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3,126,607

DEVICE FOR OPENING YARN HANKS

Filed April 27, 1962

2 Sheets-Sheet 1

Fig. 1

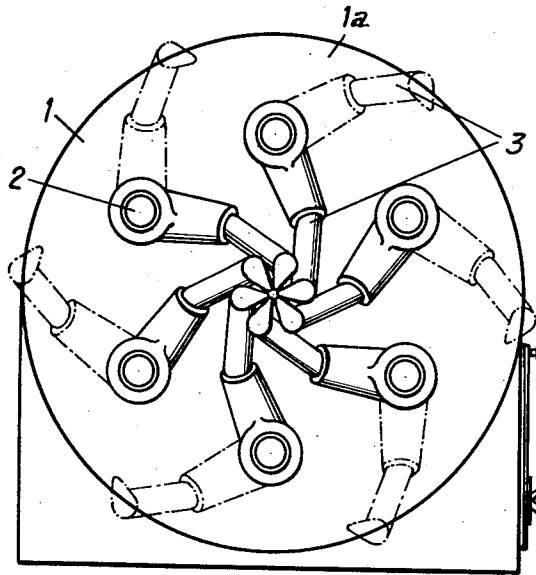
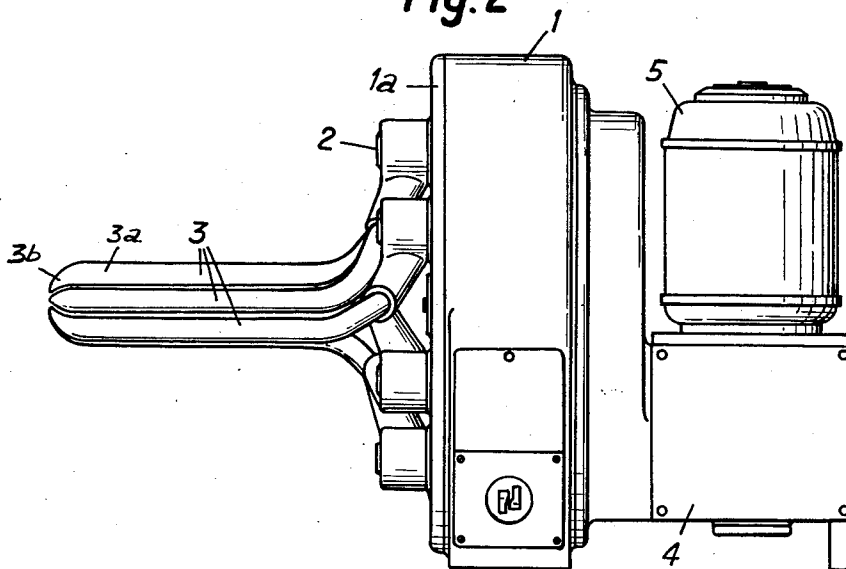


