AUTOMATIC DOPPING AND DONNING DEVICE FOR TEXTILE SLIVER-COILERS

Filed Apr. 13, 1966, Ser. No. 542,314
Claims priority, application Great Britain, Apr. 25, 1965, 12,756/65
Int. Cl. D04h 11/00
U.S. Cl. 19—159 14 Claims

ABSTRACT OF THE DISCLOSURE

An arrangement for automatically handling sliver containers used with textile sliver-coiling apparatus. Full containers are replaced by empty containers and a turntable as well as guide members is utilized to locate the containers centrally on the turntable. The empty cans are provided with releasable holding means.

The present invention relates to textile sliver-coiling apparatus and is particularly concerned with arrangements for driving and handling sliver containers used in textile sliver-coiling apparatus.

It has in the past been common practice to provide at the coiling station a driven turntable which supports the can receiving the coiled material and imparts the required rotation to it by virtue of the frictional contact between the turntable and the base of the can, guide members being provided on the turntable to locate the can centrally thereon.

There is now a tendency to employ larger cans with such sliver-coiling apparatus and to assist in their transportation and their handling they are often now fitted with castors, the cans being supported on the turntable on their castors and abutments being provided on the turntable to engage the castors to provide proper location of the can on the turntable and the necessary driving contact between the turntable and the can. It has, however, been found difficult with such arrangements to place the can on the turntable or to remove it therefrom. In fact, it is not possible in a single operation to roll an empty can on its castors on to the table from one side and to roll the full can from the table at the other side, and it therefore becomes difficult to apply automatic can supply and dolling techniques.

It is an object of the present invention to provide in textile sliver-coiling apparatus a driving arrangement for cans fitted with castors, which greatly facilitates the automatic feeding of empty cans to the coiling station and the removal of full cans therefrom.

According to the present invention, there is provided a textile sliver-coiling apparatus comprising at the coiling station a driven turntable adapted to support a can on its castors and to impart a rotary motion thereto, said turntable having guide means adapted to engage cooperating guide means provided on said can and separate from said castors, across the turntable to permit diametrical movement of said can on its castors to and from a sliver-receiving position in which the can is concentric with the turntable and to impart said rotary motion to the can when in the sliver-receiving position, and releasable locking means for holding said can in the sliver-receiving position.

Preferably, the guide means on the turntable and the guide means on the can are such that the can may be moved on to the turntable from a supply side thereof and into the sliver receiving position on the turntable where it is held by said releasable locking means, rotated by the turntable and filled with sliver, and then be removed from the turntable at a delivery side thereof opposite said supply side.

With a view to providing a sliver-coiling apparatus in which the cans are fed to and removed from the turntable automatically, aligned stationary guide means are arranged at opposite sides of the turntable so that with the turntable at rest the guide means thereon may be aligned with the stationary guide means to receive an empty can moved on its castors and guided thereto by the stationary guide means on one side of the turntable and to allow a full can to be moved on its castors from the turntable and guided by the stationary guide means on the other side of the turntable.

One embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:

FIG. 1 is a part sectional broken front elevation of textile sliver-coiling apparatus according to the invention,
FIG. 2 is a sectional plan view of the apparatus shown in FIG. 1, taken on the line II—I in FIG. 1,
FIG. 3 is an underside plan view of one of the cans shown in FIG. 1,
FIG. 4 is a section of the can shown in FIG. 3, taken on the line IV—IV in FIG. 3,
FIG. 5 is a plan view of part of the turntable of the apparatus shown in FIG. 1,
FIG. 6 is a section of the turntable shown in FIG. 5 taken on the lines VI—VI in FIG. 5, and showing the lower part of a can supported thereby, and
FIG. 7 is a schematic diagram showing the pneumatic circuit and an arrangement of electrical switches required for the automatic operation of the apparatus shown in FIGS. 1 to 6.

