

April 16, 1963

W. REINERS

3,085,713

YARN COIL CONVEYING AND SORTING APPARATUS

Filed July 7, 1959

3 Sheets-Sheet 1

FIG. 1

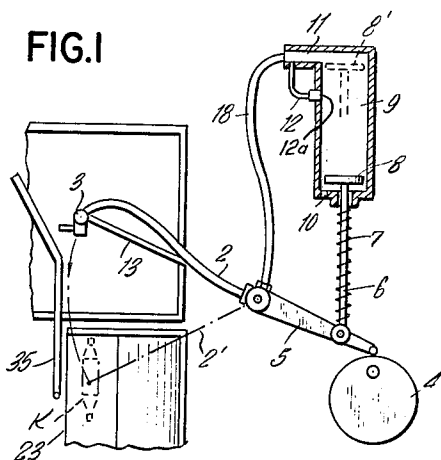


FIG. 4

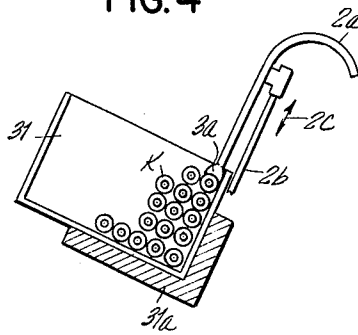


FIG. 2

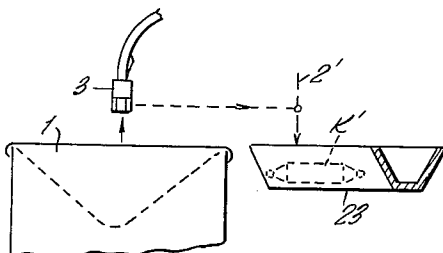


FIG. 5

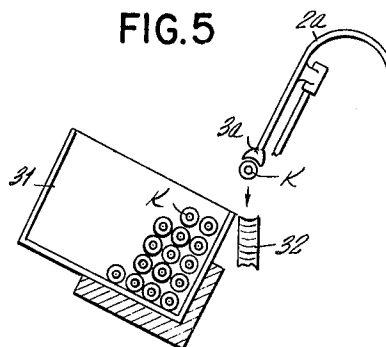
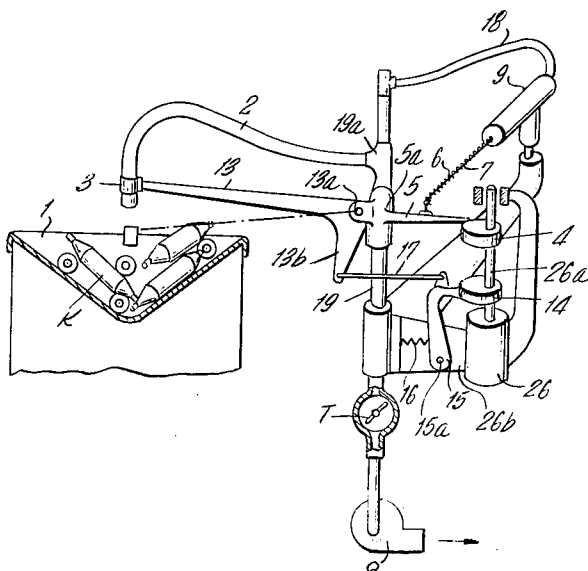


FIG. 3



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FIG. 10

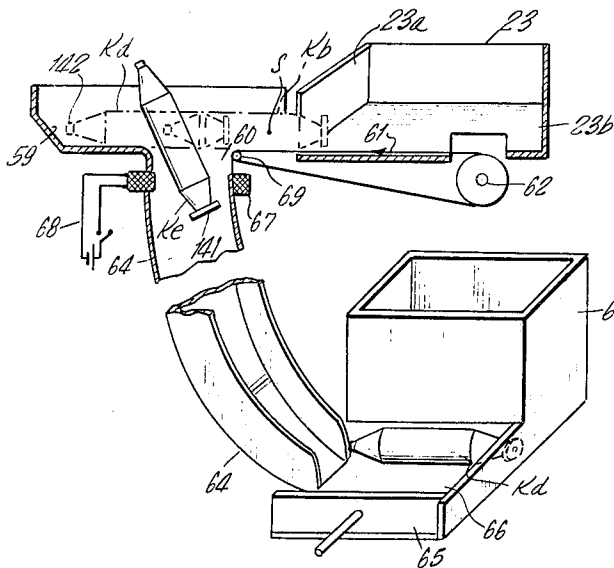
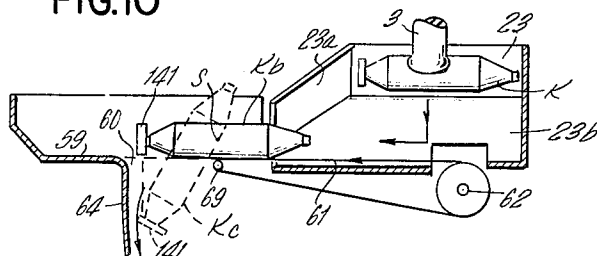


