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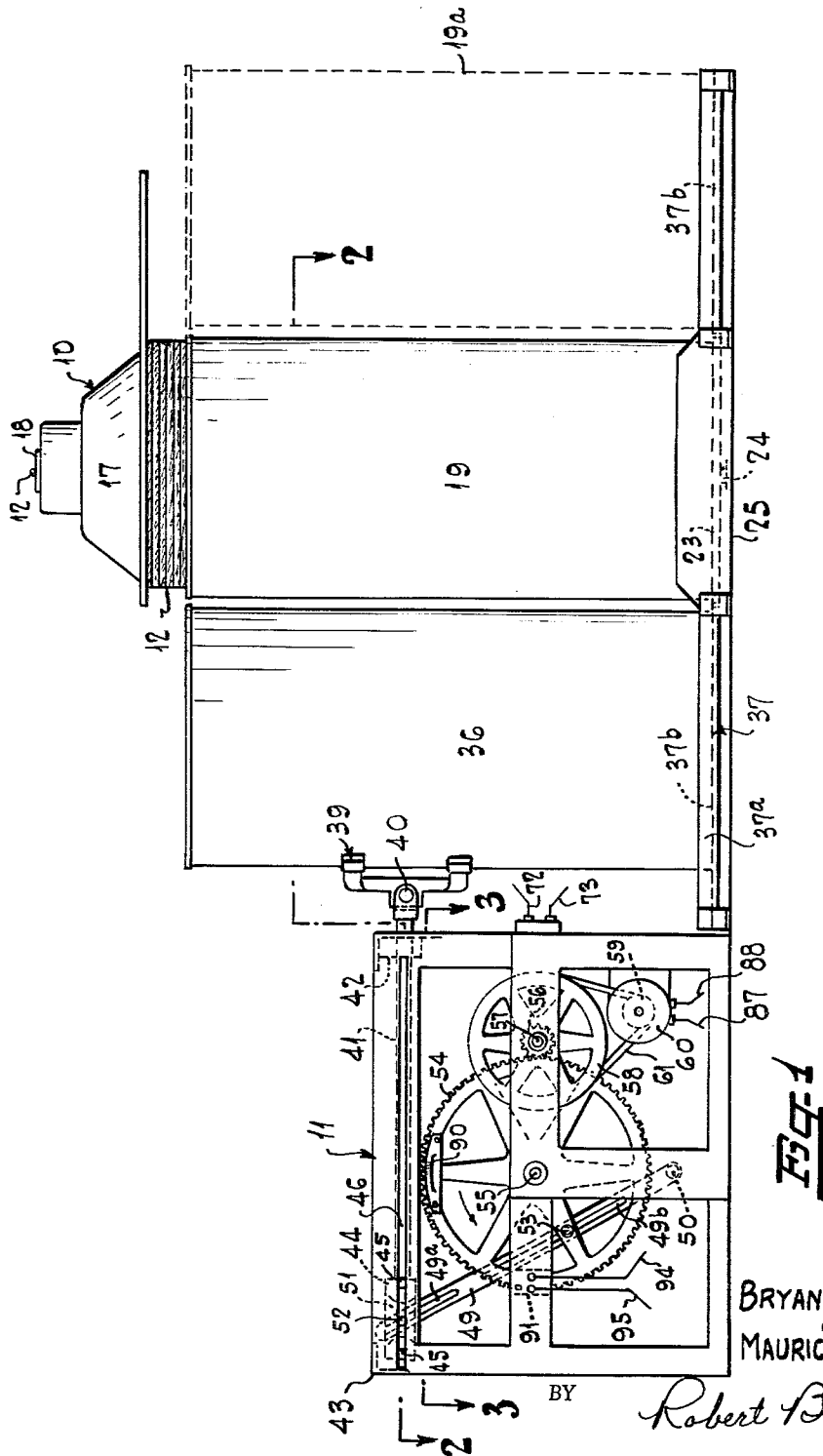
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AUTOMATIC CAN DOFFERS FOR SLIVER PROCESSING MACHINES

