frame each longer than the width of said wire to serve as a support for the entire width of said wire, said guides being spaced vertically and laterally on said frame to support said wire in unreel condition forming a continuous open loop, a belt associated with each said guide and including a portion extending lengthwise of said guide between said guide and said wire to maintain said wire out of directly supported relation with said guide, drive means on said frame for causing said guides to move outwardly thereon in the direction of their lengths to advance said wire loop onto said machine and to carry therewith said portions of said belts in stationary relation with said guides and said wire during said outward movement of said guide, means on said frame for retracting said guides from said machine, means for holding said portions of said belts against retraction on said guides to prevent relative sliding engagement between said guide and said wire and to leave said wire progressively unsupported beyond the outer ends of said guides, and means operating in timed relation with said retracting movement of said guides for withdrawing said belts from saidUnsupported portion of said wire to leave said wire on said machine.

7. A device for stringing the continuous forming wire on a Fourdrinier paper machine comprising means forming a frame adapted to be positioned beside said machine, a plurality of guides on said frame each longer than the width of said wire to serve as a support for the entire width of said wire, said guides being spaced vertically and laterally on said frame to support said wire thereon in unreel condition forming a continuous open loop, a belt associated with each said guide and including an advancing flight portion extending lengthwise of said guide between said guide and said wire to maintain said wire out of directly supported relation with said guide and having the forward end thereof extending about the forward end of said guide to a return flight portion thereof on the opposite side of said guide from said wire, drive means on said frame for causing said guides to move outwardly thereon in the direction of their lengths to advance said advancing flight portions of said belts in stationary relation with said guides and said wire during said outward movement of said guide, means on said frame for holding said advancing flight portions of said belts against movement with respect to said frame in the direction away from said machine, and means on said frame cooperating with said drive means for applying a rearward pulling force on said return flight portions of said belts to cause said guides to retract from said machine and simultaneously to withdraw said belts out of engagement with said wire and thereby to leave said wire on said machine.

8. A device for stringing the continuous forming wire on a Fourdrinier paper machine comprising means forming a frame adapted to be positioned beside said machine, a plurality of guides on said frame each longer than the width of said wire to serve as a support for the entire width of said wire, said guides being spaced vertically and laterally on said frame to support said wire thereon in unreel condition forming a continuous open loop, a continuous belt associated with each said guide and including an advancing flight portion extending lengthwise of said guide between said guide and said wire to maintain said wire out of directly supported relation with said guide and a return flight portion on the opposite side of said guide from said wire, a carriage mounted for movement on said frame inwardly of each said guide and carrying the other end of the associated said belt loop, a drive on said frame for causing said guides to move outwardly from said frame carrying said wire therewithon said machine and simultaneously causing movement of said carriages in the opposite direction to provide slack in said belts enabling said belt loop on said guides to travel therewith, said drive including driving connections between said frame and said carriages for thereafter causing reverse movement of said carriages and resulting rearward movement of said belt loop tending to retract said guides free of said wire, and means on said frame holding said advancing flight of each said belt against movement relative to said frame in the direction of retraction of said guides to cause said guides to slide relative to said belt flights while said return flight portions of said belts are taken up by said reverse movement of said carriages to effect deposit of said wire on said machine substantially without sliding engagement with any part of said device.

9. In a device for stringing the continuous forming wire on a Fourdrinier paper machine, the combination of a carriage unit comprising a frame adapted to be positioned beside the paper machine, a pair of guides movably mounted on said frame and of sufficiently greater length than the width of said wire to receive and support the entire width of said wire, said frame being pro-
portioned to maintain said guides in vertically spaced relation sufficient to receive therebetween a portion of said machine adapted to be located within said wire, drive means on said frame for causing movement of said guides in the directions of their lengths to advance said wire onto said machine and thereafter to retract out of supporting relation with said wire, and means responsive to said retracting movement of said guides to cause said retracting guides to deposit said wire on said machine.

11. In a device for stringing the continuous forming wire on a Fourdrinier paper machine, the combination of a carriage unit comprising a frame adapted to be positioned beside the paper machine, a pair of guides movably mounted on said frame and of sufficiently greater length than the width of said wire to receive and support the entire width of said wire, said frame being proportioned to maintain said guides in vertically spaced relation sufficient to receive therebetween a portion of said machine adapted to be located within said wire, a continuous belt associated with each said guide and forming a loop receiving said guide lengthwise within one end thereof to position an advancing flight portion thereof between said wire and said guide and a return flight portion on the opposite side of said guide from said wire, a carriage mounted for movement on said frame between said guides and carrying the other ends of both of said belt loops, drive means on said frame for causing said guides to move outwardly thereon carrying said wire onto said machine with accompanying movement of said carriage in the direction to provide slack in said belts enabling said loop ends on said guides to travel therewith, said drive including driving connections between said frame and said carriage for thereafter causing reverse movement of said carriage carrying said belt loop ends therewith, and means on said frame holding said advancing flight portion of each said belt against movement in the direction of retraction of said guides to cause said guides to slide relative to said belt flights while said return flight portions of said belts are taken up by said movement of said carriage to effect deposit of said wire on said machine substantially without sliding engagement with any part of said unit.

12. In a device for stringing the continuous forming wire on a Fourdrinier paper machine, comprising a plurality of carriage units adapted to be positioned beside the paper machine and each including a frame, a pair of guides movably mounted on each said frame and of sufficiently greater length than the width of said wire to receive and support the entire width of said wire, means connecting said carriage units in generally parallel and aligned relation for movement between a collapsed position of said device to receive said wire loosely on said guides and an expanded position wherein said wire is supported in unwound position on said guides separately from said machine, said frames and said connecting means being proportioned to maintain said guides in vertically and longitudinally spaced relation sufficient to form said wire into an open loop proportioned to receive therein the portion of said machine adapted to be located within said wire, coordinated drive means on said carriage units for causing conjoint movement of all said guides in the directions of their lengths to advance said wire onto said machine and thereafter to retract out of supporting relation with said wire, and means responsive to said retracting movement of said guides to cause said retracting guides to deposit said wire on said machine.

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