FIG. 11

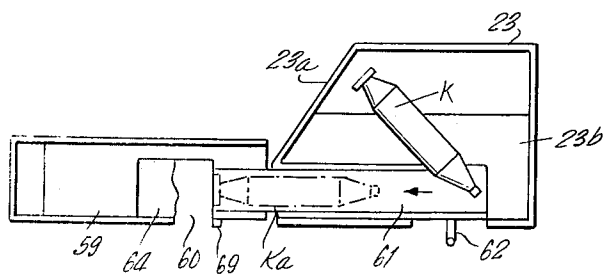


FIG. 12

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YARN COIL CONVEYING AND SORTING
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Claims priority, application Germany July 12, 1958
16 Claims. (Cl. 221—171)

My invention relates to apparatus for the orienting, stacking, conveying and sorting of yarn coils, particularly cops, for textile fabricating purposes.

After the spinning, doubling, twisting, or rewinding operation, the textile threads produced are wound into coiled yarn packages of the shape desired for the further fabrication. Such yarn coils, particularly if in the shape of cops, are collected in containers for the purpose of transporting them into subsequent fabricating machinery, the coils being usually placed one beside the other in the transporting container but with irregular disoriented positions. The further use of the coil in textile manufacture, however, requires having all coils oriented in a given direction.

It is therefore an object of my invention to provide a device which automatically performs the orienting, stacking, conveying or sorting of yarn coils in a relatively simple and reliable manner.

It is a further object of my invention to provide a device for packaging, conveying or sorting of textile coils, particularly cops, wherein the coils are automatically fed from a collecting container into a transporting container and oriented in a uniform direction for further processing.

To achieve these ends and according to the invention, I provide the coil assembling and orienting apparatus with a gripper arm which, when in operation, reaches into a container that accommodates a number of yarn coils, then takes an individual coil out of the container and, if that coil is not oriented in the desired direction, supplies it to a directing device which orients the coil and issues it, in the proper position, to another container or supplies it to the place of subsequent fabrication. The storage container from which the gripper arm seizes an individual coil is preferably given the shape of a funnel, and the gripper arm enters into the container at the location of the lowermost bottom point so that the gripper arm, during its travel within the storage container, will always find a coil at the lowermost container point as long as any coil is still located in the storage container.

The gripper arm may be operated mechanically, pneumatically, or magnetically, for seizing the yarn coils. A mechanical gripper according to the invention is preferably provided with a mechanically controlled closure which closes automatically in response to the gripper terminal member contacting a coil under control by the force which results from the gripper member abutting against the coil.

As mentioned, the gripper, after entraining a coil from the storage container, can raise the coil to a device which serves to orient the seized coil in a given direction unless the coil happens to be already properly directed. Suitable for such purposes is a device onto which the coil can be placed in any direction and which then causes the coil, if necessary, to be turned so that it will place itself in the pre-determined direction before being supplied to the subsequently operating fabricating devices.

An endless conveyor belt delivers the cop to a chute whose entrance opening is controlled in size relative to the spacing between the offset gravity center of the cop and the ends of the cop, so that the coil tends to tip into a uniformly oriented position and drops through a chute leading to the transporting container.

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The foregoing and other objects, advantages and features to my invention will become more fully apparent from the following description, especially when considered with reference to the embodiments of the invention illustrated by way of example on the accompanying drawings in which:

FIG. 1 is a schematic and partly sectional top view of a gripper device and coil orienting mechanism according to one embodiment of the invention.

FIG. 2 is a partial lateral view of the device shown in FIG. 1.

FIG. 3 is a schematically perspective view, partly in section, of the same gripper device in another position, and including the control mechanisms for its operation.

FIGS. 4 and 5 show schematically and in two different operating positions respectively, a modified gripper device for cooperation with a storage container with pre-oriented coils.

FIG. 6 is a longitudinal sectional view of a pneumatic suction member as used in devices according to FIGS. 1 to 5 and taken along line VI—VI of FIG. 6b.

FIG. 6a shows another operative position of the member according to FIG. 6.

FIG. 6b is a cross-sectional view taken along line VI-B—VI-B of FIG. 6.

FIGS. 7 and 8 show a side view and a sectional view of a funnel-shaped section nozzle applicable in a gripper member otherwise corresponding to FIG. 6.

FIG. 9 is a longitudinal sectional view of a gripper member operating with electromagnetic means.

