A device for leasing two rows of yarn into a single hank having a circular hook adapted to circulate around the two rows of hank to form a "Figure 8" configuration of lacing thread around the hank. The device also simultaneously attaches a label to the hank with the aid of a label delivering means adapted to feed a label having a hole in such a manner as to locate the hole on the path of circulation of the circular hook to permit the latter to pass therethrough.

6 Claims, 30 Drawing Figures
DEVICE FOR LEASING TWO ROWS OF YARN INTO A SINGLE HANK

This application is a continuation-in-part of my co-pending application Ser. No. 828,979, filed May 29, 1969, now abandoned.

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to a device for leasing two rows of hank wound together on a reel cage to form a bundle of hank. This invention specifically relates to a device for leasing a hank such as a hank of woolen yarn for hand knitting, wound on a reel cage in two rows, by utilizing the yarn end of the hank. That is, the same yarn forming the hank is utilized to lace or lease the hank. The term leasing is used throughout this specification interchangeably with the term leasing, also commonly used in the knitting industry.

One important object of the invention is to provide a device for lacing the hank by winding the yarn end of the hank around two rows of hank in such a manner as to form a "Figure 8" and by knotting the rows with said yarn into a single bundle. More particularly, it is an object of the present invention to provide a circular hook for lacing the hank to knot the same into a single bundle by rotating a fishhook disposed at a point of the circular hook around the two rows, catching the yarn end with the fishhook and automatically winding said yarn around the two rows in the form of a "Figure 8" to bind the two rows together. The circular hook of the invention is substantially of unitary spiral shape having an axis of rotation at the center thereof and a fishhook located at the point of a circular filigree portion of the hook.

The present invention includes staggering means for forming the respective two rows of yarn into a pair of staggered portions by bending each one of the different rows of the hank so as to form chevron shaped yarn path portions, so that the circular hook can pass around the rows during the lacing operation. The staggering means may be formed with pushing bars arranged so as to displace each position of the different portions of the two rows of hank wound on the reel cage to form the two staggered portions only during the lacing operation. The device of the invention therefore comprises a simple structure of circular hook and staggering means which is operable to automatically lace two rows of the hank by first engaging the staggering means with the rows to form the staggered portions between the rows and by then rotating the circular hook around the rows to pass the yarn end of the hank caught on the fishhook portion of the circular hook through the two staggered portions in the form of a numeral or "Figure 8".

Another important object of the invention is to provide a lacing device capable of attaching a label indicating the quality and the trade name of the hank to the yarn by passing the lacing yarn through the hole of the label during the lacing operation. A plurality of the labels are accumulated in a label case and the timing of the rotation of the circular hook for the lacing operation coincides with the delivering of labels one after another from the label case into a position on the path of the rotation of the circular hook. The circular hook then passes through a hole in the label such that the lacing yarn is tied through the hole in a respective label for each laced hank. The lacing device according to the invention includes a simply constructed circular hook, a label having a round hole therein and means for operatively delivering a label into the path of the circular hook in a timed relationship to the lacing operation whereby a label is automatically added to each hank of yarn during the lacing operation.

The lacing device according to the invention, which can automatically both lace two rows of yarn into a single hank and attach a label to the hank; can be advantageously used in an automatic reeling machine and the like. The lacing device is capable of performing its intended functions in an entirely satisfactory and trouble-free manner. Also, a preferred embodiment of the present invention is designed to be able to lace the hank with a yarn end of the same hank so that it is unnecessary to supply other thread for the lacing operation. Further, since the device of the invention may be designed to lace the hank automatically by a single rotation of the circular hook, the lacing operation can be very efficiently performed. As a still further feature, the device of the invention may be designed to make it possible to attach the label simultaneously with the lacing operation so that the efficiency of attaching the label to the hank is also very high.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood from the following description of a preferred embodiment thereof with reference to the accompanying drawings, wherein like reference numerals denote like parts and wherein:

