

Jan. 30, 1962

W. REINERS ETAL
METHOD AND APPARATUS FOR AUTOMATICALLY SORTING
AND COLLECTING YARN COILS FOR WINDING
OR WEAVING OPERATIONS

3,018,888

Filed Feb. 26, 1957

2 Sheets-Sheet 1

FIG. 1.

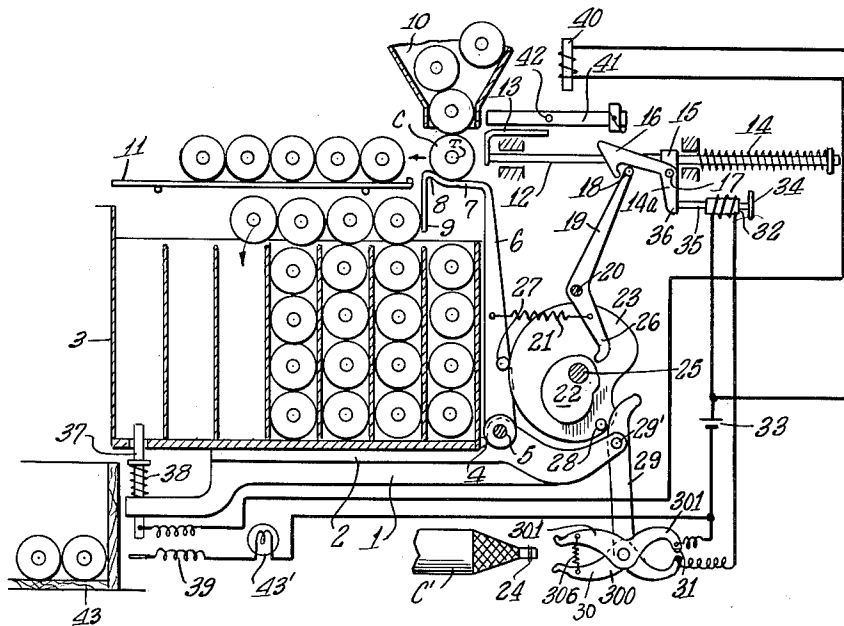
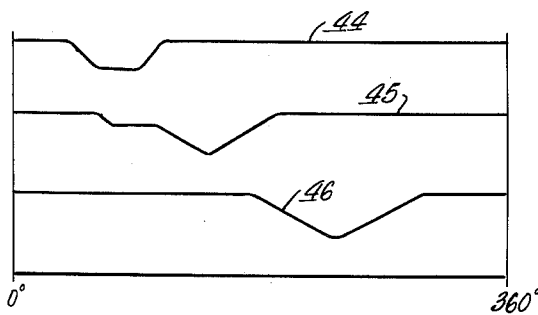


FIG. 2.