Referring first to FIGS. 1 and 2, a single head draw-frame 11 is provided with a collier head 12 which is arranged in well known manner to deliver sliver in coiled fashion to a sliver can 13 located beneath it. As illustrated in the drawings, the can 13 is supported by castors 14, 15 and 16 which rest in rolling contact on a turntable 17 mounted for rotation about a vertical stub shaft 18 and adapted to be driven by a belt 19 engaging a belt pulley 20 rotatably supported by three rollers one of which is indicated at 21 and all of which bear with rolling contact on a circular track 22 provided on a collier base frame 23 located below floor level in a recess 24 formed in the floor 25, the upper surface of the turntable 17 being flush with the level of the floor 25.

Turning now to FIGS. 3 and 4, the sliver can 13 has fitted to its base 26 a diametrically extending channel member 27 having flanges 28 and 29 welded to the base of the can. Sides 30 and 31 of the channel member 27 serve as guide surfaces the purpose of which will hereinafter be explained, and ends 32 of the sides 30 and 31 are inclined inwardly as shown to facilitate entry of the guide member into a guide channel as hereinafter to be described. The guide member 27 is, as shown, provided with a slot 34. The can 13 is provided with a conventional spring-loaded sliver supporting plate 33 which is depressed in the can as the sliver delivered to the can builds up on it, the arrangement being such that the level of the uppermost layer of sliver in the can remains at a substantially constant distance from the collier head 12.

Referring again to FIGS. 1 and 2, the guide member 27 of the can 13 is shown in full while the guide member 27 for each of the empty cans 35 and 36 and the full can 37 is shown in section and reveals slots 38 formed in the sides 30. It will be seen that the empty cans 35 and 36 are supported by their castors in rolling contact on a can-supply platform 39 and that the full can 37 is supported by its castors on a delivery platform 40. As best
seen in FIG. 2, the supply platform 39 is provided with upstanding guide plates 41, 42 and 43 defining one side of a guide channel, the other side of which is defined by further upstanding guide plates 44, 45, and 46. Each of the guide plates 41 to 46 is provided with captive balls 47 and the arrangement is such that the empty cans 35 and 36 may be rolled on their castors forward along the supply platform 39 and guided into a straight line path by the sliding engagement of the guide member 27 within the channel formed by the guide plates 41 to 46, the captive balls 47 providing rolling contact with the guide member.

The supply platform 39 is formed with a slot 48 extending substantially throughout its length, and in the space beneath the platform there is arranged a piston rod 49 supported on rollers carried by crossheads 50 and 51 and riding on a roller track 52 resting on the base of a frame 53 fitted within the recess 24 formed in the floor 25. The piston rod 49 is driven to a piston of a pneumatic can-indexing actuator 54 adapted to be reciprocated thereby and is provided with spring-loaded pivotal fingers 55 and 56 which under their spring loading bear against the ends of the guide members of the empty cans 35 and 36 and move them to the left in FIG. 1, in which they project upwardly through the slot 48 formed in the platform 39, and the arrangement is such that upon a movement of the piston rod 49 to the left in FIG. 1, the fingers 55 and 56 bear against the ends of the guide members of the empty cans 35 and 36 and move them to the left in FIG. 1, causing the can 13 to be displaced from the turntable 17 and the empty can 35 to take its place, a return movement of the piston rod 49 then resulting in the spring-loaded pivotal fingers 55 and 56 being deflected in a counterclockwise sense and drawn beneath the underside of the guide members 27 of the can 36. Beneath the supply platform 39, there are mounted two pneumatic actuators 57 and 58 arranged to cooperate with spring-loaded pivotal latches 59 and 60 which under their spring loading normally occupy positions in which they engage in the slots 38 formed in the sides of the guide members 27 of the empty cans 35 and 36, and the arrangement is such that upon the supply of pressurized air to the cylinders of the actuators 57 and 58, the pistons of the actuators withdraw the pivotal latches 59 and 60 from engagement in the slots 38.