FIGS. 10 and 11 show a coil-orienting device in two different operating positions respectively, this device being suitable as a component of apparatus according to FIG. 3 or any of the other preceding embodiments.

FIG. 12 is a top view of the device shown in FIGS. 10 and 11; and

FIG. 13 is a partial end view of the same device, viewed from the left of FIG. 12.

According to FIGS. 1 to 3, the apparatus is provided with a funnel-shaped storage container 1 for cops K which may occupy any position within the container. Mounted besides the container 1 is a gripper device with a flexible gripper arm 2 whose forward end is provided with a suction nozzle 3. The gripper arm 2 is controlled through a rod 13 by an eccentric 4 which cooperates with the cam follower arm 5 driven through shaft 26a from an electric motor 26. Linked to the arm 5 is a piston rod 6 which carries a return spring 6 and which is connected with a piston 8 reciprocating in a cylinder 9. The cylinder 9 has outlet ports 10, and inlet duct 11, and a by-pass 12. The suction nozzle 3 is held and guided by a bell-crank lever 13 which is pivoted at 13a (FIG. 3) to the hub member 5a of the arm 5, the hub member being rotatably seated on a hollow tubular shaft 19 which also serves as a suction conduit and whose interior is joined at 19a for communication with the flexible suction arm 2.

In addition to eccentric 4, the rod 13 is also controlled by another eccentric 14 on the shaft 26a of motor 26. Eccentric 14 cooperates with a follower lever 15 which is pivoted at 15a to a stationary supporting structure 26b on which the motor 26 is mounted. The follower arm 15 is biased by a spring 16 forcing the follower arm against the periphery of eccentric 14. The follower motion of arm 15 is transmitted to the lower arm 13b of bell-crank 13 by means of a linking rod 17 interconnecting elements 15 and 13b.

The flexible suction arm 2 is connected through the tubular shaft 19 with a source Q of negative pressure. The duct formed by tubular shaft 19 is also connected through a conduit 18 with the cylinder 9 through the

cylinder inlet duct 11 (FIG. 1). If desired, a throttle T (FIG. 3) can be mounted in the conduit 19 or elsewhere between the suction source Q and the entrance to conduit 2 for the purpose of limiting the amount of the suction current.

When the motor 26 is in operation, the two eccentrics 4 and 14 are slowly rotated through a reduction gear (not shown). Due to the action of eccentric 4, the gripper arm 2 is first turned until it is located directly above the lowermost point of the conical or inverted pyramid-shaped container 1. Thereafter the eccentric 14 operates to lower the rod 13 by acting through arm 15 and link 17. As a result, the suction nozzle 3 hits upon some of the cops K in container 1. The nozzle now encounters resistance and presses somewhat against one of the cops, thus pushing it slightly into the pile of cops until the one cop is securely seized by the suction nozzle. The suction arm 2 is then moved upwardly by the rod 13 and thereafter laterally into the position shown by a dot-and-dash line 2' in FIGS. 1 and 2. When the suction arm 2 with nozzle 3 on its end has reached the last-mentioned position, the current of suction air is discontinued due to the fact that in the meantime the piston 8 on piston rod 6, actuated by cam 4, has moved upwardly in the cylinder 9 to the top position 8' above the cylinder port 12a of the by-pass 12, so that ambient air can now enter through the port 10 and then through port 12a into the by-pass 12 and into the duct 18, thus counteracting the negative pressure in duct 2. As a result, the negative pressure in the suction nozzle 3 is reduced and the cop K is released to position K' (FIG. 2). The cop drops into a receiving trough 23 which forms part of the device for ultimately orienting the cop and preparing it for stacking in pre-determined orientation, as will be more fully described subsequently.

In cases where the cops or other yarn coils come from the preceding manufacturing stage in containers in which they are already pre-oriented, the funnel-shaped storage container described above may be substituted by the storage box as shown at 31 in FIGS. 4 and 5. In this case, the design of the gripper arm 2a and gripper mechanism, basically the same as that illustrated in FIGS. 1-3, can be simplified because the gripper arm need only reach the first stack of pre-oriented cops. For this purpose the box 31 is supported in the inclined position on a suitable support 31a (FIG. 4), and the only motion to be performed by the suction arm 2a, corresponding to pipe 2 in FIGS. 1-3, is upward and downward along an inclined guide rod 2b in the directions as is indicated by a doubleheaded arrow 2c in FIG. 4. When the suction nozzle 3a has entrained a cop K and lifted it to the position shown in FIG. 5, the suction pressure is discontinued by means as exemplified by the cylinder and piston device similar to that described above in FIG. 3, and the cop K drops onto a conveyor belt 32 for oriented travel of the cop to further fabricating operations.

