June 13, 1967 D. RICHARDSON 3,324,757

STRAND CARRIER FOR BRAIDING MACHINE

Filed Feb. 18, 1965 3 Sheets-Sheet 1

Fig. 1

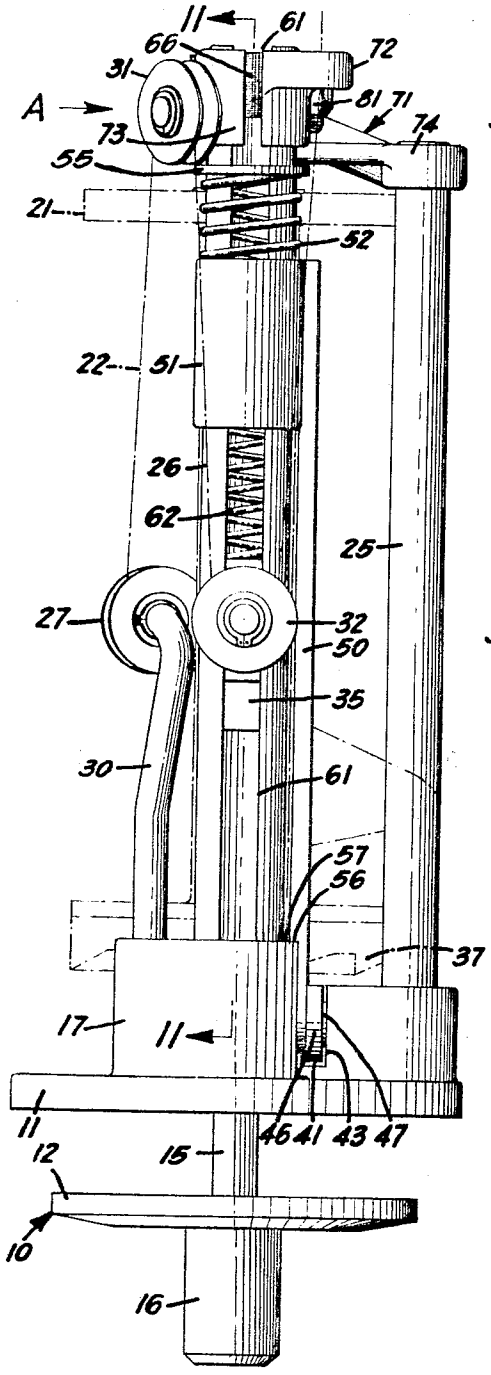
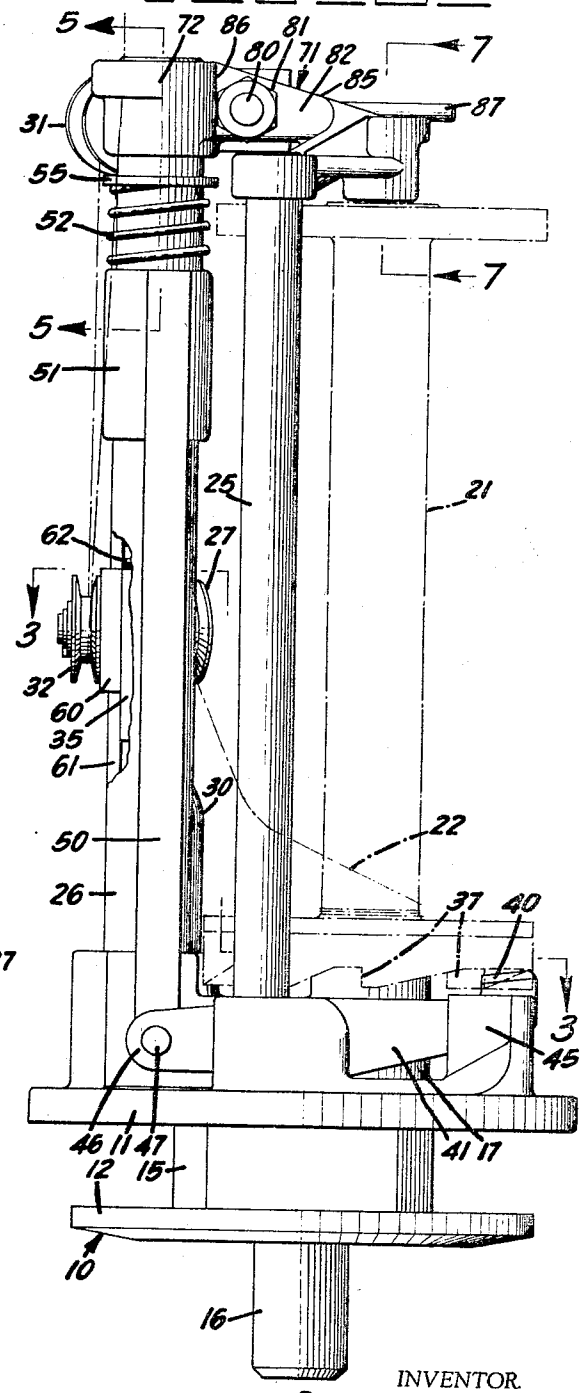