Filed May 20, 1963

2 Sheets-Sheet 1



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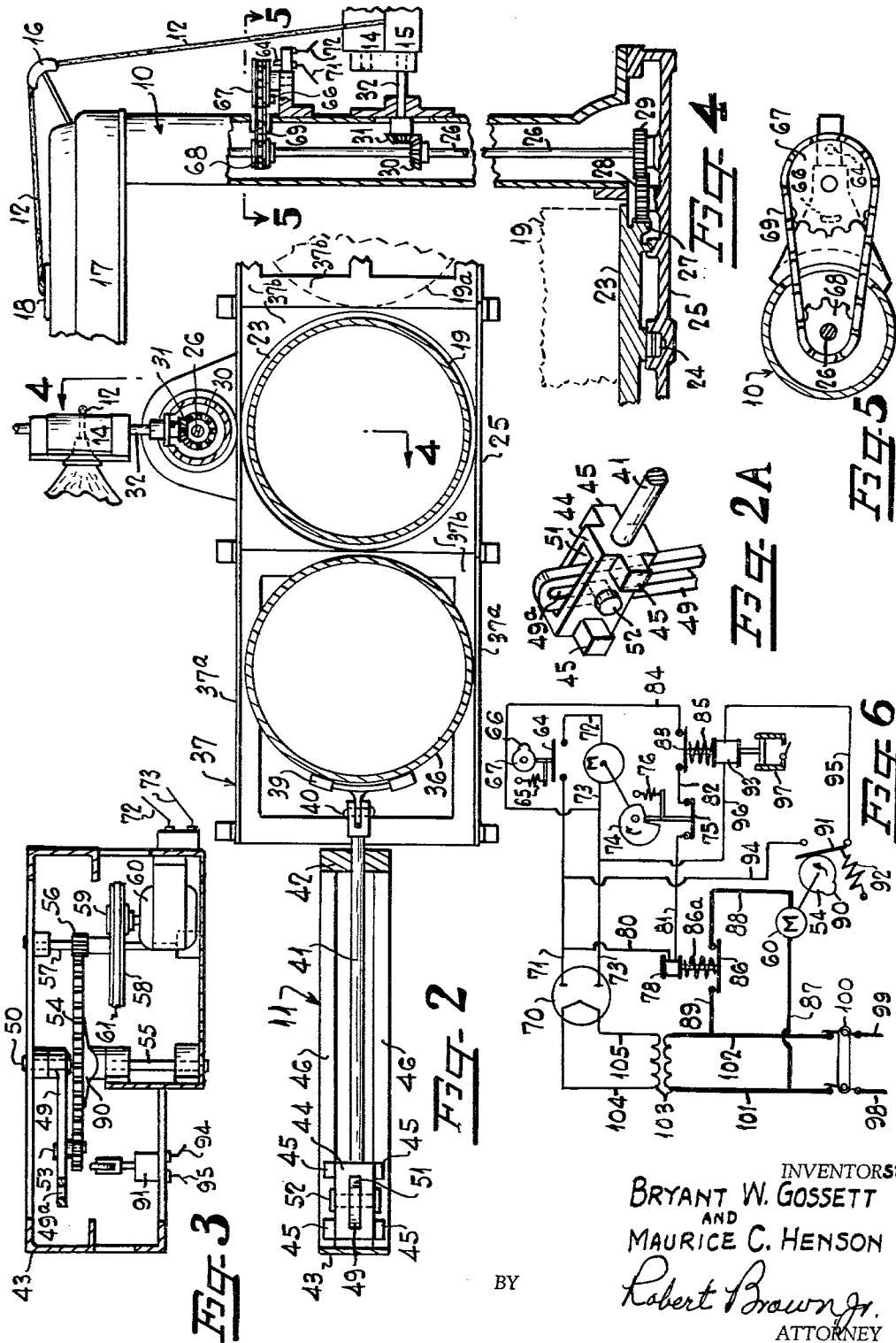
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AUTOMATIC CAN DOFFERS FOR SLIVER PROCESSING MACHINES

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Filed May 20, 1963, Ser. No. 281,739
4 Claims. (Cl. 19—159)

This invention relates to apparatus for forming a strand of material into successive condensed units such as cans, cartons, packages or piles, and more especially to a device for removing each such unit from strand receiving position after a predetermined length has been delivered. Although the device has wide usage, the most outstanding results thus far obtained have been in the handling of sliver delivered from textile machines such as coilers, draw frames, carding engines and the like and into cans in a prearranged order so as to permit subsequent withdrawal without entanglement.