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FIG-3-

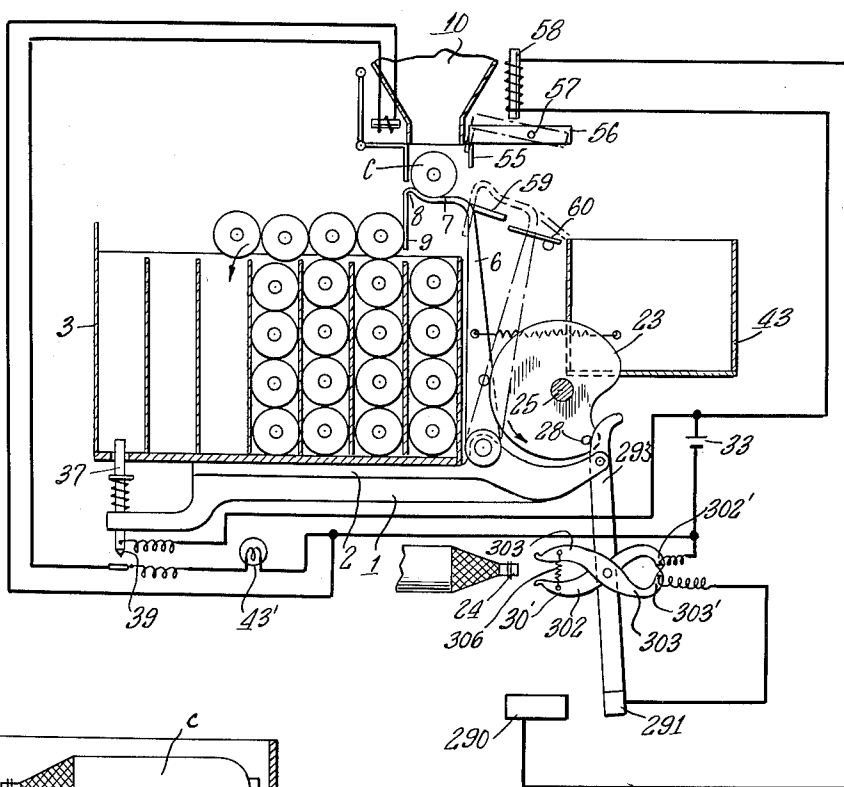
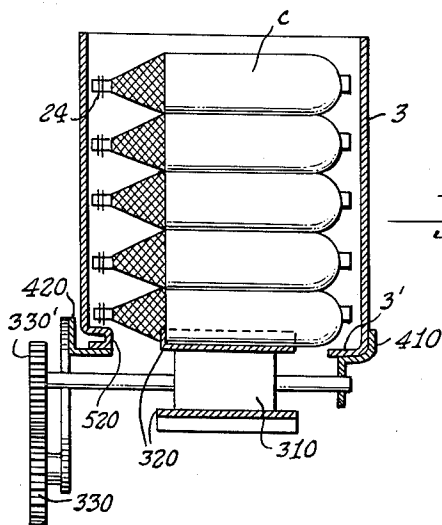


FIG-4-



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METHOD AND APPARATUS FOR AUTOMATICALLY SORTING AND COLLECTING YARN COILS FOR WINDING OR WEAVING OPERATIONS

Walter Reiners, Peter-Nonnenmuhlen-Allee 54, M. Gladbach, Germany, and Stefan Fürst, M. Gladbach, Germany; said Fürst assignor to said Reiners

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5 Claims. (Cl. 209—74)

Our invention relates to the preparation of yarn coils for winding, weaving or other operation on automatic textile fabricating machines such as yarn-winding machines, weaving looms or the like.

In the manufacture of textiles, the cops, bobbins or other coils of yarn which, coming from a spinning machine or a winding machine, are to be individually supplied to the next following fabricating machine, are preferably first subjected to a checking and sorting operation in order to separate the coils that have the full yarn content from coils which, due to any cause, are not built up to full size. The latter are termed cripples. Such cripples occur, particularly on spinning machines, when the yarn is torn, so that there is an interruption in the supply of yarn until the trouble is discovered and remedied by the attendant. The further processing of such cripple coils has the disadvantage that the resulting products made on cyclically operating machines are faulty. For instance, a cross-wound bobbin or a shuttle bobbin made from a number of cops which includes a cripple, is incomplete because of the insufficient supply of yarn. It is, therefore, desirable to separate such cripples from the normal yarn-supply coils and to process them in specially designated machines, which are given special attention in order to prevent or eliminate any faults, as compared with those machines that are supplied with perfect coils and thus require less attention to perform the processing of the coil without disturbance.

According to the present invention, we subject each yarn-supply coil between two fabricating steps to an automatic sorting operation which checks the coil to determine whether it carries a predetermined quantity of yarn. The testing and sorting may be carried out by sensing the length of the wound body of yarn, or the yarn quantity, or by weighing the body of yarn. However, according to a preferred method of the invention we test the yarn supply coil for a desired length of the wound-up yarn by automatically determining whether the core of the coil has at its tip an additional winding reserve which forms the starting end of the yarn. This reserve winding on the core tip of the coil body is made or completed only when the coil has a sufficient yarn content, that is, a sufficient length of the yarn. It is known to provide the core tip of a coil, such as a cop, with a reserve length of yarn comprising a few parallel windings, for the purpose of facilitating the locating and gripping of the yarn end at this location. The known purpose of placing this extra length of reserve winding at a separate predetermined location on the coil, (e.g. on the core tip of the coil), is to permit subsequently-used fabricating machinery, such as a coil-winding machine, to automatically seize and start to unwind the yarn from the coil with the aid of automatic means so that the coil can automatically enter into the unwinding operation without any manual activity. Such subsequent fabricating machinery forms no part of the present invention and is therefore not further described herein. However, such a reserve winding on the coil has heretofore not been used for determining the completeness or soundness of the body of yarn. It is therefore an essential feature of

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the invention to utilize the reserve winding on the core tip for the purpose of checking and sorting the coils.