Fig. 2



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June 13, 1967 D. RICHARDSON 3,324,757

STRAND CARRIER FOR BRAIDING MACHINE

Filed Feb. 18, 1965 3 Sheets-Sheet 2

FIG. 3

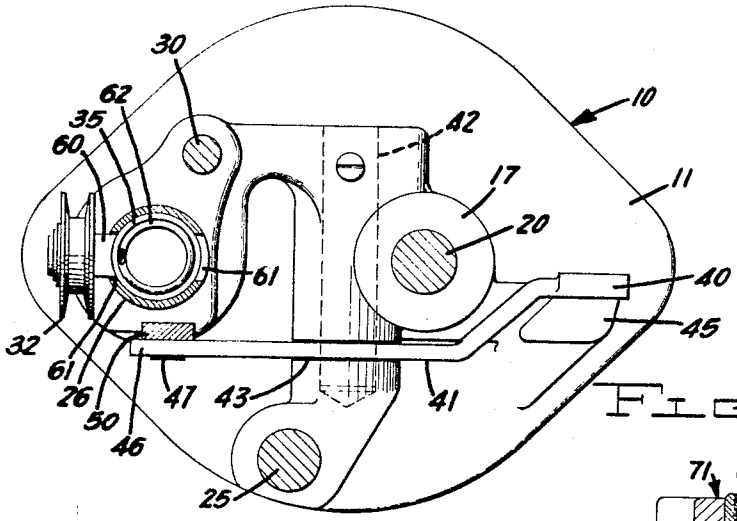


FIG. 5

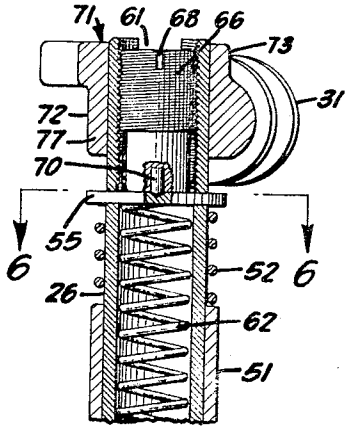


FIG. 4

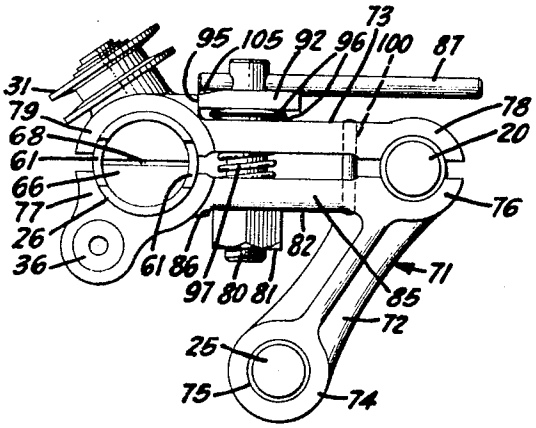


FIG. 6

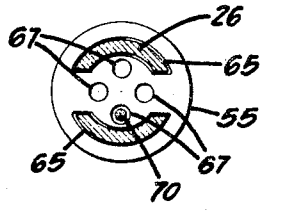
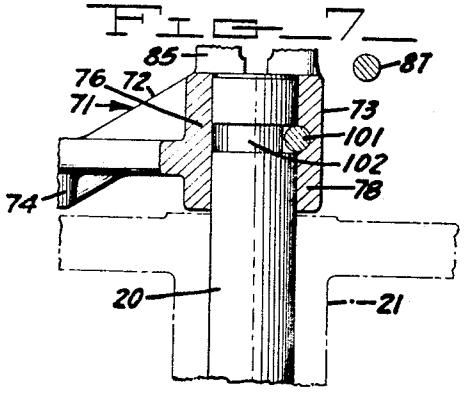