Fig. 2



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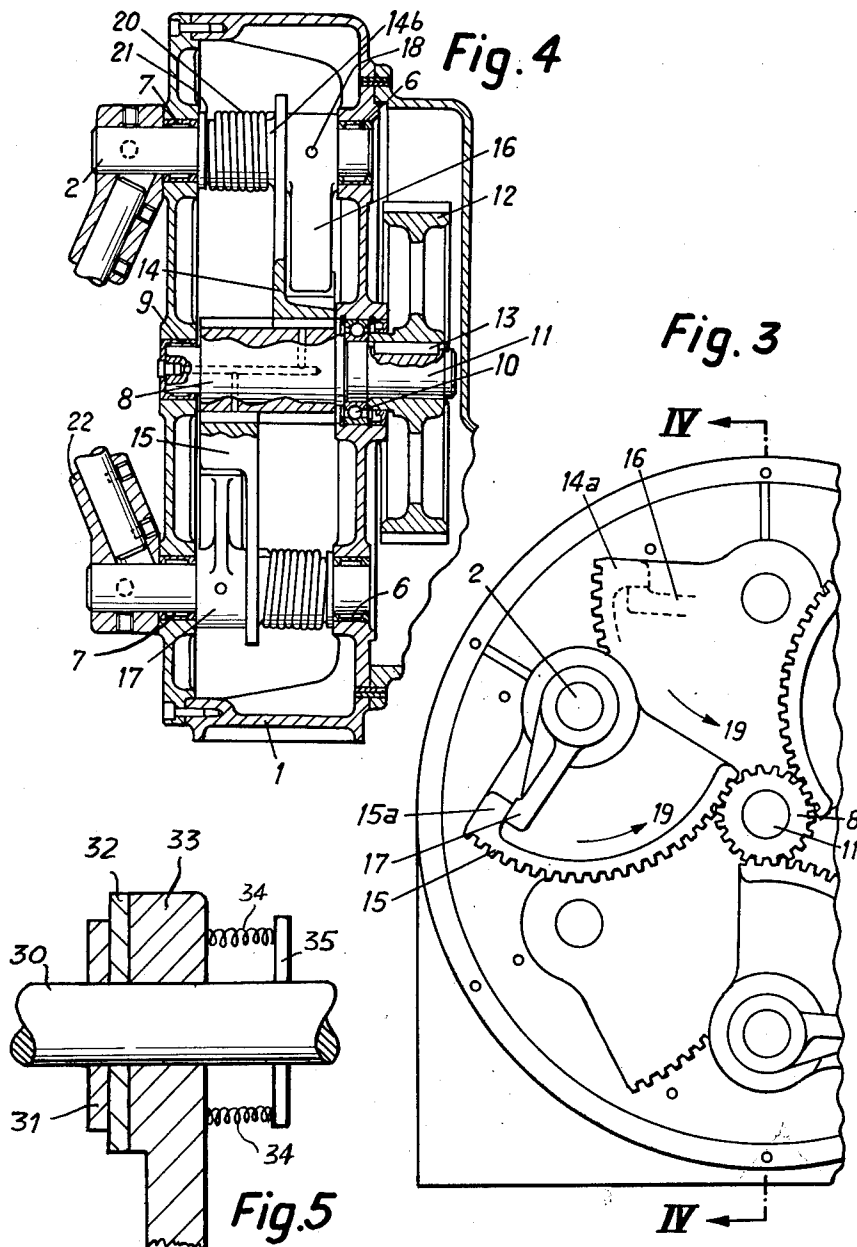
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DEVICE FOR OPENING YARN HANKS

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11 Claims. (Cl. 28—58)

The present invention relates to a new and improved device for the opening of yarn hanks.

The opening of yarn hanks is necessary, for example, when the hanks have to be placed upon a reel after dyeing. For such purpose it is known to the art to place the individual yarn hanks on a plurality of arms which are movable in relation to one another so as to open the hank in order to enable an empty yarn reel to be pushed into the opened hank. However, in known devices it is relatively difficult or complicated to push the yarn hanks onto the arms, since in order to prevent accidents, the arms must not be entirely closed on to one another i.e. to the minimum possible diameter. This is especially true when the arms are motor driven.

Thus, an important object of the present invention is to provide a simple, reliable and easily operated device for the opening of yarn hanks which can be operated without danger of accident.

Another important object of the present invention is the provision of an improved device of the type described adapted for opening a yarn bundle for application onto a carrying member in a reliable and safe manner.

Yet another important object of the present invention is to provide new and improved means for opening yarn hanks of the type provided with a plurality of movable arms, and including means operative with said movable arms to prevent movement thereof into their closed position when an obstruction is located between said arms.

Still a further object of the present invention is the provision of an improved hank opening mechanism which is extremely reliable in operation, easy to operate and manufacture, and functions in a safe manner.