The coils that have been found to contain or carry this additional reserve winding of yarn are conveyed to a collecting container or magazine which, according to another feature of the invention, is removable as a unit in order to serve as a feeder magazine for the next following fabricating operation.

According to still another feature of the invention, the testing of the coil to determine the sufficiency of its yarn content, i.e. whether the additional reserve winding is present on the core tip of the coil body, is effected by means of a gauge, for instance of the caliper or snap-gauge type. The latter is placed over the tip of the coil core or over the entire wound body of yarn; so that, when detecting a deficiency in yarn length or quantity, it controls the separation of the unsatisfactory from the satisfactory coils of yarn, by electric switching means for example. According to a further, more specific feature of the invention, the just-mentioned control is carried out in such manner that the satisfactory coils are directly guided into the collecting container or magazine, whereas the unsatisfactory coils, by changing their conveying path, are supplied to a separate collecting container.

The above-mentioned and more specific objects and features of our invention will be apparent from the embodiments illustrated on the drawings and described in the following.

On the drawing—

FIG. 1 illustrates schematically, and partially in vertical cross section, an automatic coil-gauging and sorting apparatus according to the invention.

FIGURE 2 is an explanatory motion diagram indicating the time relation or sequence of component operations occurring within the apparatus;

FIGURE 3 shows schematically and partly in section another embodiment of the invention, a modified discarding apparatus being illustrated; and

FIG. 4 is a vertical cross section through a collecting magazine having bottom openings, and illustrates a subsequent removal of the cops by conveyor.

The apparatus shown in FIG. 1 is provided with a rigid base plate 1 which may be mounted on any suitable foundation, support, table, or which may be provided with legs. Mounted on base plate 1 is a supporting plate 2 for a container for magazine 3 which is divided by partitions into a number of compartments each for the reception of a vertical column of cops. The magazine is removable from the supporting plate 2 so that it can be removed and conveyed to a weaving loom, re-winding machine or other fabricating machinery after the magazine is completely filled, and can be substituted for an empty magazine. A stop 4 on supporting plate 2 facilitates placing the magazine 3 into the proper position when inserting it into the sorting machine. Pivoted on a shaft 5 adjacent to the stop 4 is a lever arm 6 whose upper portion has an angular shape and forms a saddle surface 7 with an adjacent hump 8 and a downwardly extending front plate 9. The saddle portion 7, the hump 8 and the front plate 9 extend horizontally over most or all of the axial length of the cops to be sorted in the apparatus. A funnel 10 is located above the saddle portion 7 at a vertical spacing at least equal to the diameter of a completely filled cop, the discharge opening of funnel 10 being located vertically above the first compartment of the collecting magazine 3. A diverter plate 11 extends horizontally adjacent to the saddle portion 7 and at about the same height.

A horizontal pusher rod 12 is slidably guided in fixed relation to the base plate 1 and carries, at its front end, a cover plate 13 which extends along the saddle portion 7

of lever 6, at a location between the saddle surface and the opening of funnel 10. Pusher rod 12 is normally held in the illustrated position by a biasing spring 14 and carries a part 15 on which a latch pawl 16 is mounted for rotation about a pivot pin 17. Latch pawl 16 can cooperate with a catch pin 18 mounted on a lever 19 which is stationarily pivoted at 20. Levers 6 and 19 are biased by a spring 21 tending to hold both levers in the illustrated position.