FIG. 1 is a perspective view of a hank which was laced and labeled with the device of the present invention;
FIG. 2a is a perspective view of the device of the present invention showing a hank wound on a reel cage with the circular hook, staggering means and a label case operatively disconnected from the hank;
FIG. 2b is a perspective view of the device of the present invention showing a hank wound on a reel cage with the circular hook, staggering means and label case operatively in engagement with the hank for performing the lacing operation;
FIG. 3 is a schematic side view of FIG. 2b;
FIG. 4 is a front view of a circular hook of this invention taken in the direction of the central axis of rotation of the hook;
FIG. 5a is a side view of the circular hook of FIG. 4 showing the fishhook portion in closed position;
FIG. 5b is a similar view to FIG. 5a, showing the fishhook portion in open position;
FIGS. 6a to 6g are schematic illustrative views showing in order the steps in the lacing and label attaching operation;
FIGS. 7a to 7d are schematic illustrative views showing in order the operations of a driving means for actuating the rotation of the circular hook and the delivering of the label to cooperate with each other in the embodiment of this invention;
FIGS. 8a to 8c are schematic illustrative views showing in order the respective positioning of the yarn guide during the lacing operation;
FIG. 9 is a schematic side view showing the mechanism for moving the lacing device into and out of engagement with the reel cage;
FIGS. 10a to 10c: include a schematic illustration showing the operation of the brushes opening and closing the fishhook portions of the circular hook.

FIGS. 11a to 11d: are illustrative schematic views showing the cutting and knotting operations; and

FIG. 12: is a perspective view showing the mechanism for operating the driving means which rotates the circular hook.

DETAILED DESCRIPTION OF THE DRAWINGS

The device for lacing lea to be described in connection with a preferred embodiment of this invention includes the following basic components: a reel cage 10 worked with the yarn in two rows thereon as best shown in FIGS. 2a and 2b; a circular hook 20 as best shown in FIG. 4, a pair of pushing bars 40, 41 for the right and left rows of yarn as best shown in FIGS. 7a to 7d; a rotating means 30 for the circular hook 20 as best shown in FIGS. 7a to 7d; a delivering means 60 for delivering labels from the label case 50 as best shown in FIGS. 7a to 7d; and a body 70 for housing the rotating means 30 and the delivering means 60 and for supporting the circular hook 20 and pushing bars along with the label case. This body is movably arranged with respect to the reel cage 10.

The reel cage 10, as shown in FIGS. 2a and 2b, provided with a frame having central aperture 11 with a rotating axis disposed centrally therewith. Six cage slats 12 form the hexagonal periphery in the pointed ends of the frame. An auxiliary slat 13 is disposed between the two cage slats 12a, 12b positioned in the front of the frame. A retainer 14 is provided for the yarn end disposed on the left front end of the upper slat 12a. A yarn guiding plate 16 is provided for guiding the yarn from a cheese 15 to the reel cage 10.

With the starting point 2 of the yarn 1 inserted in the retainer 14, the reel cage 10 is rotated about its central axis to initially wind the first row of yarn 3 on the left end of the cage slats 12 while the yarn 1 is guided through the yarn guiding plate 16. After the first hank 3 is completely formed, the yarn 1 is guided to the right end of the cage slats 12 by way of the yarn 4 while the cage is continuously rotated. This shift of the yarn 4 from the first row of hank 3 to the second row of hank 5 can be automatically performed by the guiding plate 16 operable by known actuating means. Subsequently, after the second hank 5 is completely formed, the guiding plate 16 will be returned to its initial position and, thereafter, the reel cage 10 ceases its rotation at a definite position with the auxiliary slat 13 in position to face toward a spindle 21.