FIG. 7



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June 13, 1967 D. RICHARDSON 3,324,757

STRAND CARRIER FOR BRAIDING MACHINE

Filed Feb. 18, 1965 3 Sheets-Sheet 3

FIG. 12

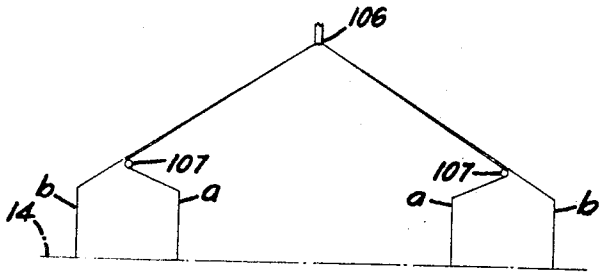


FIG. 13

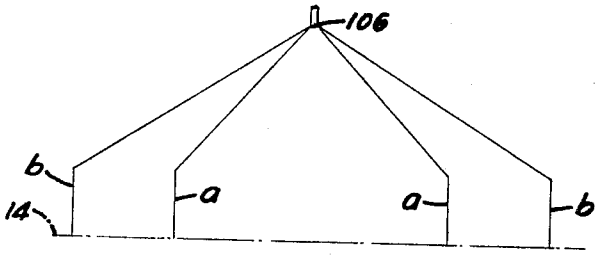


FIG. 11

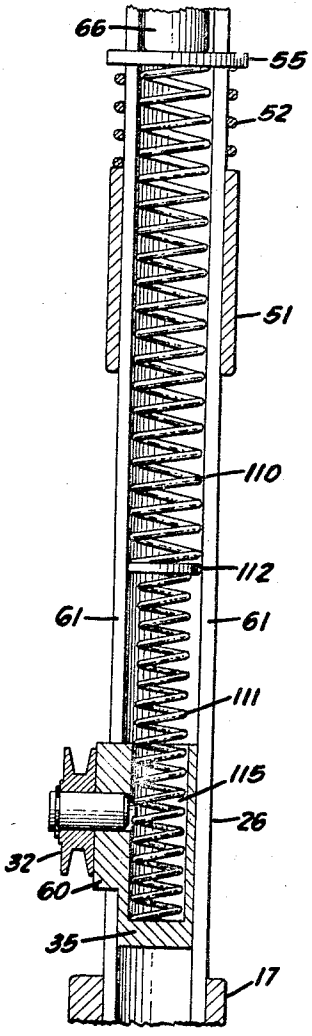


FIG. 8

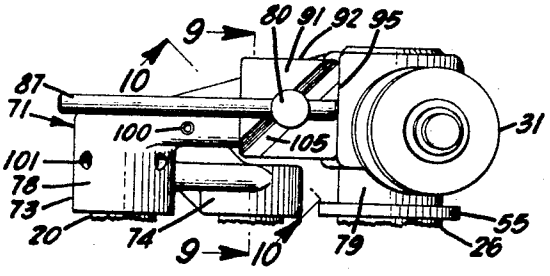


FIG. 9

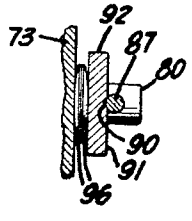
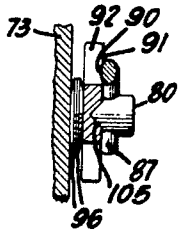


FIG. 10



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STRAND CARRIER FOR BRAIDING MACHINE

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Filed Feb. 18, 1965, Ser. No. 433,643

8 Claims. (Cl. 87—57)

This invention relates to braiding machines employing a sinuous path for the carriers and more particularly to improvements in strand carriers for such machines.

In braiding wire strand material on a braiding machine and particularly such strand material having a plurality of individual filaments, the individual filaments are usually wound or coiled in parallel relationship on the bobbin of the braiding carrier and the filaments are then fed under tension in such parallel relationship and in the form of a strand from the bobbin to the braiding point of the machine. Conventionally the braiding carrier is provided with a detent member for holding the bobbin against rotation and a tension member which acts to maintain tension in the strand material and to release the detent member from the bobbin to permit withdrawal of the strand material therefrom as it is braided into a fabric. Commonly, the detent member and tension member are under the control of compression springs or coil springs which act on the torsion principle and the springs act under predetermined prestressed conditions to provide the necessary resistance in the detent and tension members to maintain the desired tension in the strand material.

