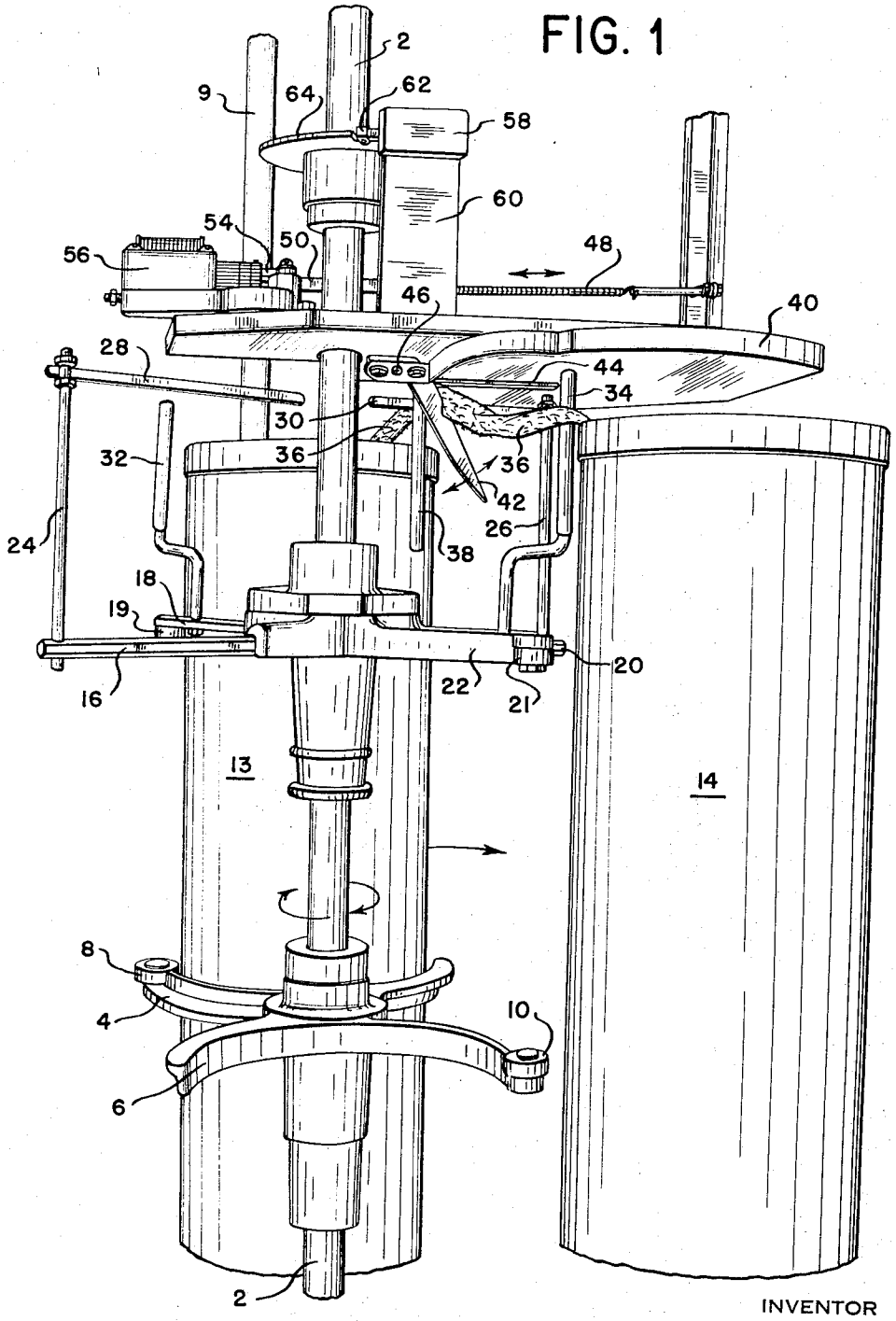
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DOFFING APPARATUS