FIGS. 8a to 8c: show the sequential shifting of the yarn guiding plate 16 by means of the yarn guide shifting mechanism 80. Yarn guide 16 is pivotally mounted at 81 and includes a cam follower portion 82 for engaging a cam groove 83 provided in cam plate 84. Cam plate 84 is pivotally mounted at pivot pin 85. The cam plate 84 is rotated in the counterclockwise direction by the rotation of the combination weight and reset lever 86 to cause the sequential shifting of the yarn guide 16 in the clockwise direction through the cam-slot engagement 82, 83. The rotation of cam plate 84 is controlled by control lever 87 and solenoid 88. Control lever 87 is pivotally mounted at 89 and is attached to a spring 90 at one end thereof and the solenoid 88 at the other end. Cam plate 84 includes two abutments 91 and 92 at its lower end for selectively engaging with ends 93 and 94 of control lever 87. FIG. 8a shows the yarn guide in a middle rest position, the yarn guide being held in place by the abutment 91 and end 93 of the control lever 87. The solenoid 88 is then actuated to release end 93 and permit the weight 86 to rotate cam plate 84 in the counterclockwise direction until end 94 of lever 87 engages with abutment 92. The yarn guide 16 is then held in the extreme right position as shown in FIG. 8b. Solenoid 88 is then deactivated to permit release of parts 92 and 94, and the consequent further counterclockwise rotation of cam plate 84 to the position shown in FIG. 8c. Guide plate 16 is then in the extreme left position. To repeat the sequence of shifting the yarn guide 16, it is necessary to reset the cam plate 84 to the position shown in FIG. 8a by lifting the combination weight and reset lever 86. Accordingly, in the position shown in FIGS. 2a and 2b with the reel cage stopped, the auxiliary slat 13 is located in the front center of the frame and the initial end 2 of the yarn 1 is retained by the retainer 14 on the left front end of the upper slat 12a while the tail end 6 of the yarn 1 is located on the left end of the lower slat 12b below the initial end 2.

The circular hook 20, as best seen in FIGS. 4, 5a and 5b, is constructed with a spindle 21 in the center, a filigree portion 22 in the form of a circular arc having a large central angle θ, a connecting portion 23 joining the filigree portion 22 with the rotating spindle 21, a fishhook 24 disposed on the pointed end of the filigree portion 22, and a coverplate 25 arranged to open and to close the opening portion of the fishhook 24. The filigree portion 22 of the circular hook 20 is spirally formed and is arranged to have a deviation of a distance h between the base portion 23a of the connecting portion 23 and the fishhook 24 along the direction of the axis of the center spindle 21. The outer diameter of the fishhook 24 is substantially the same as the outer diameter of the filigree portion 22. The point 24a of the fishhook is formed approximately U-shaped. The filigree portion 22 is made of small diameter steel wire. The inner diameter d of the filigree portion 22 is larger than the width S of the space between the first row of hank 3 and the second row of hank 5 on the reel cage 10. When the circular hook 20 is brought near the front of the reel cage 10, the rotating spindle 21 is positioned in the middle point between the first row 3 of the second row 5 slightly above the auxiliary slat 13, while the fishhook 24 is located leftwards from the lower plate 12b. A pair of pushing bars 40, 41, positioned respectively on both sides with respect to the spindle 21, are provided respectively at the ends thereof with pushing portions 40a, 41a, each having a width larger than that of the rows 3 and 5. When these pushing bars are brought near to the front of the reel cage 10 together with the circular hook, the left pushing portion 40a contacts the first row 3 at a front middle point between the auxiliary slat 13 and the upper slat 12a to create a staggered portion deviated with a distance H1 between the first row 3 and the second row 5 by bending the first row 3 together with the tail end 6 of the yarn in an angle so as to form a chevron shaped yarn path. At the same time, the right pushing portion contacts the second row 5 at a front middle point between the auxiliary slat 13 and the lower slat 12b to create a staggered portion deviated with a distance H2 between the second row 5 and the first row 3 by bending the second row 5 in an angle...
so as to form a chevron shape. The deviations H1, H2 created by the pushing bars 40, 41 between the hanks are made sufficiently large enough for the filigree portion 22 of the circular hook 20 to pass therethrough, while the distance between the pair of pushing bars 40, 41 is made slightly larger than the outer diameter of the filigree portion 22 of the circular hook 20 so as to permit the passage of the circular hook 22.

The label case 50, as best shown in FIGS. 7a to 7d accommodates a plurality of labels 51 therein for delivery one after another in order from a slit 52 disposed in the bottom of the front thereof. Each label 51 has a round hole 53 at one end large enough to accept the filigree portion 22 of the circular hook. When the label case 50 is brought near to the front of the reel cage 10 together with the circular hook, the round hole 53 of a label delivered out of the slit 52 of the label case is located in position to permit the filigree portion of the hook to pass therethrough.