However, with the demand for increasingly high strand tensions it has been found that the available space for the springs on the carrier made it difficult to design such springs to maintain the required tension on the strand as the carrier operated along its sinuous path. Efforts to solve this problem have resulted in reduced strand capacity on the carrier, reduced life of the springs and/or increased height of the carrier which in turn resulted in excessive wear in the carrier foot and the deck plates of the machine. Also the means required to adjust the springs to maintain the desired range of strand tension became both cumbersome and difficult to control.

It is an object of the invention to provide a braiding carrier having novel structure which will overcome the above mentioned and other defects encountered in prior carrier structures.

Another object of the invention is the provision of means in a braiding carrier for feeding and tensioning a strand from a bobbin carried by the carrier to a point at which the strand is formed into a braided fabric, the means including a detent member for controlling the strand let-off movement of the bobbin, a tension member for the strand movable to release the detent member from the bobbin, separate spring means controlling the movements of the detent and tension members, and a single means for adjusting the spring means associated with detent and tension members to vary the tension on said strand.

A further object of the invention is the provision of means in a braiding carrier for preventing movement of the bobbin axially of the supporting spindle therefor by the action of the detent member on the bobbin, which means includes first and second members having abutting engagement with the bobbin and movable relative to each other to releasably engage a standard on the carrier and the bobbin spindle at opposite sides of a center line therethrough, one of the members also having means in releasable engagement with a groove in the spindle when the members are in engagement with the standard and spindle to maintain the members in engagement with the bobbin.

With these and other objects in view which will become apparent from the following detailed description of the illustrative embodiment of the invention shown in the accompanying drawings, the invention resides in the novel elements, features of construction and cooperation of parts, as hereinafter more particularly pointed out in the claims.

In the drawings:

FIG. 1 is a side elevational view of a braiding carrier according to the instant invention;

FIG. 2 is a view of the braiding carrier as seen from the right of FIG. 1;

FIG. 3 is a sectional view taken substantially on the line and in the direction of the arrows 3—3 of FIG. 2;

FIG. 4 is a top plan view of the upper portion of the carrier of FIG. 2;

FIG. 5 is a sectional view on an enlarged scale taken in the direction of the arrows 5—5 of FIG. 2;

FIG. 6 is a sectional view taken on the line and in the direction of the arrows 6—6 of FIG. 5;

FIG. 7 is a sectional view taken in the direction of the arrows 7—7 of FIG. 2;

FIG. 8 is a view of the upper portion of the carrier as seen in the direction of the arrow A of FIG. 1;

FIG. 9 is a sectional view taken on the line and in the direction of the arrows 9—9 of FIG. 8;

FIG. 10 is a sectional view taken on the line and in the direction of the arrows 10—10 of FIG. 8;

FIG. 11 is a sectional view as seen in the direction of the arrows 11—11 of FIG. 1 and showing a modified form of the strand tensioning means of the carrier;

FIG. 12 is a diagrammatic view of a braiding machine on which the carrier of FIGS. 1 to 10 is used; and

FIG. 13 is a diagrammatic view of a braiding machine on which the carrier having the strand tensioning means of FIG. 11 is used.

Referring to FIGS. 1 and 2 of the drawings the braiding carrier of the instant invention includes a conventional foot portion 10 having spaced upper and lower plate portions 11 and 12 for engaging upper and lower surfaces of the usual race plate of a braiding machine shown diagrammatically at 14 (FIGS. 12 and 13), a heart piece 15 connecting the upper and lower plate portions and adapted to engage in a sinuous raceway formed in the race plate, and a circular lug 16 extending from the lower plate portion for engagement with horn or driving gears (not shown) of the machine. Extending upwardly from the upper plate portion 11 is a boss or hub 17 (FIGS. 2 and 3) which fixedly supports the lower end of a spindle 20 for rotatably supporting a bobbin 21 for strand material 22 such as wire or the like, a guide post 25 and a tubular post or standard 26. In its path from the bobbin 21 to the braiding point of the machine, the strand material 22 passes from the bobbin over the guide post 25, under a grooved guide roller 27 freely rotatably mounted on a support member 30 secured in fixed position in a portion of the boss 17 (FIGS. 1 and 3) and over a freely rotatably grooved guide roller 31 at the upper end of the standard 26. From the roller 31 the path of the strand continues around a groved guide roller 32 freely rotatably mounted on a tension member 35 and through a guide eyelet 36 to the braiding point of the machine.