The necessity for the present invention has become of increasing importance with the comparatively recent trend toward higher sliver delivery rates of textile machinery which, in turn, has increased the burden of doffing the filled cans to such an extent that it is now impractical and economically unfeasible to perform the task manually, or with prior art devices intended to automatically doff filled sliver cans.

It is therefore an object of this invention to provide a doffing apparatus of the class described which will overcome the above-mentioned difficulties.

It is another object of invention to provide a doffing apparatus having an electrically controlled reciprocatory pusher bar for automatically removing cans from sliver receiving position as they become filled and simultaneously replacing them with empty cans.

It is another object of invention to provide the combination of a stationary sliver coiler having a rotary base for supporting a can in sliver receiving position, a chute for confining an empty can in alignment with and adjacent to the supported can, and a reciprocatory bar movable forwardly of the chute a distance at least equal to the dimension of the empty can to move both cans forwardly so as to remove the supported can from the rotary base and replace it with the empty can. The subsequent reverse movement of the bar will thus be sufficient to provide space for accommodating the succeeding empty can. This arrangement substitutes a simple chute and a single can base rotatable about a stationary axis for platforms of the type disclosed in Patent No. 271,155 and which are mounted upon a trackway, each such platform having at least two rotary can supporting plates successively movable therewith to sliver receiving position.

It is another object of invention to provide an automatic can doffer for card coilers comprising a reciprocatory can advancing member having a rotary actuating mechanism which yieldingly holds the advancing member in fully retracted position at the end of one doffing cycle and at the beginning of the succeeding cycle. The actuating mechanism is so constructed and arranged that its forward movement at the beginning of a doffing cycle is yieldingly resisted by progressively increasing forces and its reverse movement or back-lash by similar progressively increasing forces. Thus, during a short period covering the end of one operating cycle and the beginning of another, the can actuating mechanism is yieldingly confined in position. During operation, externally applied operating forces are disconnected after somewhat more than the required amount of power and momentum have been exerted than is necessary to complete the cycle. Over-run at the end of the cycle, however, will be yieldingly resisted as pointed out above.

It is another object of invention to provide an automatic doffer for card cans and the like which is simple in construction, relatively inexpensive to manufacture, and highly efficient in operation.

Some of the objects of invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which—

FIGURE 1 is an elevational view showing a sliver coiler in combination with apparatus for automatically replacing coiler cans filled with sliver with empty cans;

FIGURE 2 is a sectional plan view taken along line 2—2 in FIGURE 1;

FIGURE 2A is an isometric view of portions of the can advancing mechanism shown in the upper left-hand portion of FIGURE 1;

FIGURE 3 is a sectional plan view taken along line 3—3 in FIGURE 1;

FIGURE 4 is a vertical sectional view taken along line 4—4 in FIGURE 2;

FIGURE 5 is a sectional plan view taken along line 5—5 in FIGURE 4 and showing the operating mechanism for the impulse switch which is responsive to the length of sliver deposited in the coiler can; and

FIGURE 6 is a wiring diagram illustrating one manner of electrically controlling the automatic operation of the present invention.

Referring more particularly to the drawings, the numeral 10 broadly designates a conventional coiler for textile sliver, and the numeral 11 broadly designates an automatic doffing apparatus associated with the coiler.

A strand of sliver 12 passes in a well-known manner from calender rolls 14 and 15 (FIGURE 4) at the delivery end of a carding engine, draw frame or similar sliver processing mechanism (not shown), then upwardly over guide 16, downwardly into coiler head 17 through trumpet 18, and into sliver can 19. Can 19 is supported beneath coiler head 17 upon a can plate 23 rotatably mounted in bearing 24 of coiler base 25. Can plate 23 is driven in a conventional manner by upright coiler shaft 26 through a series of intermeshing gears 27, 28 and 29, said shaft 26 being driven by a pair of beveled gears 30 and 31 and a shaft 32 extending from lower calender roll 15.