According to the present invention there is provided a hank-opening device which comprises a number of supports which are movable from a closed position in which they conjointly form a guide to receive a yarn hank to an open position in which the supports expand the hank to receive a reel, and the supports are movable individually between the opened and closed position by drive means which include yieldable elements disposed to yield in the closing direction to obstruction to complete movement of the supports to their closed position.

More precisely, the present invention relates to a hank-opening device which comprises a number of approximately parallel arms movable between a closed end position and an open end position, and a drive device for moving the arms in the opening and closing directions. Additionally, each arm is pivotably mounted, with preferably the pivoting axes of all the arms lying on a common circle or pitch, and with the free ends of the arms shaped to form conjointly a hank-receiving guide terminating in a point, and the arms are coupled individually with a drive means through a yieldable element disposed to yield in the closing direction of each arm. Due to the position of the yieldable elements it is possible, despite the ability to bring the arms completely together normally in the closed end position, to prevent the danger of an accident by clamping between the closing arms. Due to the normal complete closure of the arms, yarn hanks can easily be pushed on to the arms without auxiliary means. The yielding function of the drive to close the arms can be constituted by springs or by pre-loaded stripping clutches for example.

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Still further objects and the entire scope of applicability of the present invention will become apparent from the detailed description given hereinafter; it should be understood, however, that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

In the drawings:

FIGURE 1 is a front elevation of the device of the present invention;

FIGURE 2 is a side elevation of the device shown in FIGURE 1;

FIGURE 3 is a front elevation of a portion of the drive housing with its cover removed;

FIGURE 4 is a cross-sectional view taken along the line IV—IV of FIGURE 3 and additionally illustrating portions of the arms and associated sockets;

FIGURE 5 is a fragmentary view, partly in cross-section, schematically depicting a modified form of driving coupling arrangement.

Referring now to FIGURE 1, reference numeral 1 indicates a drive housing having a plurality of drive spindles 2 extending from the front face 1a of the housing 1. On each drive spindle 2 there is mounted a support or arm 3, with the forward extending portions 3a of all the arms shaped so that in the closed position as shown in FIGURE 2 the forward portions 3a extend parallel with one another so as to constitute a closed, nearly cylindrical guide or retainer for a yarn hank which is to be opened. The hank is applied by being pushed onto the arms 3, for which purpose the free ends 3b of the arms 3 are tapered as is clearly shown in FIGURE 2.

The drive spindles 2 are driven by a suitable drive mechanism provided in the drive housing 1. As is shown in FIGURE 2, the drive mechanism is driven by an electric motor 5 through suitable reduction gearing arranged in a reduction unit 4 secured to the drive housing 1. The reduction gearing of the reduction unit 4 can be formed for example by worm gearing in a manner known to the art. Each of the drive spindles 2 are rotatably mounted in the drive housing 1 in two needle bearings 6 and 7. The drive spindles 2 are disposed in a circle about a central drive pinion 8, one end of which is mounted in a needle bearing 9 and the other end of which is mounted in a ball bearing 10. One end of the pinion 8 is provided with an extended spindle portion 11 which projects beyond the ball bearing 10 and has secured thereto a gear or toothed wheel 12 which is keyed against rotation by a key 13 to the spindle end 11.

The drive pinion 8 meshes with toothed segments 14 and 15 which are mounted to turn on the drive spindles 2. The toothed segments 14 and 15 are oppositely directed and engage the pinion 8 in an axially offset manner, with each toothed segment 14 being arranged between two toothed segments 15 in the peripheral row of drive spindles 2. Each drive spindle 2 also carries a drive arm, with the respective drive arms for segment members 14 being indicated at 16 and for the other segment members 15 at 17. The drive arms 16 and 17 are secured against rotation on their associated drive spindles 2 by suitable pins 18 for example. The toothed segments 14 and 15 are formed with dogs 14a and 15a (FIGURE 3) which are arranged to cooperate with the drive arms 16, 17 when the toothed segments 14, 15 are driven by the drive pinion 8 in a counter-clockwise direction, i.e. in the direction of the arrows 19. On the hubs 14b and 15b of the toothed segments 14 and 15 are mounted respective torsion springs 20, one end of which is secured in bushings 21 secured by suitable pins to the drive spindles 2, while the other respective ends engage with the toothed

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segments 14 and 15 themselves. As is shown in FIGURE 4, the yarn support arms 3 are carried by their drive spindles 2 by being mounted in sockets 22 secured to the associated drive spindle.