Levers 19 and 6 are driven from respective cam disks 22 and 23 firmly mounted on a common drive shaft 25. Lever 19 has an arm 26 biased by spring 21 against the contour of cam 22, whereas lever 6 carries a pin 27 biased by spring 21 against the contour of cam 23. Cam 23 carries a dog pin 28 for cooperation with a lever 29 which is pivoted to the supporting plate 2 at 29' and carries, or is mechanically connected with, a pincer-type gauge 30. During rotation of the cam 23, the gauge 30 is moved first forward toward the cop and then back to the original position during one full revolution of shaft 25.

For the purpose of illustration, the gauge 30 is shown in FIG. 1 below its actual location and in the same plane in which the magazine 3 is shown sectioned. Actually, however, the gauge 30 is mounted at the height of the pusher rod 12 so that the mouth of gauge 30, when the gauge is shifted toward the left, can pass over the tip T of the cop then located on the surface of saddle portion 7. That is, the gauge actually moves on a path perpendicular to the plane of illustration, from the observer toward the tip T of cop C on saddle portion 7, the illustration of a cop C' opposite gauge 30 being merely added for the purpose of explanation.

The spring 306 of gauge 30 normally pulls the left (FIG. 1) parts of gauge levers 300 and 301 toward each other, and consequently keeps the right ends of the gauge levers apart. The pincer-type gauge 30 carries at one end a cooperating pair of normally open electric contacts 31 which, when closed, energize an electromagnet 32 from a current source 33. The electromagnet then causes its armature 34 to force a plunger 35 against an arm 36 of latch pawl 16, thus moving the pawl out of the range of catch 18. Such operation takes place only if the gauge 30, when its mouth passes over the tip T of the cop, encounters a reserve number of turns 24 on that tip. However, if such a yarn reserve on the tip of the coil core is missing, then the mouth of the gauge will not open wider, the contacts 31 will not close, and the electromagnet 32 is not energized. As a result, the catch 18 on lever 19, when being turned counterclockwise by cam 22, entrains the pawl 16 and thus moves the pusher rod 12 and the cover plate 13 in opposition to the force of biasing spring 14 toward the left.

The apparatus is further provided with a feeler pin 37 which is slidably mounted in base plate 1 and is biased upwardly by means of a spring 38. The feeler pin 37 protrudes into the last compartment of the magazine container 3. When feeler pin 37 is pushed downward by the weight of a cop, it closes a contact 39 which actuates a signal device, for instance a lamp 43', to indicate that the magazine is nearly filled. At the same time, another electromagnet 40 is energized from source 33 through contact 39 and attracts a weighted lever 41 fulcrumed at 42. The lever 41 then moves its left-hand portion downwardly behind the cover plate 13, previously advanced by rod 12 as above described, so that the cover plate is latched in its advanced position and closes the opening of funnel 10. Instead of latching the cover plate 13, the electromagnet 40 may also operate to move a separate slider in front of the funnel opening to prevent the further discharge of cops. Located beneath and in front of the magazine 3 is a collecting container 43.

The time relation or sequence of the respective operations of gauge 30, lever 19 and lever 6 is apparent from the motion diagrams or time curves 44, 45 and 46 illustrated in FIG. 2. The motions are relative to a single full

revolution (0° to 360°) of the cam shaft 25. Time curve 44 indicates the motion of lever 29 and gauge 30. Time curve 45 indicates the motion of lever 19; and time curve 46 indicates the motion of lever 6.

During operation, the cops to be sorted into the magazine drop individually and successively through the funnel 10 onto the supporting surface of saddle portion 7. These cops may arrive directly from a spinning machine or spinning station from which they are successively discharged. The rotation of cam shaft 25 is properly timed in accordance with the periodic arrival of the cops or a single revolution of the cam shaft 25 is released in the conventional manner each time a cop passes into the apparatus. During the rotation of cam shaft 25, the gauge 30 advances toward and over the tip T of the cop C then located on saddle portion 7. If gauge 30 detects the presence of the reserve winding 24, then the contacts 31 are closed, the magnet 32 responds and unlatches the pawl 16 so that the pusher rod 12 remains in inactive position. Consequently, during the next following motion of lever 6 (see FIG. 2), the cop C, abutting against the cover member 13 passes over hump 8 and then drops into the first compartment of the container 3. When the first compartment is completely filled, the next following cop from saddle portion 7 drops onto the top of the filled compartment and, during the next following return motion of front plate 9, is pushed forward so that it will drop into the second compartment of container 3. When the second compartment is filled, the third compartment and thereafter the fourth and the following compartments are filled analogously until the entire magazine is filled, or the first cop, or first few cops dropping into the last compartment depress the feeler pin 37 thus signalling that the magazine is nearly filled and is to be replaced by an empty container.