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FIG. 1



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FIG. 2

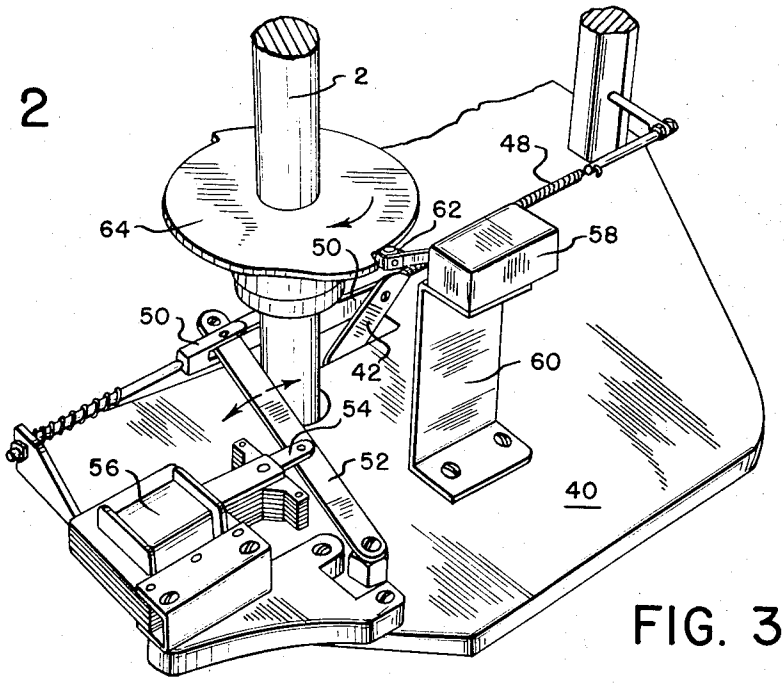
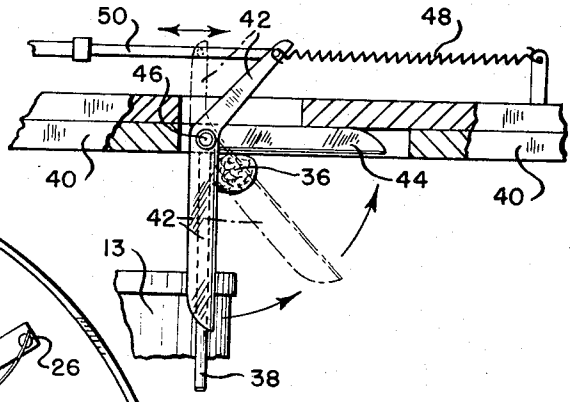


FIG. 3



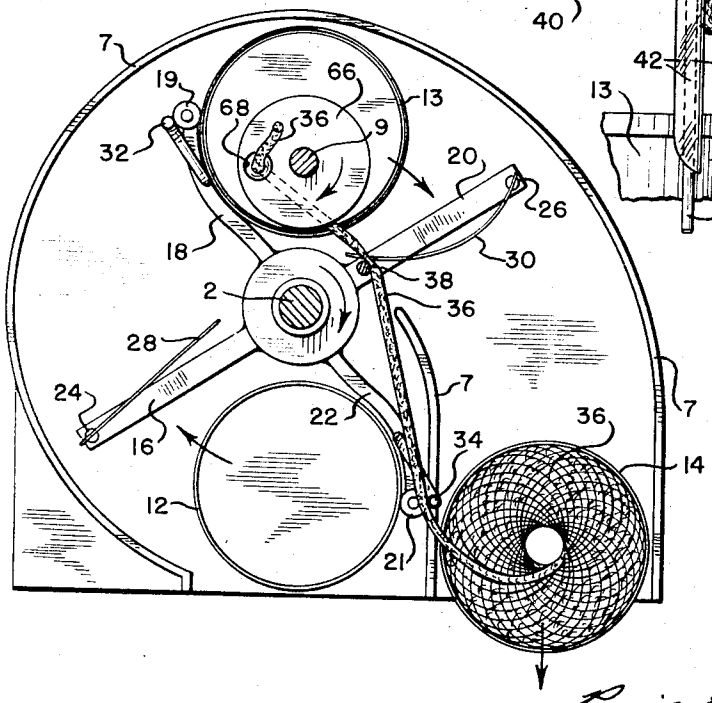


FIG. 4

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3,354,513

DOFFING APPARATUS

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Filed Jan. 23, 1964, Ser. No. 339,771
10 Claims. (Cl. 19—159)

This invention has reference to an apparatus for doffing sliver cans after they have been packed with sliver. The invention is particularly directed to a doffing apparatus which ejects a sliver can after it has been packed, cuts the sliver end to a predetermined length and feeds an empty sliver can into packaging position.