The gripper after entraining a cop is then lifted and moved above the trough 23 (FIG. 1) or conveyor belt 32 (FIG. 5) where the gripper member 3 is opened. These operations may be controlled by a cam mechanism similar to the one illustrated in FIG. 3.

A gripper member designed as a suction nozzle, as described above with reference to FIGS. 1 to 3, may also be made to start its sucking action automatically only when it touches a cop K. A suction nozzle of this type, applicable in cooperation with the above-described devices, is illustrated in FIG. 6 and 6a.

In this embodiment of the invention, the active member of the gripper arm is designed to be operated pneumatically as a suction nozzle which is placed against a yarn coil so that the coil covers the suction opening of the nozzle, thus being attached to the nozzle by negative pressure as long as the suction pressure is maintained within the nozzle. The nozzle portion is formed by a ring or sleeve 51 of soft rubber or sponge rubber. Such

a suction nozzle, according to a further feature of my invention, is preferably given a widening, funnel-shaped nozzle mouth for providing a better air-tight fit. This nozzle mouth of soft sponge rubber can readily adapt itself to the shape of the yarn coil being seized. When using such a pneumatic gripper member, the drive for the necessary pivoting, raising or lowering movement of the gripper arm carrying the suction nozzle may likewise be effected by means of suction air. If desired, the flexible nozzle portion may also be given a flared-out or funnel-shaped design as shown at 52 in FIGS. 7 and 8 for better air-tight fit around the cop.

The active cross section of the suction nozzle must be adapted to the size or weight of the particular coils to be processed. This cross section is preferably between 0.5 cm.² and 5 cm.². It has been found preferable to dimension the flow cross section so that the suction nozzle is capable of carrying a yarn coil of approximately 250 gram weight with a suction pressure of at least 5000 mm. water column.

As shown in FIGS. 6, 6a and 6b, the nozzle portion 51 or 52 is mounted on a sleeve 53 which is axially displaceable on a valve tube 56 in opposition to the force of a spring 54. The valve tube 56 has lateral outlet openings 55 and is covered at the front by means of a lid 57 fixedly attached to the tube 56. In FIG. 6 the ports 55 are shown open at top and bottom with cover 57 midway between the bottom inlet and upper outlet of ports 55. When the sleeve 53 is pushed upwardly in opposition to the force of spring 54 to the position shown in FIG. 6, the lower inlets of lateral ports 55 become uncovered, as shown, and the current of suction air can pass in the direction of the arrows from the nozzle opening 58 past the rim of the lid 57 and through the ports 55 around lid 57 into the nozzle tube 56. When the sleeve 53 has reached its uppermost position (FIG. 6) it becomes latched by a hook 39 which is pivoted to the suction tube 56 at 39a and linked to a diaphragm 50 which is subject to the negative pressure obtaining within the suction nozzle 56. The hook of latch lever 39 catches into a hole 38 of sleeve 53 and retains sleeve 53 up to thus hold cop K on the nozzle as long as negative pressure obtains in the suction tube 56. The soft rubber ring 51 of funnel 52 secures a good sealing contact with the cop K and thus promotes the proper seizing and holding of the cop by suction. FIG. 6a shows the same structure with the ports 55 closed by sleeve 53 in its lowered position, spring 54 not compressed, and hook 39 unlatched, with the suction on and before a cop K is engaged by nozzle 51.

During the above-described upward and subsequent lateral motion of the gripper arm, the cop K is carried and entrained by the suction nozzle until it is located above the trough structure (23 in FIGS. 1, 2). In this position, with the gripper arm in the position 2' (FIG. 1), the ambient air is admitted through ports 10, by-pass 12 and duct 18 so that the pressure in the suction tube 56 (FIG. 6) increases, reducing the suction, with the effect of releasing the cop K and permitting the diaphragm 50 to move outwardly. The latch lever 39 now releases the sleeve 53 which is then forced downwardly into the illustrated position of FIG. 6a by means of the spring 54. Thus, after releasing the cop K into the trough structure 23, the gripper is again ready for performing another gripping and conveying operation.

After the coil is received in the trough structure 23 (FIGS. 1 to 3), it drops upon an endless belt 61 (FIGS. 10 to 13) whose driving drum is continuously driven by shaft 62 from a suitable drive motor (not shown). The trough-shaped guiding structure 23 is located adjacent to the above-mentioned endless belt 61 at the location where the yarn coils K pass from the gripper onto the belt 61. One of the outer walls 23a of the trough structure forms an acute angle relative to the traveling direction of the belt and a hopper-shaped bottom 23b is provided in the trough structure which is inclined downwardly toward the

belt. A yarn coil K placed into such a trough structure in any position is then forced and guided by the angular wall and inclined bottom of the structure to place itself onto the belt while being directed in the longitudinal belt travel direction thus always securing the proper position on the yarn coils required for the above-mentioned automatic checking and orienting operation.