Referring now to FIG. 5, the turntable 17 is provided with upstanding guide plates 61 and 62 which form one side of a guide channel, the other side of which is defined by a single guide plate 63. The guide plates 61 and 63 are fitted with captive balls 64 and generally correspond to the guide plates 41-46 provided on the supply platform 39, and the arrangement is such that upon proper orientation of the turntable 17 an empty can 35 can be rolled from the supply platform 39 on to the turntable 17 and guided thereon by its guide member 27 engaging in the channel formed by the guide plates 61 to 63 and the captive balls mounted thereon.

It will be appreciated that the can on the turntable 17 should be centrally located thereon, and for this purpose there is provided a locating device comprising a pivotal arm 65 mounted for turning movement on a pivot pin 66 carried by the guide arm 62, a locating roller 67 being mounted on the pivot pin 66 and adapted to engage in the slot 38 formed in the side of the can guide member 27, and a spring 68 biasing the arm 65 to the roller engaging position.

FIG. 6 shows clearly the lower part of the can 13 with its castors 14 and 16 resting on the turntable 17. The turntable 17 is provided with a driving belt 19 engaging the belt pulley 20. It furthermore shows the spring loaded arm 65 in a position in which its roller 67 is in engagement in the slot 38 of the guide member 27 fixed to the base of the can 13. It also clearly shows one of the three rollers 21 which rotatably support the pulley 20 and the turntable 17 on the collar base frame 23.

Referring again to FIGS. 1 and 2, when the can 13 is full the empty cans 35 and 36 are pushed forward under the action of the pneumatic actuators 57 and 58 and the can 13 is to be rolled from the turntable 17 on to the delivery platform 40 where it is guided by upstanding guide plates 69 and 70 which are arranged to define a guide channel through which the guide member 27 on the can 13 is caused to pass. The delivery platform 40 is formed with a longitudinal slot 71 and beneath the platform there is mounted a pneumatic can-ejecting actuator 72 having a piston rod fitted with crosshead 73 carrying a roller 74 arranged to ride on a roller track plate 75. The crosshead 73 supports a spring biased pivotal latch 76 which under the action of its biasing spring bears clockwise against a stop so as to occupy a rest position in which it projects upwardly through the slot 71 in the delivery platform 40. Upon displacement of the can 13 from the turntable 17 the forward end of the guide member 27 thereon bears against the rear end of the guide member 27 on the can 37 resulting in the displacement of the can 37 from the delivery platform and on to the floor 25 and the movement of the can 13 to a position on the delivery platform 40. During this motion of the cans the spring loaded finger 76 is deflected against the action of its spring and caused to ride along the underside of the guide members 27 of the cans 37 and 13. At the same time the actuator 72 is extended causing the crosshead 73 to move on its roller to the right in FIG. 1. The can 13 will have moved to a position off the turntable but with the rear end of its guide member 27 still in contact with the front end of the guide member 27 of the can 37. The can 13 would in this position disturb the subsequent rotary motion of the can on the turntable and provision is made for the actuator 72 then to withdraw causing the spring loaded latch 76 to engage the forward end of the slot 34 and move the can 13 along the delivery platform to the position previously occupied by the can 37 in FIG. 1.