During the sinuous movement of the carrier around the braiding point of the machine, the bobbin 21 is alternately held against rotation and released to permit the strand material 22 to be withdrawn from the bobbin to maintain a substantially constant tension on the strand material. For so holding the bobbin, the lower end thereof is provided with spaced teeth 37 which are adapted to be engaged by one end 40 of a pawl lever or detent 41 carried

in a slot 43 formed in the boss 17 and pivotally mounted on a pin 42 carried in fixed position in the boss 17 (FIG. 3). As shown in FIG. 3 the end 40 of the pawl lever 41 is offset from the main body of the pawl lever for engagement with an upwardly projecting backing lug 45 on the upper plate 11 when the end 40 is in engagement with a tooth 37 to stop the bobbin 21.

At its other end 46 the pawl lever 41 is pivotally connected by a pin 47 to the lower end of a link 50. The upper end of the link 50 is secured as by brazing or the like to a sleeve 51 having sliding engagement with the outer surface of the standard 26. A compression spring 52 surrounding the standard 26 between the upper end of the sleeve 51 (FIGS. 1, 2, 5 and 11) and a plate 55 carried on the standard tends to bias the sleeve 51 and link 50 downwardly to turn the pawl lever 41 counterclockwise as viewed in FIG. 2 to move the end 40 of the pawl lever into holding engagement with the teeth 37 on the bobbin 21. As shown in FIG. 1 the lower end of the link 50 is reduced in thickness to provide a shoulder 56 for engagement with an upper surface 57 of the boss 17 which acts to limit the downward movement of the sleeve 51 and link 50 and the movement of the end 40 of the pawl lever toward the bobbin 21.

The tension member 35 is slidably mounted within the tubular standard 26 and has a portion 60 extending outwardly through one of a pair of slots 61 formed in the standard at opposite sides of the axial center thereof. The portion 60 in addition to forming the support for the guide roller 32 is adapted to engage and raise the sleeve 51 to turn the pawl lever clockwise as viewed in FIG. 2, when the tension member 35 is raised by the strand material, to disengage the end 40 of the pawl lever from a tooth 37 on the bobbin 21 to permit the strand material to be withdrawn from the bobbin. Movement of tension member 35 to raise the sleeve 51 and release the pawl lever from the bobbin 21 is resisted by a compression spring 62 mounted in the standard between the tension member and the plate 55.

As shown in FIGS. 5 and 6, the plate 55 is provided with openings 65 interfitting the walls of the standard 26 between the sides of the slots 61 and the plate is adapted to be moved axially on the standard to adjust the compressive force of the springs 52 and 62 on the sleeve 51 and tension member 35 respectively by a plug 66 threadably carried in the upper end of the standard. The plug 66 is provided with a screw driver slot 68 by means of which the plug is rotated to adjust the position of the plate 55 on the standard and the plate is provided with a series of indentations 67 any one of which is adapted to receive the end of a pin 70 carried in the lower end of the plug 66 to maintain the plug against accidental rotative movement relative to said plate member.

During operation of the carrier as it follows its sinuous path around the braiding point of the machine the length of the strand material 22 from the braiding point to the fixed guide roller 27 is gradually reduced thereby raising the tension member 35 against the force of the spring 62. As the tension member 35 continues to rise it engages and raises the sleeve 51 against the force of the spring 52 to turn the pawl lever 41 clockwise to disengage the end 40 from a tooth 37 of the bobbin 21 thereby permitting partial rotation of the bobbin and withdrawal of a short length of the strand material from the bobbin by the take-up action of the tension member 35 as it is again moved downwardly by the spring 62. This downward movement of the tension member 35 again releases the sleeve 51 for movement downwardly under the influence of the spring 52 to turn the pawl lever counterclockwise into engagement with the next tooth 37 to stop the bobbin 21. This action occurs constantly throughout the braiding operation of the carrier.