The trough structure 23, as shown in FIGS. 10-11, is bordered at the forward side, relative to the traveling direction of the upper belt portion, by deflecting wall 23a which extends at an acute angle with respect to the travel direction of belt 61. The bottom or hopper wall 23b of the trough structure is inclined toward the belt 61. When a cop K, as shown in FIG. 12, passes in any random position into the trough structure, it will drop so that at least one of its ends will always pass onto the running belt 61. This end is then entrained by the belt 61, and the other end of the cop will be dragged along or roll down on the inclined plane formed by the trough bottom 23b. The cop K is now entirely located on the belt 61, in the position shown at Ka in FIG. 12, and passes toward a supporting surface 59 which extends horizontally at substantially the same height as the upper portion of belt 61 but is horizontally spaced therefrom so as to form an opening at 60. The horizontal distance between the supporting surface 59 and the belt 61, i.e. the opening 60, is slightly shorter, namely 5 to 10% less, than the larger spacing of the gravity center from one of the ends of the coil.

As shown in FIGS. 10-13, the device is preferably provided with an endless belt 61 whose most forward reversing point, where the belt passes over the tail pulley 69, is adjacent to a horizontal supporting surface 59 located at approximately the same height as the top portion of the belt 61, but horizontally spaced from the belt at a distance 60. This distance 60 is pre-determined in relation to the coils so that its length is somewhat smaller than the spacing of the gravity center S of the yarn coil from the coil end most remote from the gravity center S; but its length is larger than the spacing of that gravity center S from the nearest coil end. As a result, when the coil has its long portion (the portion from the gravity center S to the remotest end) located in front or leading when arriving on the endless belt, the coil will first run onto the horizontal supporting surface and will thereafter tip with the rear work end 141 into the space 60 between supporting surface 59 and endless belt 61, as soon as the rear end 141 has left the belt. The coil then passes over a slideway 64 in properly oriented position to a collecting container 63. However, if the leading end of the yarn coil on the endless belt 61 is the one that is closer to the gravity center S, the leading end will tip into the space between belt and supporting surface before the leading end can reach the supporting surface. The coil then also passes into the collecting container 63 with the same orientation as the coil mentioned above. Consequently, such a device reverses the direction of only those coils that are not properly oriented when they pass from the gripper onto the endless belt. As a result, all coils in the collecting container are properly oriented for further fabrication.

In FIGS. 10 and 11 the cops are shown in various operating positions. The gravity center of a cop which has reached the end of belt 61 in position Kb is denoted by S. As above mentioned, the gravity center S is not located in the geometric center of the cop but rather closer to the foot end because the foot end 141 (FIG. 10) of the coil core is heavier than the tip. When the orientation of the cop on the belt 61 is such that the distance between the gravity center S to the leading end is smaller than the longitudinal length of the opening 60, then the cop will tip counterclockwise (as viewed in FIG. 10) off the running belt 61 as soon as the gravity center S passes beyond the reversing roller 69 of the belt, without ever reaching the opposite supporting surface 59. This will always occur when the heavier foot end is the leading end.

A cop thus tipping into the opening 60 with its foot end first is shown at Kc in FIG. 10. The cop then passes into a collecting container 63 (FIG. 11) over a slideway or chute 64 with the desired uniform orientation. A pusher 5 which continuously moves horizontally forward and back, then pushes the cop, shown at Kd in FIG. 13, over a horizontal catcher plate 66 from below into stacks in a collecting container 63.

If the design of the coil is such that normally the gravity center is located in the middle, i.e. when it does not have a heavy foot end 40a, the coil can be weighted at one end by means of an iron ring 140 placed upon that one end of the coil. A magnet winding 67 (FIG. 11) connected in an electric circuit 68 may then act magnetically to attract the ring 40 in order to increase the tipping moment of that end of cop K into opening 60.

If, contrary to the operation described above, the cop K happens to be so located on the endless belt 61 that the leading end 142 is spaced from the gravity center S a greater distance than the trailing end, then when the gravity center S passes over the reversing roller 69 of belt 61, the leading end 142 will have already reached the supporting surface 59 in the position shown at Kb in FIG. 11. Consequently, the cop will continue advancing until the trailing end has passed beyond the roller 69. Thereafter, the heavier trailing end will tip clockwise (as viewed in FIG. 11) into the chute 64 as is the case with the cop shown at Ke in FIG. 11. Consequently, the cop is again oriented to exactly the same direction as in the case first described, and all cops, once collected in the container 63, lie parallel to each other with their tips pointing uniformly in the same direction.