If the gauge 30 during its forward motion according to time curve 44 in FIG. 2 does not encounter a reserve winding 24 on the core tip T of cop C, then the contacts 31 remain open, the electromagnet 32 remains deenergized, and the pawl 16 is engageable by the catch 18 of lever 19. Consequently, during the subsequent forward motion of lever 19, the pusher rod 12 is shifted toward the left and forces the cop C over the hump 8 onto the deflector plate 11 from which it drops into the collecting container 43. As a result, the fully wound cops are separated from the incompletely wound cops and both kinds of cops can be further fabricated separate from each other. Hence, when the filled magazine 3 is removed from the sorting apparatus and supplied, for instance, to an automatic re-winding machine or weaving loom, full assurance is given that each and every cop supplies the full measure of yarn.

The embodiment illustrated in FIG. 3 is to some extent similar to that described above with reference to FIGS. 1 and 2, the same reference numerals being used in both illustrations for similar parts respectively. As in the embodiment of FIG. 1, a magazine container 3 in the device according to FIG. 3 is filled only with such cops which have been found, by operation of a gauge 30', to contain a full measure of yarn as evidenced by the presence of a reserve winding 24 on the tip of the cop C. However, the tappet 12 and the cover plate 13 with the appertaining latch mechanism are omitted and are replaced by a stop plate 55 which is mounted on an armature member 56 pivoted at 57 and controlled by an electromagnet 58 which is energized from source 33 under control by the contacts of the gauge 30'. When the gauge 30' detects the absence of the reserve winding 24 on the tip of the cop, the circuit through magnet 58 is closed and the magnet consequently energized to lift the stop plate 55. The cop then rolls over the back of lever 6 onto a guide plate 59 which is attached to the lever 6, as illustrated. From guide plate 59, the cop passes onto a guiding grate 60 which is slotted for the passage of lever

6 and along which the cop rolls into the collecting container 43.

The gauge 30', and its associated circuit, is representative of any reserve winding sensing device capable of closing the circuit energizing magnet 58 when the reserve winding is absent. As shown in FIG. 3, gauge 30' comprises two levers 303 and 302, crossing on a common pivot. Spring 306 pulls the left ends of levers 303 and 302 together. This pivots the right parts of the levers toward each other, so that the contacts 302' and 303' are normally brought together. The normally closed contacts 302' and 303' do not normally close the circuit of magnet 58 because stationary contact 290 and the contact 291 carried by lever 293 are not normally in contact with each other. When lever 293 swings gauge 30' to the left over the cop end, contacts 290 and 291 close. If the left jaws of gauge 30' sense and are spread apart by the reserve winding 24 on the cop, the contacts 302' and 303' of plier gauge 30' are opened, preferably before contacts 290, 291 are closed. Consequently, magnet 58 remains de-energized and gate 55 remains closed, and the cop so sensed subsequently drops into the magazine 3.

Obviously, it is possible to change the circuitry so that the cripples are collected in the magazine 3 and the full cops sorted into container 43, suitably compartmented.

As shown in FIG. 4, the bottom plate 3' and two opposite ends of magazine 3 may have openings so that, upon removal of the magazine, a conveyor belt 320 can enter at one end and move toward the other, carrying with it cops C fed down to it from the magazine. In this way the cops are automatically fed from the magazine to a re-winding apparatus, as further described in detail in the co-pending application of Stefan Fürst, Serial No. 640,137, filed February 14, 1957.