Upward movement of the bobbin 21 on the spindle 20 through the action of the pawl lever 41 on the teeth 37 of the bobbin is resisted by a bridge member 71 which is adapted to be releasably engaged with the upper ends of the spindle 20, guide post 25 and standard 26. The bridge member 71 includes a main portion 72 and a cap portion 73. The main portion 72 is provided with a boss 74 having an opening 75 slidably interfitting the guide post 25 and half bearing portions 76 and 77 which are apertured to engage the spindle 20 and standard 26, respectively, at one side of a center line passing through the spindle and standard (FIG. 4). The cap portion 73 has half bearing portions 78 and 79 which are suitably apertured to engage the spindle and standard, respectively, at the opposite side of the center line through the spindle and standard from the main portion 72. As shown in FIGS. 2 and 7, the bearing portions 76 and 78 extend downwardly into abutting engagement with the upper surface of the bobbin 21. Also, as shown in FIG. 4, the guide eyelet 36 is carried in the main portion 72 of the bridge member 71 and the guide roller 31 is rotatably carried on the cap portion 73 of the bridge member.

The cap portion 73 is adapted to be moved from the position shown in FIG. 4 in which the bearing portions 78 and 79 are held in resilient engagement with the spindle 20 and standard 26, which is the active position of the bridge member 71, to a position in which the bearing portions are released from the spindle and standard when the bridge member is to be removed from the carrier to replace an empty bobbin with a full bobbin. In order to hold the cap portion 73 in resilient engagement with the spindle and standard, the cap portion and main portion 72 are apertured to slidably receive a pin 80. The end of the pin 80 adjacent the main portion 72 is threaded to receive a hexagon nut 81 adapted to engage an outer face 82 of the rib 85 connecting the bearing portions 76 and 77 of the main portion 72. The rib 85 is provided with a shoulder 86 which lies closely adjacent to and cooperating with one of the flat sides of the nut 81 (FIGS. 2 and 4) to normally prevent the nut from turning with the pin 80. The other end of the pin 80 extends beyond the cap portion 73 and carries a handle 87 adapted to engage a shallow notch 90 formed in adjacent face 91 of a square washer or block 92 carried on the pin between the handle and cap portion (FIGS. 8, 9 and 10). One of the side edges of the washer 92 is in interfitting engagement with a shoulder 95 formed on the cap member 73 (FIGS. 4 and 8) to prevent the washer from turning with the pin when the pin is rotated to release the portions 72 and 73 from the spindle 20 and posts 25 and 26 as hereinafter set forth. Intermediate the washer 92 and cap member 73 the pin 80 carries a pair of spring washers 96 which are inverted in relation to each other and intermediate the portions 72 and 73 the pin 80 carries a compression type coil spring 97 (FIG. 4). A pin 100 (FIGS. 4 and 8) secured in the main portion 72 and having sliding engagement in an aperture formed in the cap portion 73 prevents relative rotation of the portions 72 and 73 when the bridge member 71 is removed from the carrier and a pin 101 carried in the bearing portion 78 of the cap portion 73 (FIGS. 7 and 8) for engagement in a groove 102 in the spindle 20, when the cap portion 73 is in resilient engagement with spindle and standard 26, maintains the bridge member in engagement with the upper end of the bobbin 21. In the position of the parts in FIG. 4 the spring washers 96 are only compressed sufficiently to maintain the handle 87 in engagement with the notch 90 and prevent accidental turning movement of the handle and pin 80 during operation of the carrier.

To permit removal of the bridge member 71 from the carrier as hereinbefore set forth the handle 87 and pin 80 are rotated clockwise as viewed in FIG. 8 from the position of FIG. 4 to align the handle with a deep notch 105 formed in the face 91 of the washer 92, this turning movement of the pin relative to the nut 81 and the depth of the groove 105 permitting sufficient movement of the cap member 73, under the influence of the spring 97, away from the portion 72 of the member 71 to disengage the pin 101 from the notch 102 in the spindle 20.

The main and cap portions of the bridge member may then be lifted from the spindle **20**, guide post **25** and standard **26** to replace an empty bobbin as above set forth. To return the bridge member to its operative position on the carrier, the bearing portions **76** and **77** of the main portion **72** are first engaged with the upper ends of the spindle **25** and standard **26** to align the opening **75** in the boss **74** with the guide post **25** and the bridge member is then moved to engage the guide post and to engage the bearing portions **76** and **78** with the upper end of the bobbin **21**. The handle **87** is then turned to its position of FIG. 8 to move and resiliently hold the cap portion **73** in engagement with the spindle **20** and standard **26**.