Each delivery of a label from the label case 50 is, as shown in FIGS. 7a-7d, carried out by a lug member 54 slidably disposed in the bottom of the label case 50. The lug member 54 has a thin portion 54a on one end thereof and a thick portion 54b at the root, the former being thinner than the latter with the difference in thickness therebetween being the same as the thickness of a sheet of label, and at every reciprocating sliding motion of the lug member 54 a label 51 rested on the thin portion 54a is delivered from the slit 52.

The operation of the rotating means 30 for the circular hook 20 and the label delivering means 60 is, as shown in FIGS. 7a-7d, carried out by the driving means 31.

FIG. 12 shows, in schematic form, a fluid piston-cylinder arrangement 100 for linearly reciprocating the driving means 31. Other arrangements including cams, levers and the like could also be used for reciprocating the driving means 31. The rotating means 30 includes a pinion 32 mounted on the spindle 21 of the circular hook and a pair of racks 33a, 33b which are positioned on the opposite side at the upper and lower portions of the driving means 31 and mesh with the pinion 32 on the right and left side thereof respectively. When the driving member 31 moves linearly upward from the lower position to the upper position, the rack 33a on the right side first meshes with the pinion 32 to rotate the spindle in the counterclockwise direction, and secondly the rack 33b on the left side meshes with the pinion 32 to rotate the spindle in the clockwise direction. When the driving means 31 moves linearly downward from the upper position to the lower position, the rack 33b on the left side initially meshes with the pinion 32 to rotate the spindle in the counterclockwise direction and then the rack 33a on the right side meshes with the pinion 32 to rotate the rotating spindle in the clockwise direction.

Further, the delivering means 60 includes a case lever 61 for supporting the label case and a pushing lever 62 for supporting the lug member 54. First and second cans 63, 64 are mounted on the driving means 31 for contacting rollers 61a and 62a of the levers 61 and 62 respectively. The other ends of the two levers 61, 62 are pivoted by a common pivot pin 65 mounted rigidly in position on body 70. Return springs 66 and 67 are connected to the lower ends of levers 61, 62, respectively. The label case 50 is in a position apart from the circular hook 20 when the roller 61a of the case lever 61 engages on the land portion 63a of the first cam 63 and is in a position near to the circular hook when the roller 61a of the case lever 61 engages on the recess portion 63b of the first cam 63. Also, the lug member 54 is located at the inner rear of the label case 50 so as not to push out the label when the roller 62a of the pushing lever 62 engages on the land portion 64a of the second cam 64, but slides outwardly of the label case 50 to push out the label 51 from the slit 52 when the roller 62a of the pushing lever 62 engages on the recess portion 64a of the second cam 64.

The body 70 of the lacing device shown in FIG. 2 is intermittently movable into and out of operative engagement with the reel cage by driving mechanisms of known construction. For example, a positioning apparatus such as shown in the U.S. Pat. No. 2,838,967, to Meyer, could be used to move the body 70 in two mutually perpendicular directions; one direction being axially parallel to the axis of reel cage 10 and the other direction being perpendicular to the axis of reel cage 10. A further preferred arrangement for moving body 70 is schematically shown in FIG. 9, wherein pivotal movement of body 70 is effected by a driving mechanism including a fluid cylinder 101 having fluid inputs 102 and 102'.

Body 70 is mounted on the upper end of a frame 103 which is pivotally mounted at 104 to a fixed platform adjacent the reel. Frame 103 is also pivotally mounted to the upper end of a shaft 106 operated by the air cylinder 101 whereby actuation of the air cylinder 101 operatively pivotally shifts the position of body 70. This body 70 accommodates the rotating means 30 therewithin and the delivering means 60, the circular hook 20, and pushing bars 40 on the outside thereof. The body 70 also carries the label case 50 by means of the lever extending therebetween adjacent the reel cage 10. In this arrangement the circular hook 20 and the pushing bars 40, 41 are located in the front of the reel cage 10 while the label case 50 is at one side of the body 70. Body 70 is movable into a first definite position for actuating the rotating means 30 and the delivering means 60 for lacing the rows of yarn 3, 5 on the reel cage 10, and thereafter is movable into a second position spaced from the reel cage 10. Namely, the driving mechanism, as abovementioned, moves the body 70 to the reel cage 10 for the lacing operation and then retracts the body after completion of the lacing operation.