The operation of the device may be controlled by a conventional electric switch known to the art and having forward and reverse start and stop keys, which are operable for example by the foot, for the purpose of energizing and deenergizing the drive motor 5. When the drive motor 5 is energized the gear 12 is driven through the reduction gear unit 4 and the gear 12 rotates the drive pinion 8. According to the selected direction of rotation of the drive motor 5, the drive pinion rotates either in the clockwise or in the counter-clockwise direction (FIGURE 3). When the drive pinion 8 rotates in the clockwise direction, the toothed segments 14 and 15 are driven in the direction of the arrows 19 and engage and move the drive arms 16 and 17, through their dogs 14a and 15a, so that all of the drive spindles 2 are turned to the same extent in the counter-clockwise direction so as to expand the yarn support formed conjointly by the arms 3. As a result, the arms 3 move from the positions shown in solid lines in FIGURE 1 to the positions shown by phantom lines. These two positions correspond respectively to the closed and opened position of the arms 3. Thus, a yarn hank which has been pushed over the support arms 3 when they were in their closed position is opened or stretched during movement of the arms 3 from the closed to the opened position. The opened yarn position enables a suitable yarn reel, such as a spoked reel for example, to be introduced between the arms 3, and if then the drive motor 5 is reversed the arms 3 are swung through the intermediary of the toothed wheel 12, the drive pinion 8, the toothed segments 14 and 15, the torsion springs 20 and the drive spindles 2 in the clockwise direction towards their closed position. When the diameter of the circle or cylinder defined by the arms 3 is smaller than the diameter of a yarn reel, the yarn hank comes to rest on the arms of the reel, so that the hank can be withdrawn from the arms 3 by extraction of the reel in the axial direction in relation to the arms 3, the hank remaining on the reel. The end positions of the arms 3 can be determined by suitable stop switches (not shown) which can be actuated for example by one of the toothed segments 14, 15. The opened end position of the arms 3 can thus be adjusted in order to limit the maximum opening of the yarn hank.

As a result of the transmission of the drive force of the drive motor 5 through the torsion springs 20 in the closing direction of the arms 3 there is achieved an advantageous result that should these arms 3 clamp against the yarn reel, or should the hand of the operator be located between two arms, those arms remain open since further rotation of the toothed segments for those arms in the closing direction is taken up by the torsion spring or springs 20. The characteristics of the torsion springs 20 are selected such that crushing or damage is avoided even on maximum rotation.

Instead of transmitting the force for opening and closing the arms 3 in one direction through drive arm members 16, 17 and dogs 14a, 15a and in the other direction through the torsion springs 20, it is also conceivable to employ a coupling arrangement which permits of transmission of a greater force to the arms 3 in one direction than in the other. Thus, the coupling can consist for example, of a positive dog-coupling or jaw clutch effective in one direction and a slipping clutch coupling effective only in the opposite direction, whereby the transmittable torque of the slipping coupling is adjustable. In FIGURE 5 there is depicted a variant form of the invention employing a slip type clutch or coupling arrangement. For clarity in illustration, there is only shown one of the drive spindles 30 provided with the lateral shoulder portions 31 against which bears a suitable friction disk 32. A drive arm 33 is arranged on the opposite side of the