FIG. 12 diagrammatically illustrates a braiding machine on which the carriers **10** of FIGS. 1 to 10 are employed including the race plate **14** hereinbefore set forth having the usual sinuous raceway for guiding the carriers around a braiding point indicated at **106**. The carriers as they move around the braiding point move from an inner part of the raceway indicated by the lines *a* to an outer part of the raceway indicated by the lines *b*. From the carriers the strands **22** carried thereby are directed over a braid ring **107** and from the latter to the braiding point **106**. The braid ring **107** is fixed in position at a point above the tops of the carriers and midway between the inner and outer portions of the raceway. With the braid ring centrally located between the inner and outer paths of movement of the carriers the take-up movements of the tension members **35** as the carriers move between the inner and outer portions of the raceway to the center thereof are substantially the same.

During operation of the carriers as they follow the sinuous path around the braiding point **106** the length of the strand material **22** between the braiding point and the fixed guide roller **27** is gradually reduced thereby raising the tension member **35** against the force of the spring **62**. As the tension member **35** continues to rise it engages and raises the sleeve **51** against the force of spring **52** to turn the pawl lever **41** clockwise about the pin **42** to disengage the end **40** from a tooth **37** of the bobbin **21** thereby permitting partial rotation of the bobbin and withdrawal of a short length of strand material from the bobbin by the take-up action of the tension member as it is again moved downwardly by the spring **62**. This downward movement of the tension member **35** again releases the sleeve **51** for movement downwardly under the influence of the spring **52** to turn the pawl lever counterclockwise into engagement with the next tooth of the bobbin **21**. This action occurs constantly throughout the braiding operation of the carrier, during which the take-up member **35** moves from the position of FIGS. 1 and 2 to a position to raise the sleeve **51** sufficiently to release the pawl lever **41** from a tooth of the bobbin **21** which is equal to a distance of approximately 1¾ inches.

In machines where the strand **22** on the bobbin **21** extends directly from the carrier to the braiding point **106** of the machine as shown in FIG. 13, the movement of the tension member **35**, as the carrier moves between the outer portion *b* and inner portion *a* of the raceway of the machine, may be as much as 4½ inches. Where only a single spring such as spring **62** is used to control the greater movement of the tension member **35** the spring quickly loses its effectiveness to maintain tension on the strand during the initial movement of the tension member and causes rapid fatigue of the structure of the spring and breakage thereof. In order to overcome this condition two springs are provided to control the movement of the tension member **35**, as shown in FIG. 11, including an upper spring **110** which has substantially the same compressive strength as spring **62** and a lower spring **111** the lower end of which is seated in an aperture **115** in the tension member. The upper and lower springs are separated by a disk **112**. The lower spring **111** acts on the tension member to resist the initial upward movement thereof during which movement the lower spring is compressed until the disk is in engagement with the tension member. Thereafter, the upper ring **110** acts on the tension member during its continued upward movement to engage and raise the sleeve **51** to disengage the pawl **41** from the teeth **37** of the bobbin **21**.

Of course the improvements specifically shown and described by which the above results are obtained can be changed and modified in various ways without departing from the invention herein disclosed and hereinafter claimed.

What is claimed is:

1. A braiding carrier having a foot portion, a vertical tubular standard mounted on said foot portion, a spindle mounted on said foot portion to support a bobbin having a strand coiled thereon, and means for guiding a strand along a path from said bobbin to a point at which said strand is to be braided into a fabric, including a guide post secured to said foot portion, a first grooved guide roller mounted in fixed position on said foot portion, a second grooved guide roller mounted in fixed position on said carrier above said first guide roller, a pawl for engaging and holding said bobbin against rotation, a sleeve member mounted for sliding movement on said standard, means connecting said sleeve member to said pawl, means for moving said sleeve member to disengage said pawl from said bobbin to permit rotation thereof including a third guide roller for said strand mounted for sliding movement in said standard, said third guide roller being moved in said standard by said strand as it is fed to said braiding point to engage and move said sleeve to disengage said pawl from said bobbin, a first spring means acting to resist the pawl disengaging movement of said sleeve member by said third guide roller, a second spring means acting to resist the movement of said third guide roller to raise said sleeve member, and common means for adjusting the compressive force of said first spring means on said sleeve member and said second spring means on said third guide roller.

2. A braiding carrier according to claim **1** in which said second spring means acting to resist said pawl disengaging movement of said third guide roller comprises a coil spring positioned in said standard between said third guide roller and said common means.