The conveyor 320 comprises trays which are segments of a cylinder, and which are fixedly or pivotally attached to a conveyor chain in known manner. A roller 310 is driven by a pair of spur gears 330 and 330'. The gear 330 is connected to a suitable drive (not shown) so as to advance the conveyor 320 one step at a time. The trays on the conveyor 320 receive respective yarn-supplying cops C from the magazine 3. The magazine 3 is partitioned into a number of cop-receiving portions or chutes (FIG. 3). Each cop, as usual, has a body of yarn wound crosswise upon a core. The starting end or reserve portion of the yarn on each individual cop is wound about one end of the core in parallel turns 24. The magazine device 3 is placed upon guide rails 410 and 420 (FIG. 4), provided with flanges. The trays of the conveyor 320 pass through the bottom opening 520 of the magazine structure.

It will be apparent to those skilled in the art, upon a study of this disclosure, that our invention permits of various modifications with respect to the design and arrangement of the apparatus components and hence may be embodied in devices other than those particularly illustrated and described herein, without departing from the essence of the invention and within the scope of the claims annexed hereto.

We claim:

1. An apparatus for automatically sorting and collecting yarn coils, said winding coils being unsorted and of two types, one of which types has an additional predetermined length of reserve yarn winding separately located on one core tip of said coils and joined to but apart from the main winding thereof, comprising means to supply said unsorted yarn coils in sequence, an upwardly opening multi-compartmented magazine for storing the coils having the reserve winding, a reciprocating member having a coil arresting means positionable for temporarily retaining said coils one at a time at a coil arresting position between the supply means and an inlet opening of a compartment of the magazine, means to sense whether said additional length of reserve wind-

ing is present on the tip of the core of the coil arrested on said arresting means, said automatic means having coil transfer means under control of said sensing means to displace the coil from the coil arresting means to a position where said coil is not accessible to the magazine if said reserve winding is not present on that coil, the reciprocating member being movably mounted and having drive means for periodic movement of same out of said coil arresting position, said reciprocating member being provided with a coil pusher portion for pushing a coil from said arresting position to the inlet openings of the adjoining compartments upon return of said member to coil arresting position, if the first mentioned compartment is full.

2. An apparatus for automatically sorting and collecting yarn coils, said winding coils being unsorted and of two types, one of which types has an additional predetermined length of reserve yarn winding separately located on one core tip of said coils and joined to but apart from the main winding thereof, comprising means to supply said unsorted yarn coils in sequence, an upwardly opening multi-compartmented magazine for storing the coils having the reserve winding, a reciprocating member having a coil arresting means positionable for temporarily retaining said coils one at a time at a coil arresting position between the supply means and an inlet opening of a compartment of the magazine, means to sense whether said additional length of reserve winding is present on the tip of the core of the coil arrested on said arresting means, said automatic means having coil transfer means under control of said sensing means, to displace the coil from the coil arresting means to a position where said coil is not accessible to the magazine, if said reserve winding is not present on that coil the reciprocating member being movably mounted and having drive means for periodic movement of same out of said coil arresting position, said reciprocating member being provided with a coil pusher portion for pushing a coil from said arresting position to the inlet openings of the adjoining compartments upon return of said member to coil arresting position, if the first mentioned compartment is full, the means to sense comprising a gauge having articulated jaws adapted to be automatically passed over the end of the yarn coil in said arrested position to determine, by the resulting positions of the jaws, whether said additional length of reserve winding is present, electric circuit operated means operably connected to said sensing means for controlling the displacement of the coil from said coil arresting position to a position where it is not accessible to the magazine, said circuit means including electric contact means carried by said gauge jaws and openable and closable in accordance with positions of said jaws.

3. An apparatus for automatically sorting and collecting yarn coils, said winding coils being unsorted and of two types, one of which types has an additional predetermined length of reserve yarn winding separately located on one core tip of said coils and joined to but apart from the main winding thereof, comprising means to supply said unsorted yarn coils in sequence, a compartmented magazine for storing the coils having the reserve winding, the compartments having upwardly open inlet openings, a member pivotally mounted and having a coil arresting portion positionable for temporarily retaining said coils one at a time at a coil arresting position between the supply means and one compartment of the magazine, the pivoted member also having a coil pusher portion, means to sense whether said additional length of reserve winding is present on the coil arrested on said arresting portion, coil transfer means having drive means operably connected to said sensing means for displacing the coil from said arrested position on the coil arresting means to another position where the coil is not accessible to the magazine if said reserve winding is not present on that coil, the pivoted member being connected