In addition to the elements described above, a plurality of brushes 71, 72 are disposed on the path of rotation of the circular hook for opening and closing the cover plate 25 mounted on the fishhook 24 of the circular hook, as best shown in FIG. 10. After the yarn is wound on the rows 3, 5 of yarn in the form of a Figure 8, a pair of scissors 73 commences to cut off the tail end 6 of the yarn 1 in a known manner and a knotter commences to form a knot 7 between the tail end 6 of the yarn removed from the retainer 14 on the upper slot 13a of the reel cage 10. FIGS. 11a to 11d schematically show the cutting and knotting operations. FIG. 11a schematically shows the yarn and reel immediately following the lacing operation. FIG. 11b schematically shows the cutting operation by scissors 73, immediately following the lacing operation. FIG. 11c schematically shows the yarn end tightening operation by means of aspirator 110 operatively hooked to suction device.
11. FIG. 11d shows the final knotting step by knotter 120. The lacing device of the present invention is operable to lace the two rows 3 and 5 of the hank into a single package with a single length of yarn by winding the yarn end of the hank around the two rows of hank 3, 5 in such a manner as to form a "Figure 8." During this operation, a label 51 can be simultaneously attached to the hank at the position adjacent to the knot 7, indicating the quality and the like to the yarn of the lease 8.

Following is a description of the lacing and labelling operations, referring particularly to FIGS. 6a-6g and 7a-7d:

a. First, as shown in FIG. 2a and FIG. 6a, the body 70 of the lacing device is located in the remote position from the reel cage 10 just before the lacing operation. The reel cage 10 is held in a position in which the auxiliary slat 13 is located in the middle of the front, and the two rows 3, 5 are wound, respectively, on the left and right sides of the cage slats 12 of the reel cage 10. The initial end 2 of the yarn 1 is retained by retainer 14 of the upper cage slat 12a at the left side of the first row 3 while the tail end 6 of the yarn 1 is positioned on the right end of the cage slat 12b near to the first row 3 and belo the initial end 2.

b. Next, as shown in FIG. 2b, FIG. 3 and FIG. 6b, the body 70 of the lacing device is moved by the driving mechanism to a predetermined position close to the front of the reel cage 10 in the direction of the arrow shown in FIG. 2a. In this position, a pair of pushing portions 40a, 41a of the pushing bars 40, 41 on the left and right sides contact the first row of hank 3 with the tail end 2 of the yarn and the second row of hank 5 respectively, at the upper and the lower sides of the auxiliary slat 13 and thereby create two staggered portions. One staggered portion has a deviation distance H1 between the first and second rows of hank formed by the bending of the first row 3 with the tail end of the yarn 2 in an angle at the middle point between the auxiliary slat 13 and the upper slat 12a. The other staggered portion has deviation distance H2 between the second and first rows of hank formed by bending the second row 5 in an angle at the middle point between the auxiliary slat 13 and the lower slat 12b.

The spindle 21 of the circular hook 20 is located near to the auxiliary slat 13 and the fishhook 24 extends from the spindle 21 towards the auxiliary slat 13 with a deviation distance h (see FIGS. 5a and 5b) arranged to be located in the middle point of the staggered portions of the H1 said first and second rows of hank. At this time the coverplate 25 of the fishhook is in the opened position.