As is further shown in FIG. 1, the coil orienting device can be improved and simplified by making the gripper member, for example the suction nozzle 3 according to FIGS. 1 to 3, rotatable about its axis. A deflector wall 35 (FIG. 1) is then fixedly mounted above the storage container 1 in such a position that it extends parallel to the trough structure 23, chute, or other conveying means into which the entrained coil is released by the gripper member 3. During the pivoting motion of the gripper arm 2 from the center of the storage container 1 to the position 2', the cop K then places itself into the proper direction by gliding along the deflecting wall 35 and turning to the desired direction if necessary.

According to another embodiment, the gripper member may also be given a magnetic type of design, as illustrated in FIG. 9. When operating the active gripper member magnetically, a feeler member is preferably provided which is actuated when the gripper member abuts against a yarn coil and which then causes an electromagnet to be energized so that the magnet attracts a magnetic part mounted on the coil, particularly on the coil core, thereby entraining the entire coil out of the storage container. The gripper arm 2 in this embodiment carries an electromagnet 75 with an excitation winding 74. The tubular core of the winding is traversed by a feeler pin 73 which is biased by a helical spring 72 to normally protrude out of the winding 74. The feeler pin 73 carries an electric contact 71 on its rear (upper) end. The magnetic mouth of the gripper may be elongated to better span the cop. When mouth 75a of the gripper hits upon the above-mentioned magnetizable ring 40 of a cop, then the resulting mechanical pressure upon the feeler pin 73 closes the electric contact 71. This energizes the magnet 74 so that the ring 40 of the cop is attracted. After the subsequent pivoting motion of the gripper arm to its discharge position, which motion is controlled in the same manner as described above with reference to FIG. 3, the electric circuit of the magnet 74 is temporarily interrupted by opening an electric switch contact 76 so that the magnet is deenergized and releases the cop K. Thereafter the gripper returns to the initial position and another operating circuit can commence.

It will be obvious to those skilled in the art, upon a

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study of this disclosure, that apparatus according to my invention are amenable to a variety of modifications and may be embodied in devices other than particularly illustrated and described herein, without departing from the essence of my invention and within the scope of the claims annexed hereto.

I claim:

1. Apparatus for orienting yarn coils, particularly axially elongated coils such as cops, comprising an upwardly open coil storage container for receiving un-oriented coils, a gripper member engageable with a coil in said container for seizing said coil, a control mechanism for controlling said gripper member and on which said gripper member is movably mounted, said control mechanism including means for sequentially moving said member downwardly into said container to seize a coil and then upwardly and laterally out of said container while entraining that coil, and means for receiving the entrained coil from said gripper member when said member is located laterally of said container and to orient said coils in a uniform direction.

2. Apparatus according to claim 1, said storage container being funnel-shaped and having an inverted apex defining its deepest extremity, said gripper member being mounted for movement and activation over said deepest extremity for entraining coils from above that location.

3. Apparatus for orienting yarn coils, particularly axially elongated coils such as cops, comprising an upwardly open coil storage container for receiving un-oriented coils, a gripper member engageable with a coil in said container for seizing said coil, a control mechanism for controlling said gripper member and on which said gripper member is movably mounted, said control mechanism including means for sequentially moving said member downwardly into said container to seize a coil and then upwardly and laterally out of said container while entraining that coil, orienting means for receiving the entrained coil from said gripper member when said member is located laterally of said container and to orient said coils in a uniform direction, said orienting means comprising substantially horizontal conveyor means having a given direction of travel, means for feeding the yarn coils upon said conveyor means with the coil axis oriented in said travel direction, a substantially horizontal supporting surface member mounted adjacent to said conveyor means at a distance from the forward travel end of the conveyor means shorter than the distance from the gravity center of the coils to the more remote coil end, whereby the coils will tip downward between said conveyor means and said surface member with a given coil end in leading position, and collecting means adjacent said orienting means for receiving oriented coils therefrom.

4. Apparatus for orienting yarn coils, particularly axially elongated coils such as cops, comprising an upwardly open coil storage container for receiving unoriented coils, a gripper member engageable with a coil in said container for seizing said coil, a control mechanism for controlling said gripper member and on which said gripper member is movably mounted, said control mechanism including means for sequentially moving said member downwardly into said container to seize a coil and then upwardly and laterally out of said container while entraining that coil, orienting means for receiving the entrained coil from said gripper member when said member is located laterally of said container and to orient said coils in a uniform direction, said orienting means comprising substantially horizontal conveyor means having a given direction of travel, deflecting means for guiding the yarn coils upon said conveyor means with the coil axis oriented in said travel direction, a substantially horizontal supporting surface member mounted adjacent to said conveyor means at a distance from the forward travel end of the conveyor means which distance has a length shorter than the distance from the gravity center of the coils to the more remote coil end, whereby the coils will tip down-

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ward between said conveyor means and said surface member with a given coil end in a leading direction, and collecting means adjacent said orienting means for receiving oriented coils therefrom.