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friction disk 32 and is urged thereagainst by suitable springs 34 or the like, the force applying effect of which may be adjusted, and bearing against a collar or sleeve member 35. Thus, for example, when a driving force is transmitted to the driving arm 33 by a suitable tooth segment for example, and in a manner as previously described, the spindle 30 may be rotated into a yarn opening position. By suitably adjusting the loading of the springs 34, it can be achieved that during closing movement of the yarn, the drive arm 33 will slip on the friction disk 32 if an obstruction appears between the support arms for the yarn. Of course, other coupling arrangements are possible which will achieve the desired result. Thus, the shoulder 31 and drive arm 33 may be provided with meshing teeth to provide a jaw clutch-type arrangement, in a manner familiar to persons skilled in the art.

While the foregoing description and specific embodiments have been given by way of illustration and not limitation, it is to be understood and appreciated that various changes and modifications are possible, as will readily suggest themselves to those versed in the art.

Having thus described the invention what is desired to be secured by United States Letters Patent is:

1. A hank-opening device comprising a number of support members adapted to be moved from a closed position in which they conjointly form a guide to receive a yarn hank into an open position in which said support members expand the hank into position for receiving a carrying reel, drive means operatively connected with said support members for moving the latter individually between their opened and closed positions, said drive means including coupling means for each support member including yielding means disposed to yield in the closing direction to obstruction to closure of said support members.

2. A hank opening device comprising a plurality of substantially parallel hank-supporting arms movable between a closed end position to receive a hank and an open end position to expand the hank to receive a reel, drive means for moving said arms, means for pivotably mounting said arms with the pivotal axes for said arms lying on a common circle, said arms being provided with free ends providing conjointly in the closed position a guide to receive a hank and in the open position to expand the hank, and drive means including coupling means operably connected with said individual arms, said coupling means including an element disposed to yield in the closing direction for each arm in the event of obstruction to such movement.

3. A hank opening device according to claim 2; wherein said yieldable element of said coupling means comprises torsion spring means disposed for operation in the closing direction of said arms.

4. A hank opening device according to claim 2; wherein said coupling means for said arms each comprises a driving member and a driven member operative with an associated arm, said driving and driven members being arranged so that the driving member moves into engagement with the driven member during opening movement of said arms.

5. A hank opening device according to claim 4; including a separate pivotably mounted component for each arm and provided with gear teeth, said driving member being a dog supported on an associated pivotal component, said driven member being a lever arm cooperating with its associated hank-supporting arm and driven by said dog, a common gear member for driving said pivotably mounted components for each arm and arranged at approximately the center of said common circle.

6. A hank opening device comprising a housing, a plurality of spindles mounted to turn in the housing and arranged with their axes of rotation on a common circle, a support arm cooperating with each spindle and operable to approach one another when said spindles are moved in one direction into position to receive a hank and to separate when said spindles are moved in another

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direction so as to open the hank into position to receive a carrier, common drive means operable to move said spindles, and a coupling device for each spindle to transmit drive from the drive means to the spindle individually, said coupling means each including a yieldable component disposed to yield in the closing direction of said spindles to obstruction to closing movement of the related support arm.

7. A device of the type described comprising a plurality of yarn support arms pivotably mounted for opening movement into one position to open said yarn and into another position for receiving said yarn with said support arms substantially parallel to one another, drive means operatively connected with said support arms for moving such into said one and another position, said drive means including means operative in said closing position of said support arms responsive to obstruction to closure of said support arms for preventing further closing thereof.

8. A device according to claim 7; said operative means being a slip coupling arrangement.

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9. A device according to claim 7; said operative means being resilient means.

10. A device according to claim 7; said drive means including a central driving gear and individual driven gear means, said drive means further including means for transmitting driving force from said driving gear to said support arms via said driven gear means.

11. A device according to claim 10; said transmitting means including a separate arm member for each support arm and operatively connected therewith and a separate dog member for each driven gear means for engaging and driving an associated arm member.

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