Further, in this position, as shown in FIG. 7a, the rollers 61a, 62a of the case lever 61 and the pushing lever 62 are contacted respectively to the land portions 63a, 64a of the first and second cams 63, 64 connected to the driving means 31. The label case 50 is located in a position at the right side of and apart from the circular hook, while the lug member 54 is in a position to push the front end of a sheet of the lowest label resting on the thin portion thereof out of the slit 52 of the label case.

c. Then, as shown in FIG. 7b, the driving means 31 is moved upward from the lower position to operate the rotating means 30 for the circular hook 20 and the label delivering means 60. This movement of 31 operates the delivering means 60, as shown in FIG. 6c and FIG. 7b. The rollers 61a, 62a of the case lever 61 and the pushing lever 62 contacts respectively on the re- cess portion 63b, 64b of both the first and second cams of the driving means 31, respectively. The label case 50 is located in a position close to the circular hook 20, while the lug member 54 pushes the label 51 resting on the thin portion thereof out of the slit 52 of the label case to locate the round hole 53 thereof on the path of rotation of the circular hook 20.

When the rotating means 30 is operated, the fishhook 24 of the circular hook is rotated in the counterclockwise direction together with the meshing of the pinion 32 with the rack 33a in the upper right side thereof. Fishhook 24 passes initially on the inside of the first row of hank 3 with the initial end 2 and tail end 6 of the yarn under the auxiliary slat 13, secondly on the outside of the second row of hank 5, thirdly through the round hole 53 on the label 51, fourthly on the inside of the second row 5 above the auxiliary slat 13, fifthly on the outside of the first row 3 with the tail end 6 of the yarn. At that point, the hook 20 catches the initial end 2 of the yarn 1 with the point 24a of the fishhook, as shown in FIG. 6d. Of course, it is necessary to regulate in advance the relation of the two positions of the initial end 2 of the yarn 1 and the rotating point 24a of the fishhook to assure catching of the yarn.

Thus, the initial end of the yarn 1 is caught on the fishhook 24 of the circular hook 20, as shown in FIG. 6d. Then the driving means 31 is further moved upward from the middle position to the upper position, as shown in FIG. 7c, and the pinion 32 meshes with the rack 33b in the left lower side thereof to rotate the spindle in the clockwise direction. The delivering means 60 is thereby operated in succession, the roller 62a of the pushing lever 62 contacting the land portion 64a of the second cam 64 of the driving means 31, and the lug member 54 being retracted into the label case 50 to position label 51 in the slit 52 of the label case in a position where it will be pulled out by cooperation with the circular hook without interruption, the roller 61a of the case lever 61 contacts, as shown in FIG. 7d, the land portion 63a of the first cam 63 of the driving means 31 causing the label case 50 to be located in a position apart from the circular hook 20, while the point of the next label 51 resting on the thin portion 54a of the lug member 54 is pushed out of the slit, thereby completing one cycle of the delivery means 60.

While the rotating means 30 is operated, the fishhook 24 of the circular hook, as shown in FIG. 6e, is rotated in the rightward direction through the spindle 21 connected therewith. Subsequently, the point 24a of the fishhook 24 is closed by the cover as the latter is pivoted in engagement with the brush 71 disposed so as to operate the coverplate 25, whereby the initial end 2 of the yarn 1 caught by the fishhook can be prevented from accidentally disengaging out of the fishhook in succession. See FIGS. 10a to 10c for a schematic illustration of the operation of the brush in opening the coverplate 25.

FIG. 10a shows an enlarged view of fishhook end 24 with pivotal coverplate 25 thereon. FIG. 10b schematically shows the opening of coverplate 25 by the fixed brush 72 engaging the coverplate when the needle moves in the direction of the arrow.
the direction opposite that shown in FIG. 10b. As the fishhook is further rotated, the point 24a of the fishhook passes outside the first row of hank 3 with the tail end 6 of the yarn above the auxiliary slat 13; inside the second row of hank 5; through the round hole 53 in the label 51; outside the second row of hank 5 under the auxiliary slat 13; inside the first hank 3 with the initial end 2 and tail end of the yarn; and lastly to its initial position. Then the point 24a of the fishhook is opened by the brush 72. At this time, the initial end 2 of the yarn 1, as shown in FIG. 6f, which is caught on the fishhook 24 of the circular hook 20 and is released from the retainer 14 of the upper slat 12b by pulling thereof, is passed in succession from the outside of the first row of hank 3 to the inside of the second row of hank 5; from the outside of the second row of hank 5 to the inside of the first row of hank 3; and lastly to the outside of the first row of hank 3; whereby the yarn is wound around both the first and second rows of hank in the form of a "Figure 8." During this operation, when the initial end 2 of the yarn 1 circulates from the inside to the outside of the second row of hank 5, the label 51 is attached to the yarn 8 by passing the initial end 2 of the yarn 1 through the round hole in the label.