5. Apparatus for orienting yarn coils, particularly axially elongated coils such as cops, comprising an upwardly open coil storage container for receiving un-oriented coils, a gripper member engageable with a coil in said container for seizing said coil, a control mechanism for controlling said gripper member and on which said gripper member is movably mounted, said control mechanism including means for sequentially moving said member downwardly into said container to seize a coil and then upwardly and laterally out of said container while entraining that coil, orienting means for receiving the entrained coil from said gripper member when said member is located laterally of said container and to orient said coils in a uniform direction, said orienting means comprising deflecting means for guiding the yarn coil axis into a predetermined direction, sorting means defining an opening having a length shorter in said predetermined direction than the distance from the gravity center of the coils to the more remote coil end, whereby the heavier end of the coils will become oriented first downward into said opening, a receiving container for the coils, and means defining a passageway extending from said sorting means to said receiving container, said passageway means having laterally confining walls to maintain the coils in oriented condition as they pass into said receiver.

6. Apparatus for orienting yarn coils, particularly axially elongated coils such as cops, comprising an upwardly open coil storage container for receiving un-oriented coils, a gripper member engageable with a coil in said container for seizing said coil, a control mechanism comprising mounting means for said gripper member and having a control arm provided with hub means pivotally mounted for rotation of said arm about a predetermined axis, said arm being movable for raising and lowering said gripper member in a direction toward and away from the interior of said container, said control mechanism further including means operably connected to said mounting means for sequentially moving said gripper member downwardly into said container to seize a coil and then upwardly and laterally out of said container while entraining that coil, orienting means for receiving the entrained coil from said gripper member when said member is located laterally of said container and to orient said coils in a uniform direction, and collecting means adjacent said orienting means for receiving oriented coils therefrom.

7. Apparatus for orienting yarn coils, particularly axially elongated coils such as cops, comprising an upwardly open coil storage container for receiving un-oriented coils, a gripper member engageable with a coil in said container for seizing said coil, a control mechanism comprising mounting means for said gripper member and having a control arm provided with hub means pivotally mounted for rotation of said arm about a predetermined axis, said arm being movable for raising and lowering said gripper member in a direction toward and away from the interior of said container, said control mechanism further including cam means and cam follower means operably connected to said mounting means for cyclically, continuously and sequentially moving said gripper member downwardly into said container to seize a coil and then upwardly and laterally out of said container while entraining that coil, orienting means for receiving the entrained coil from said gripper member when said member is located laterally of said container, releasing means operably connected with said gripper member and said cam means for releasing said entrained coil from said gripper member when that coil is positioned over said orienting means, and collecting means adjacent said orienting means for receiving oriented coils therefrom.

8. Apparatus for orienting yarn coils, particularly axially elongated coils such as cops, comprising an up-

wardly open coil storage container for receiving un-oriented coils, a movable gripper member mounted for horizontal and vertical movement and engageable with a coil in said container for seizing said coil, entraining means operably associated with said gripper member for actuating said gripper member to automatically entrain a coil upon contact therewith and to discharge same when said member reaches a predetermined location, a control mechanism for controlling the movement and entraining action of said gripper member including means for sequentially moving said member downwardly into said container to seize a coil and then upwardly and laterally out of said container into said predetermined location while entraining that coil and subsequently to discharge the coil at said location, orienting means for receiving the discharged coil at said location from said gripper member and to orient said coils in a uniform direction, and collecting means adjacent said orienting means for receiving oriented coils therefrom.

9. Apparatus according to claim 8, the body of each of said coils having a magnetizable part, said entraining means comprising an electromagnet mounted at the coil-engaging end of said gripper member for engaging said magnetizable part of said coils, and electric circuit means for energizing said electromagnet to attract said magnetizable part and thus to entrain a coil when said gripper member contacts same.

10. Apparatus according to claim 8, the body of each of said coils having a magnetizable part on one of its ends, said orienting means comprising deflecting means for guiding the yarn coil axis into a predetermined direction, sorting means having substantially horizontal surface means defining an opening having a length at least as long in said predetermined direction as the distance from the geometric center of the coils to the coil end having said magnetizable part, electromagnetic means adjacent said opening for attracting said magnetizable part downward through said opening before the opposite end of said coil leaves said horizontal surface means, a receiving container for the coils, and chute means extending from said opening to said receiving container for laterally confining the coils to deliver same to said receiving container with said magnetizable part of each coil oriented uniformly in the leading direction.