The present invention automatically effects replacement of can 19, when filled with sliver substantially as shown in FIGURE 1, with an empty can 36, at which time the filled can is advanced to dotted line position 19a. An elongated chute or channel 37 is disposed beneath coiler head 17, said chute having parallel upstanding walls 37a between which cans 19 and 36 are confined while moving longitudinally of the chute and beneath the coiler head. Chute 37 also has a horizontal bottom 37b which is flush-top with rotary can plate 23 whereby the cans may be moved intermittently to and from sliver receiving position without obstruction.

The intermittent can movement is effected by apparatus 11 when the sliver receiving can 19 has been filled with a predetermined length of strand 12. The can-pushing mechanism of apparatus 11 comprises a contact shoe or pusher member 39 for engaging empty can 36 intermediate its upper and lower ends, said shoe being pivoted as at 40 to one end of reciprocatory shaft 41 supported horizontally in bearing 42 of framework 43. The other end of shaft 41 has a slide block 44 secured thereto (FIGURES 2 and 2A), which block has four laterally extending lugs 45 slidably mounted in horizontal guide slots 46. It will be observed in FIGURE 2 that shaft 41 is alined with the longitudinal centerline of chute 37 as well as the vertical axis of rotation of can plate 23 so that the cans will pass precisely underneath coiler head 17 and onto the can plate.

Members 39 through 45 are reciprocated horizontally by means of a lever or leverage member 49, said member being mounted on framework 43 by means of pivot pin 50 and having its upper end extending through a slot 51 in block 44. The upper end of lever 49 has a slot 49a therein which is slidably penetrated by a pin 52 extending transversely of slot 51. It is apparent from FIGURES 1 and 2 that lever 49 is mounted for oscillation in a plane which also includes the reciprocatory axis of shaft 41 upon which pusher member 39 is mounted. The intermediate portion of lever 49 has another slot 49b therein which is slidably penetrated by a pin 53 eccentrically mounted upon one face of gear wheel 54, the gear wheel being mounted upon rotatable shaft 55. Wheel 54 is driven by pinion 56 fixedly mounted upon shaft 57, said shaft having pulley 58 fixedly mounted thereon. Pulley 58 is driven by a smaller pulley 59 of motor 60 by means of belt 61.

It is evident from FIGURES 1 and 2 that the rotation of gear 54 by the above-described members 56 through 61 will oscillate lever 49 to impart reciprocatory movement to shoe 39.

One revolution of gear corresponds to each doffing cycle during which shoe 39 is advanced to fully extended position and then fully retracted to the position shown in FIGURE 1. Gear 54 exerts a minimum or substantially zero operating stress upon pins 53 and lever slot 49b in the position shown in FIGURE 1 at the beginning of a cycle and at the end of the preceding cycle of the doffing mechanism, at which time the shoe 39 is fully retracted. In other words, the lever slot 49b is tangent to the circular path of travel of pin 53 when the shoe or pusher member 39 is in fully retracted position and therefore the pin travels parallel to the slot at the instant the tangential relationship is assumed. When such tangential relationship exists, the longitudinal axis of leverage member 49 is disposed substantially normal or at right angles to the radius containing the pin 53 of rotary member 54. Forward advancement of shoe 39 from fully retracted position is yieldingly resisted by progressively increasing operating stresses during the initial rotation of gear 54. During the completion of the revolution of gear 54 there is a progressively decreasing operating stress until a substantially zero torque or operating stress is reached when shoe is fully retracted. The progressively decreasing stress at the end of the cycle facilitates the return of the parts to fully retracted position while the progressively increasing stresses encountered at the beginning of the succeeding cycle serves as a yieldable stop tending to hold the shoe in fully retracted position.