Referring now to FIG. 7, this shows in diagrammatic form the pneumatic circuits for feeding pressurized air to the can-indexing actuator 54 and the can-ejecting actuator 72, as well as to the can-locking actuators 57 and 58. It furthermore shows schematically the electrical switches which are employed to prevent faulty automatic operation of the apparatus. The coil head 12, shown in FIG. 7, is provided with switch SW1 which is adapted to be operated automatically after the coil head has delivered a pre-determined measure length of sliver. A switch SW2 is mounted on the guide plate 44 and is arranged to be held operated by the guide member 27 of the can 35 in the position shown, hereafter referred to as the first reserve position, and moves to the inoperative position in the absence of a can at the first reserve position. A switch SW3 is mounted at the periphery of the turntable 17 and is adapted to be operated by a striker 77 carried by the driving pulley 20 (FIG. 6), the arrangement being such that the switch SW3 is operated by the striker when the turntable 17 occupies a position on which its guide plates 61 to 63 (FIG. 5) are in alignment with the guide plates on the supply and delivery platforms 39 and 40. A further switch SW4a is mounted adjacent the periphery of the turntable 17 and is arranged to be operated by a striker 78, the arrangement being such that the switch operates only when the turntable is in proper alignment for can indexing. Switches SW4b and SW4c are mounted adjacent the can locking actuators 57 and 58 and are arranged to be operated only when the actuators have reached the end of their travel and the guide member 27 is in engagement with the cans 35 and 36 at the first and second reserve positions. Switch SW6a is mounted beneath the platform 39 and is arranged to be operated by the passage of the crosshead 50 on the can 49, the arrangement being such that the switch is operated near the end.
of the indexing stroke of the actuator 54. Switch SW6b is likewise mounted beneath the platform 39 and arranged to be operated by the crosshead 50 upon completion of the indexing stroke of the actuator 54. Switch SW8a is mounted beneath the entry platform 39 and is arranged to be operated by the crosshead 50, the arrangement being such that the switch is operated when the actuator has completed its retraction stroke. Switch SW9 is mounted beneath the crosshead 50 for operation with the pivotal latch 59 and operates when the latch moves to its locking position.

The can-locking actuators 57 and 58 are supplied with air under pressure from a spring-loaded spool valve PAV1 and the can-indexing actuator 54 and the can-ejecting actuator 72 are supplied with air under pressure from a change-over spool valve PAV2.

In operation, the switch SW1 operates when the crosshead 12 has delivered a predetermined measured length of silver. Upon operation of this switch, the drawframe is stopped by any conventional means, for example a clutch-brake mechanism. Provided the switch SW2 is held operated by the striker 77 while switch SW1 is held in operative position the turntable 17 remains stationary and can be operated by the cam 135 and 136. Switches SW3 and SW4a are mechanically actuated during each revolution but will not operate until actuation of switch SW1 and a certain number of steps in the sequence of operations have been completed. As a result of this, switches SW4b and SW4c operate and together complete a circuit for energizing the electrically-operated spool valve PAV1 which switches over to direct air under pressure to the actuators 54 and 72 in such a sequence as to cause the two actuators to extend. As hereinbefore described the extension of the actuator 54 causes the pivotal latches 55 and 56 to push the cans 35 and 36 forward, the can 35 replacing the can 13 on the turntable 17 and the can 13 taking up a position on the delivery platform 40 with the pivotal latch 76 of the actuator 72 in its extended position and engaging in the slot 34 of the guide member 27 of the newly-positioned can 13. Upon the actuator 54 reaching a position near the end of its indexing stroke the switch SW6b operates causing the de-energization of the spool valve PAV1 whereupon the supply of pressurized air to the actuators 57 and 58 is reversed, allowing pivotal latches 59 and 60 to move under the action of their biasing springs to locking engagement with the empty can now in the first reserve position. Switch SW6b operates upon completion of the indexing stroke of the actuator 54, the resultant reversal of the valves PAV2 and the consequent reversal of flow of pressurized air to the actuators 54 and 72 which thereupon retract resulting as hereinbefore described in the withdrawal of the full can on the delivery platform 49 to a position in which it is fully clear of the can. Upon completion of the retracting stroke of the actuator 54, the switch SW8a operates. Auxiliary contacts on the switch SW4b provide a check that the valve PAV1 has de-energized and caused the locking of the empty can at the first reserve position. Switch SW9 operates upon the movement of the pivotal latch 59 to the locking position with the can at the first reserve position and this switch is so connected in the operating circuit of the crosshead 12 that the machine will restart when this switch and switch SW8a are both held operated.

Even when using automatic doffing, if it is necessary to withdraw the can from the indexing position to effect piecing it is a simple matter to stop the machine and to inch the turntable around to a position where the locking means can be released and the can withdrawn diametrically towards the front of the machine to enable the operator to effect the piecing and then replace the can in the indexing position.