11. Apparatus according to claim 8, said entraining means comprising a flexible mouth portion mounted on said gripper member, a source of suction air connected to said mouth portion, valve means for automatically applying the suction through said mouth portion when said gripper member contacts a coil, said control mechanism comprising cam means operably connected to said gripper member for cyclically, continuously and sequentially moving said gripper member downwardly into said container to seize a coil and then upwardly and laterally out of said container to discharge said coil at a predetermined location, and means operably connected to said cam means for reducing the suction vacuum and thus increasing the pressure in said mouth portion to discharge the coil when said gripper member reaches said predetermined location.

12. Apparatus according to claim 11, said mouth portion of said gripper member being of flexible sponge rubber material and shaped to flare outwardly in inverted funnel shape for providing an air-tight fit upon contact with a coil.

13. Apparatus according to claim 11, the flow cross section of said gripper member and mouth portion being adapted to the particular coils to be processed and comprising an area of 0.5 cm.² minimum to 5.0 cm.² maximum, said mouth portion and said source of suction air connected thereto being capable of carrying a weight of 250 grams with a suction pressure of at least 5,000 mm. water column.

14. Apparatus for orienting yarn coils, particularly axially elongated coils such as cops, comprising an up-

wardly open coil storage container for receiving un-oriented coils, a gripper member engageable with a coil in said container for seizing said coil, a control mechanism for controlling said gripper member and on which said gripper member is movably mounted, said control mechanism including means for sequentially moving said member downwardly into said container to seize a coil and then upwardly and laterally out of said container while entraining that coil, orienting means for receiving the entrained coil from said gripper member when said member is located laterally of said container and to orient said coils in a uniform direction, said orienting means comprising substantially horizontal conveyor means having a given direction of travel, deflecting means for guiding the yarn coils upon said conveyor means with the coil axis oriented in said travel direction, a substantially horizontal supporting surface member mounted adjacent to said conveyor means at a distance from the forward travel end of the conveyor means which distance has a length in said travel direction approximately 5% to 10% shorter than the distance from the gravity center of the coils to the coil end more remote from said gravity center, whereby said coils will tip downward into the space between said conveyor means and said surface member with a given coil end in a leading direction, and collecting means adjacent said orienting means for receiving oriented coils therefrom.

15. Apparatus for orienting yarn coils, particularly axially elongated coils such as cops, comprising an upwardly open coil storage container for receiving un-oriented coils, a gripper member engageable with a coil in said container for seizing said coil, a control mechanism for controlling said gripper member and on which said gripper member is movably mounted, said control mechanism including means for sequentially moving said member downwardly into said container to seize a coil and then upwardly and laterally out of said container while entraining that coil, orienting means for receiving the entrained coil from said gripper member when said member is located laterally of said container and to orient said coils in a uniform direction, said orienting means comprising substantially horizontal conveyor means having a given direction of travel, means for feeding the yarn coils to said conveyor means with the coil axis oriented in said travel direction, a substantially horizontal supporting surface member mounted adjacent to said conveyor means at a distance from the forward travel end of the conveyor means shorter than the distance from the gravity center of the coils to the more remote coil end, whereby the coils will tip downward between said conveyor means and said surface member with a given coil end in leading position, said means for feeding the yarn coils upon the conveyor means comprising a trough structure having a bottom hopper wall inclined downwardly toward said conveyor means, and collecting means adjacent said orienting means for receiving oriented coils therefrom.

16. Apparatus for orienting yarn coils, particularly axially elongated coils such as cops, comprising an upwardly open coil storage container for receiving un-oriented coils, a gripper member engageable with a coil in said container for seizing said coil, a control mechanism for controlling said gripper member and on which said gripper member is movably mounted, said control mechanism including means for sequentially moving said member downwardly into said container to seize a coil and then upwardly and laterally out of said container while entraining that coil, orienting means for receiving the entrained coil from said gripper member when said member is located laterally of said container and to orient said coils in a uniform direction, said orienting means comprising substantially horizontal conveyor means having a given direction of travel, means for feeding the yarn coils upon said conveyor means with the coil axis oriented in said travel direction, a substantially horizontal

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supporting surface member mounted adjacent to said conveyor means at a distance from the forward travel end of the conveyor means shorter than the distance from the gravity center of the coils to the more remote coil end, whereby the coils will tip downward between said conveyor means and said surface member with a given coil end in leading position, said means for feeding the yarn coils upon the conveyor means comprising a trough structure having a bottom hopper wall inclined downwardly toward said conveyor means, a deflecting wall at the forward end of said trough structure in said travel direction for guiding said coils into alignment with said

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travel direction, and collecting means adjacent said orienting means for receiving oriented coils therefrom.

References Cited in the file of this patent

UNITED STATES PATENTS

1,570,622	Danberg	Jan. 26, 1926
1,658,428	Charles	Feb. 7, 1928
2,247,787	Schmidt	July 1, 1941
2,379,717	Hurley	July 3, 1945
2,652,931	Hughes	Sept. 22, 1953