Stated in greater detail, the operating stress or the load exerted by motor 60 to move only the lever 49 and mechanism driven thereby forwardly from retracted position increases rapidly from substantially zero stress to a maximum stress during the first 60 degrees counterclockwise rotation of gear 54 (FIGURE 1) because the distance between lever pivot 50 and the point of sliding contact of pin 53 with slot 49b gradually decreases, thereby decreasing the effective lever arm by which the power of motor 60 is transmitted to shaft 41 and the associated pusher member 39. After gear 54 rotates the first 60 degrees from the starting position shown in FIGURE 1, the lever 49 will assume a vertical position with pin 53 in its closest position relative to lever pivot 50 which corresponds to the shortest leverage for actuating members 41 and 39. During the immediately following 60 degrees counterclockwise rotation of gear 54 the operating stress will progressively decrease substantially to zero with slot 49b again substantially tangent to the circular path of travel of pin 53, but with lever 49 and shoe 39 in fully advanced position.

During the next succeeding 120 degrees rotation of gear 54 the shoe 39 will move toward retracted position and the operating stress will progressively increase from

zero to another peak stress which is relatively lower than the aforementioned maximum stress occurring after the initial 60 degrees rotation of the doffing cycle, at which time slot 49b will be vertically disposed. This lesser peak stress is due to the fact that pin 53 is then engaging slot 49b at a greater distance from lever pivot 50 and nearer point 52. During the final 120 degrees rotation of gear 54, the operating stress will progressively decline at the end of the doffing cycle from said lesser peak stress to substantially zero stress and to the positions occupied by lever 49 and gear 54 in FIGURE 1, at which time, further forward rotation will be yieldingly resisted by progressively increasing operating stresses previously described and occurring at the beginning of the succeeding cycle.

It is of course necessary during a doffing operation for motor 60 to exert a force in addition to that previously described during the first 120 degrees rotation of gear 54, the additional force being at least sufficient to slide cans 19 and 36 one step forwardly. Thus the operating stress will be increased substantially over the entire period of advancement of shoe 39. The operating stresses during a doffing operation and while gear 54 rotates the retracting 240 degrees will remain the same as described in the preceding paragraph.

An operating cycle of the invention consists of a measuring cycle during which sliver of a predetermined length is deposited into a can, and a doffing cycle during which a filled can is replaced by an empty one. These two cycles alternate with one another.

FIGURE 6 diagrammatically illustrates one form of electrical wiring which may be employed to automatically control the alternate measuring and doffing cycles. The parts shown in this diagram occupy positions at the termination of a measuring cycle and at the beginning of a can doffing cycle.

The measuring means of sliver strand 12, as it is deposited into can 19, comprises an impulse switch 64 (FIGURES 4, 5 and 6) which is normally held in open position by spring 65 and intermittently closed by a cam 66 on rotating sprocket 67, said sprocket being driven by upright coiler shaft 26 by suitable means as another sprocket 68 and a chain 69. Each closing of switch 64 energizes a circuit leading from rectifier 70, which circuit includes conductors 71, 72 and 73 and clock motor M. Intermittent energization of motor M will intermittently rotate cam 74 in a clockwise manner, said cam controlling switch 75 which is normally urged toward closed position by spring 76.

A full revolution of the cam 74 corresponds to a sliver measuring cycle, at which time switch 75 is automatically closed to initiate controls which start motor 60 as described below.

The switch 75 controls the circuit which energizes solenoid 78, the latter controlling the circuit through motor 60. The solenoid circuit comprises conductor 80, leading from conductor 71 to the solenoid 78, conductor 81 leading from solenoid 78 to switch 75, conductor 82 leading from switch 75 to switch 83, and conductor 84 leading from switch 83 to conductor 73. Switch 83 is normally held in closed position by spring 85.

The closing of switch 75 energizes solenoid 78 which closes switch 86, normally held in open position by spring 86a. Switch 86 is in the same circuit with motor 60, the circuit also including conductors 87, 88 and 89. With switch 75 closed, motor 60 will rotate gear 54 in a counterclockwise direction (FIGURE 1) until cam 90 on said gear engages and closes switch 91, the latter switch being normally held in open position by spring 92.