After finishing the lacing 8 by winding the initial end 2 of the yarn 1 around the two rows of hanks 3, 5 in the form of a "Figure 8" as mentioned above, the tail end of the yarn 1 is cut by the scissors 73 and then the knotter commences to bind both the tail end of the yarn cut and the initial end 2 released from said fishhook 24, thereby the lacing operation is completed. See FIGS. 11a to 11d for a schematic showing of the cutting and knotting operations. Upon completion of the lacing operation, the body 70 of the device is retracted in the direction of the arrow shown in FIG. 6g by the driving mechanisms shown in FIG. 9 to the initial position apart from the reel cage 10. The two rows of hank are removed from the reel cage, and then the two rows of hank, as shown in FIG. 1, laced together with the same yarn and attached with the label 51 are thus obtained.

Consequently, by continuously repeating the above described 5 cycles a, b, c, d and e in order, the operation of lacing the hank and attaching the label to the hank are performed automatically.

Many modifications and changes may be considered without departing from the scope of the invention described above. Therefore, it is to be understood that such modifications and changes be included in the scope of the present invention and that the present invention is not to be limited to the preferred embodiment as hereinbefore fully set forth.

We claim:

1. A device for lacing hank comprising a reel cage for winding yarn hanks in two rows thereon, staggering means for making two paths sectioned separately between said two hanks by staggering one hank with respect to the other hank at two points of the hanks, a circular hook which rotates to pass thread for lacing through said two paths sectioned by the hanks so as to go around in sequence one side of one hank, the other side of the other hank, one side of the other hank and the other side of the one hank in the form of substantially a Figure 8, driving means for reciprocatingly rotating said circular hook, and means for delivering a label for the attachment thereof to said yarn hanks said label having a hole therethrough for the passing of said circular hook, wherein said circular hook, said driving means, and said delivery means are movable to and from operating positions adjacent the reel cage, wherein the lacing of the hanks occurs upon stoppage of the reel cage when the two rows of hanks are completed, wherein said circular hook comprises a central spindle rotatable by said driving means, a filigree portion of substantially a circular arc having a large central angle, a connecting portion for joining said filigree portion with said spindle; and a fishhook member provided on the point of said filigree portion for catching said thread, and wherein said fishhook member has an opening portion at a point formed in the fishhook of U-shape and a coverplate, and wherein a plurality of brushes are disposed in the path of rotation of said fishhook member for selectively either closing said opening portion to catch said thread or opening said opening portion to release said thread.

2. A device for lacing hank according to claim 1, wherein said driving means includes means for locating the hole of said label on the path of rotation of said circular hook.

3. A device for lacing hank according to claim 1, wherein said circular hook includes a central spindle, said driving means comprises a pinion mounted on said spindle of the circular hook and a rack reciprocating linearly, and said driving means sequentially actuates said delivering means.

4. A device for lacing hank according to claim 1, wherein said means for delivering a label includes a label case for housing a plurality of labels, and wherein said means for delivering a label is sequentially actuated by said driving means to deliver the labels one after another from a slit in said label case.

5. A device for lacing hank according to claim 1, wherein the means for delivering a label includes locating means for locating the hole of said label on the path of rotation of said circular hook, said driving means comprising a pinion mounted on said spindle of said circular hook, and a rack reciprocating linearly, and wherein said driving means sequentially actuates said locating means.

6. A device for lacing hank according to claim 1, wherein means are provided for locating both the tail end and the initial end of the yarn on one side of the reel cage adjacent one of the hanks, and wherein said lacing thread is formed with one of said two ends of the yarn.

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