to said drive means for movement by said drive means out of said coil arresting position, the coil pusher portion upon pivoting of said pivoted member pushing the coil to a location above the compartment next to said one compartment upon return of said member to coil arresting position, if said one compartment is full, the means to sense comprising a gauge having articulated jaws adapted to be automatically passed over the end of the yarn coil in said coil arresting position to determine by the resulting positions of the jaws, whether the reserve winding is present, electric circuit operated means operably connected to said sensing means for controlling the displacement of the coil from said coil arrested position to said other position where said coil is not accessible to the magazine, said circuit means including electric contact means carried by said gauge jaws and openable and closable in accordance with positions of said jaws, said coil transfer means comprising a reciprocable pusher rod, actuating means for operably connecting said pusher rod to said drive means, and linking means between the actuating means and the pusher rod operably connected to said electric circuit operated means for adjustment into linking and non-linking position by said electric circuit operated means.

4. An apparatus for automatically sorting and collecting yarn coils, said coils being unsorted and of two types, one of which types has a predetermined length of reserve yarn winding located on one core tip of said coils and joined to but wound in a bunch spaced from the main winding thereof, said apparatus comprising means to supply said unsorted yarn coils in sequence, a magazine to receive the coils having the reserve winding, a reciprocating member having a coil arresting portion positionable for temporarily retaining said coils one at a time at a coil arrested position between the supply means and the magazine, automatic means to sense whether said length of reserve winding is present on the tip of the core of the arrested coil, said automatic means having coil transfer means under control of said sensing means to automatically displace the coil from said coil arresting portion to another position where said coil is not accessible to the magazine if said reserve winding is not present on that coil, and, if it is present, to transfer the coil to the magazine, the means to sense comprising a gauge having articulated jaws adapted to be automatically passed over the end of the yarn coil at said coil arrested position to determine, by the resulting positions of the jaws, whether said length of reserve winding is present, electric circuit operated means operably connected to said transfer means for controlling the displacement of the coil to said other position where it is not accessible to the magazine, said circuit means including electric contact means carried by said gauge jaws and openable and closable in accordance with positions of said jaws.

5. An apparatus for automatically sorting and collecting yarn coils, comprising means to supply in sequence unsorted yarn coils of two types, one of which has a reserve yarn winding at one end and the other of which does not, a compartmented magazine for storing the coils having the reserve winding, the compartments having upwardly open inlet openings, a member pivotally mounted and having a coil arresting portion positionable for temporarily retaining said coils one at a time at a coil arresting position between the supply means and one compartment of the magazine; the pivoted member also having a coil pusher portion, means to sense whether said additional length of reserve winding is present on the coil arrested on said arresting portion, coil transfer means having drive means operably connected to said sensing means for displacing the coil from said arresting on the coil arresting means to another position where the coil is not accessible to the magazine if said reserve winding is not present on that coil, the pivoted member being connected to said drive means for movement by said drive means out of said coil arresting position, the coil pusher portion upon pivoting of said pivoted member pushing the coil to a location above the compartment next to said one compartment upon return of said member to coil arresting position, if said one compartment is full, the means to sense comprising a gauge having jaws adapted to be automatically passed over the end of the yarn coil in said coil arresting position to determine, by the resulting positions of the jaws, whether the reserve winding is present, electric circuit operated means operably connected to said sensing means for controlling the displacement of the coil from said coil arrested position to said other position where said coil is not accessible to the magazine, said circuit means including electric contact means carried by said gauge jaws and openable and closable in accordance with positions of said jaws, said coil transfer means comprising a reciprocable pusher rod, actuating means for operably connecting said pusher rod to said drive means, and linking means between the actuating means and the pusher rod operably connected to said electric circuit operated means for adjustment into linking and non-linking position by said electric circuit operated means, said pusher rod actuating means being pivoted, said drive means including rotary cam means operatively connected to pivot the pivoted member, move the swingable gauge, and pivot the actuating means for the pusher rod.

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