3. A braiding carrier according to claim **1** in which said second spring means acting to resist said pawl disengaging movement of said third guide roller comprises a first coil spring and a second coil spring, said first and second coil springs being positioned in said standard between said third guide roller and said common means.

4. A braiding carrier having a vertical tubular standard, a spindle, a bobbin rotatably mounted on said spindle having a strand coiled thereon, means for guiding said strand along a path from said bobbin to a point at which said strand is to be braided into a fabric, a detent member for engaging and holding said bobbin against rotation, a sleeve member slidably mounted on said standard and connected to said detent member, said sleeve member being movable to disengage said detent member from said bobbin to permit rotation thereof, a tension member for said strand slidably mounted in said tubular standard and movable by said strand to engage and move said sleeve member to disengage said detent member from said bobbin, a first compression spring acting to resist the movement of said sleeve member by said tension member to disengage said detent member from said bobbin, a second compression spring acting to resist the movement of said tension member to move said sleeve member to disengage said detent member from said bobbin, and common means for adjusting the compressive force of said first spring on said sleeve member and said second spring on said tension member.

5. In a braiding carrier according to claim **4** in which said common means for adjusting the compressive forces of said first and second compression springs includes a

plate member mounted on said standard for movement toward and away from said sleeve and tension member, said first spring being mounted on said standard between said sleeve member and said plate member and said second spring being mounted in said standard between said tension member and said plate member, and a threaded member carried in said standard for engagement with said plate member, said last mentioned member being rotatable in said standard to adjust the position of said plate member on said standard relative to said sleeve member and said tension member.

6. In a braiding carrier according to claim 5 in which said plate member and said threaded member are provided with cooperating means for maintaining said threaded member against accidental rotative movement relative to said plate member.

7. A braiding carrier having a tubular standard, a spindle, a bobbin rotatably mounted on said spindle having a strand coiled thereon, means for guiding said strand along a path from said bobbin to a point at which said strand is to be braided into a fabric including a guide post, a detent member for engaging one end of said bobbin to hold it against rotation, a sleeve member slidably mounted on said standard, a link connecting said sleeve member to said detent member, said sleeve member being movable from a position in which said detent member is in holding engagement with said bobbin and a position in which said detent member is disengaged from said bobbin to permit said bobbin to rotate, a tension member for said strand slidably mounted in said standard and movable by said strand to engage and move said sleeve member to disengage said detent member from said bobbin, a first compression spring acting to resist movement of said sleeve member to disengage said detent member from said bobbin, a second compression spring acting to resist the movement of said tension member to move said sleeve member to disengage said detent member from said bobbin, common means for adjusting the compressive force of said first spring on said sleeve member and said second spring on said tension member, and a bridge member removably mounted on said spindle, guide post and standard including a first member, an opening in said first member for slidably receiving said guide post, bearing means on said first member for engaging said spindle and said standard at one side of a center line passing through said spindle and standard, a second member, bearing means on said second member for engaging said spindle and standard at the other side of said center line through said spindle and standard, means rotatably carried in said first and second members, said last mentioned means being rotatable to a first position to move said

second member into engagement with said spindle and standard and being rotatable to a second position to permit said second member to be disengaged from said spindle and standard, and means for disengaging said second member from said spindle and standard when said last mentioned means is in said second position.

8. A braiding carrier having a tubular standard, a spindle, a bobbin rotatably mounted on said spindle having a strand coiled thereon, means for guiding said strand along a path from said bobbin to a point at which said strand is to be braided into a fabric including a guide post, a detent member for engaging one end of said bobbin to hold said bobbin against rotation, a tension member for maintaining said strand under tension in its path from said bobbin to the braiding point, said tension member being movable by said strand to disengage said detent member from said bobbin, and means for preventing axial movement of said bobbin on said spindle including a first member, an opening in said first member for slidably receiving said guide post, bearing means on said first member for engaging said spindle and standard at one side of a center line passing through said spindle and standard when said guide post is in said opening, a second member, bearing means on said second member for engaging said spindle and standard at the other side of said center line through said spindle and standard, said bearing means for said spindle on said first and said second members having abutting engagement with the other end of said bobbin, rotatable means carried in said first and second members, said rotatable means being rotatable from a first position in which said bearing means thereon is resiliently engaged with said spindle and standard to a second position to permit said bearing means to be disengaged from said spindle and standard, and means for disengaging said second member from said spindle and standard when said rotatable means is in said second position.

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