Broadly stated, the function of switch 91 is to effect de-energization of solenoid 78 and cause motor switch 86 to be opened by spring 86a to stop motor 60. More specifically, the closing of switch 91 energizes solenoid 93 through the circuit including conductors 94, 95 and 96, thereby opening switch 83 to de-energize solenoid 78 as

5

stated above. It is important to note, however, that rotating cam 90 is so positioned relative to switch 91 as to effect stoppage of current flow through motor 60 after sufficient power has been exerted to doff the filled can 19, replace it with empty can 36, and return the mechanism to normal position as shown in FIGURE 1, all substantially in advance of the end of a doffing cycle. It will be noted in FIGURE 1 that gear 54 and its associated pin 53 must rotate in a counterclockwise direction through an angle of approximately 90 degrees before the cam 90 contacts switch 91 to de-energize motor 60. During this one quarter revolution of gear 54 at the beginning of a cycle, the motor has imparted sufficient momentum to can actuating members 49, 41 and 39 to complete the cycle, and a residual momentum which will insure a reasonable rotational speed at the end of the cycle. Overrun of gear 54 at the end of the cycle will be prevented by the aforementioned progressively increasing resistance offered at the beginning of the next cycle.

A dashpot 97, or other time delay device, is attached to solenoid 93 to delay return of switch 83 to closed position until the switch 75 has been opened by the continued clockwise rotation of cam 74 (FIGURE 6). Thus the motor circuit switch 86 will remain open until the succeeding measuring cycle is completed, that is, until substantially another revolution of cam 74 is made. Alternating current is supplied to the motor circuit by leads 98 and 99 from which the current passes to master switch 100 and conductors 101 and 102. Current for operation of the remaining circuits passes from conductors 101 and 102, through transformer 103, and then through conductors 104 and 105 to rectifier 70.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. In combination with sliver processing machinery having cans at the delivery end thereof for receiving the sliver, doffing apparatus for successively replacing filled cans at sliver receiving position with adjacent empty cans comprising a reciprocatory pusher member engageable with said empty can and movable toward and away from sliver receiving position, a leverage member having a free end mounted for oscillation about a pivot, said pusher member being connected to said free end, a rotatably mounted member for oscillating said leverage member, and connecting means between said two last-named members, said connecting means including a slot in one of the two last-named members and a pin on the other for slidably engaging said slot whereby the rotary motion of the rotatably mounted member will impart oscillatory motion to said leverage member.

2. In combination with a textile sliver coiler having a horizontally disposed plate mounted for rotation about a vertical axis and adapted to support thereon a can in sliver receiving position, apparatus for successively replacing a can supported on said plate with an empty can comprising: an elongated chute for supporting an empty can alongside said supported can, said chute having a bottom

6

substantially flush-top with and including the upper surface of said plate, a pusher member engageable with said empty can and mounted for reciprocation longitudinally of said chute toward and away from the sliver receiving can, a leverage member having a free end mounted for oscillation about a pivot, connecting means between said pusher member and the free end of said leverage member, said means including a pin on one of said members and a slot in the other whereby the oscillatory motion of the leverage member will impart reciprocatory motion to the pusher member to push the engaged empty can onto said plate concurrently with pushing the sliver receiving can off the latter, a rotatably mounted member for oscillating said leverage member, and a second connecting means between said two last-named members, said second means including a slot in one of the two last-named members and a pin on the other whereby the rotary motion of said rotary member will impart oscillatory motion to said leverage member.

3. In combination with a textile sliver coiler having a horizontally disposed plate mounted for rotation about a vertical axis and adapted to support thereon a can in sliver receiving position, apparatus for successively replacing a can supported on said plate with an empty can comprising: an elongated chute for supporting an empty can alongside said supported can, said chute having a bottom substantially flush-top with and including the upper surface of said plate, a pusher member engageable with said empty can and extensible and retractable longitudinally of said chute, an elongated leverage member having a free end mounted for oscillation about a pivot, connecting means between said pusher member and the free end of said leverage member, a rotatably mounted member, and a second connecting means fixedly mounted on one of said two last-named members and reciprocably mounted relative to the other, whereby the rotation of said rotatably mounted member will impart oscillatory motion to said leverage member to thereby extend and retract the pusher member.

4. The combination as defined in claim 3 wherein said second connecting means is disposed substantially at the intersection of the longitudinal axis of said leverage member with a normally disposed radius of said rotatably mounted member when the pusher member is in retracted position whereby the torque between the rotatable and leverage members will be substantially zero.

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