What I claim as my invention and desire to secure by Letters Patent is:

1. A can doffing and donning arrangement for a textile silver coiling apparatus provided with a coiling station and a plurality of cans having castors thereon comprising a turntable, means for rotatably driving said turntable, said turntable adapted to support one of said cans on its castors and to impart a rotary motion thereto, said turntable having guide means adapted to engage cooperating guide means provided on said cans and separate from said castors to guide each of said cans as it moves diametrically across the turntable on its castors and from a sliver-receiving position and to impart said rotary motion to each of said cans when in the sliver-receiving position, yieldable holding means for engaging said guide means on each said can for holding said can in a sliver-receiving position, said turntable having a supply side and a delivery side having supply guide means on said supply side of said turntable and having delivery guide means on the delivery side of said turntable, said supply and delivery guide means being so arranged that with the turntable at rest in a predetermined position said guide means thereon are in alignment with said supply and delivery guide means and for moving an empty one of said cans on its castors from said supply guide means to said turntable guide means, and means for moving a full can from said turntable guide means to said delivery guide means.

2. Arrangement according to claim 1 wherein the castors of each of said cans have rolling contact with said turntable and the guide means of each can comprises a guide member extending diametrically across the base of the can and adapted to be slidable within the guide means on the turntable and the said supply and delivery guide means.

3. Arrangement according to claim 2, wherein the guide means on the turntable comprise upstanding spaced guide members defining a guide channel to which said guide member on the base of each can is confined for movement therealong.

4. Arrangement according to claim 3, wherein each of said supply and delivery guide means comprise upstanding spaced guide members forming a guide channel to which the guide member on the base of each can is confined for movement therealong.

5. Arrangement according to claim 4, wherein each of the guide members is provided with captive balls against which the sides of the guide member on each can bears with rolling contact during movement therealong.

6. Arrangement according to claim 1, wherein the supply guide means to which empty cans are supplied includes a supply platform flush with the turntable and the means for moving empty cans comprises a can indexing mechanism mounted thereon and adapted to move empty cans under guidance by said guide means forward on the platform.

7. Arrangement according to claim 6, wherein the yieldable holding means comprises a pivotal arm on said turntable, a roller mounted in said arm, a roller locating slot in the guide means of each of said cans, and means for spring-biasing said arm to a position in which the roller engages the locating slot of a can on the turntable, the arrangement being such that the roller can be forcibly displaced from the slot upon indexing of the cans by said indexing mechanism.
8. Arrangement according to claim 6, wherein the can indexing mechanism comprises a pneumatic can-indexing actuator having a can-engaging output element arranged to reciprocate beneath the supply platform and to have a stroke which will result in the indexing of an empty can located at a first reserve position on the supply platform on to the turntable under guidance of the supply guide means and the indexing of a further empty can located at a second reserve position on the supply platform into the vacated first reserve position under guidance of the supply guide means.

9. Arrangement according to claim 8, comprising locking means located beneath the supply platform and adapted to engage an empty can at said first reserve position to prevent inadvertent displacement of said empty can during a colling operation of the apparatus.

10. Arrangement according to claim 9, wherein said locking means comprises a pneumatic can-locking actuator located beneath the supply platform at the reserve position and arranged to cooperate with a locking element which is adapted to engage the empty can at the reserve position.

11. Arrangement according to claim 8, wherein the delivery guide means includes a delivery platform flush with the turntable and wherein the means for moving a full can comprises a can-effecting mechanism mounted beneath the delivery platform and adapted to move the can displaced from the turntable to a delivery position in which it is fully clear of the turntable.

12. Arrangement according to claim 11, wherein said can-ejecting mechanism comprises a pneumatic can-ejecting actuator having an output element which is arranged to reciprocate beneath the delivery platform and to have a stroke which will result in the movement of the can displaced from the turntable to the delivery position remote therefrom.

13. Arrangement according to claim 12, wherein the output element of the can-indexing actuator carries a spring-loaded pivotal latch adapted to project above the platform and drivably to engage the guide member on the can for movement of the can in one sense only.

14. Arrangement according to claim 12, wherein the output element of the can-ejecting actuator carries a spring loaded pivotal latch adapted to project above the platform and drivably to engage the can for movement of the can in one sense only.

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