Sliver is a composite of textile fibers arranged in a rope-like mass having a substantially circular cross-section. After the individual fibers have been cleaned and straightened in a carding machine, they are combined as they leave the machine to form the sliver. It is customary at this stage to package the sliver in cans or drums. At a later stage in the manufacture of yarn, several slivers may be combined in a drawing frame and the sliver thus formed is also packaged in cans.

Sliver is packaged by means of a sliver packaging apparatus. The principal element of such an apparatus is the coiler head. The coiler head is equipped with a revolving plate so that the sliver is deposited into the sliver can in a coiled manner. It is also conventional to rotate the sliver can during the packaging operation (usually clockwise in the same direction as that of the revolving plate of the coiler head) by means of a turntable upon which the sliver can rests. The sliver packaging apparatus may, as in conventional, have the coiler head in a fixed position above the sliver can or, as disclosed in co-pending Robinson et al. application Ser. No. 284,693, now Patent No. 3,241,196, assigned to the same assignee herein, have a movable coiler head which is movable vertically within the sliver can.

For the purpose of efficiency and economy of operation it is desirable to fill sliver cans quickly, remove them rapidly, and immediately replace the doffed can with the empty can next to be filled. The doffing mechanism must not interfere with the rotary motion of the sliver can on the turntable yet should permit the can to be positively moved off the turntable at the proper moment. As the filled sliver can is moved away from its packaging position on the turntable a length of sliver will be extending from the can to the coiler head (the device which feeds sliver into a sliver can). Before the succeeding empty sliver can may be packed that length of sliver must be cut. It is preferred that the sliver ends be cut to some constant remaining length to reduce waste and to facilitate the subsequent removal of sliver from the packed can. It is further desirable that at the start of the packaging operation in the empty sliver can the initial end of sliver be positioned below the sliver coils and not in a potentially entangling position along the side of the can. The present invention meets all the above objectives and may be used in a sliver packaging apparatus having either a fixed conventional type coiler head, or a movable coiler head.

Broadly, the present invention is for a sliver can doffing mechanism which comprises a rotatable doffer shaft having can engaging means attached thereto. A sliver positioning means positions the sliver preparatory to cutting by a sliver severing means.

In the preferred embodiment of the invention the can engaging means comprises a pair of can engaging collars which function to eject a packed sliver can and bring an empty sliver can into packaging position upon rotation of the doffer shaft. The sliver positioning means is also keyed to the rotation of the shaft. The sliver positioning

means comprises a sliver support finger, a sliver guide post, and a sliver gathering post for drawing the supported sliver against the sliver guide post. When so drawn taut against the guide post the sliver is adjacent the sliver severing means which comprises a fixed shear blade and a flying shear blade. The movement of the flying shear blade in cooperation with the fixed blade cuts the sliver. The timing and actuation of the flying shear blade is governed by a trip cam on the doffer shaft acting in cooperation with a cam operated switch and a solenoid.

A better understanding of the invention can be had by reference to the drawings which illustrate a preferred embodiment of the invention.

FIG. 1 is a perspective of the sliver can doffing apparatus showing, generally, the can feeding and doffing means, the sliver gathering means, the sliver severing means and the knife actuating means.

FIG. 2 is a perspective of the knife actuating means.

FIG. 3 is a sectioned elevation of the sliver severing means.

FIG. 4 is a schematic plan of the can feeding and doffing means.

The sliver can doffing apparatus shown in the drawings comprises and combines as its major elements a sliver can feeding and doffing means, a sliver gathering and positioning means, a sliver severing means, and a knife actuating means. Referring specifically to FIG. 1, the principal axis to which these various elements are related is doffer shaft 2. Doffer shaft 2 is a vertical shaft which is intermittently rotated through an arc of 180° by a drive and control means (not shown). The periods of rotation of doffer shaft 2 are related to the sliver packaging cycle and to the completion of the sliver packaging operation.

The sliver can feeding and doffing means is best seen in FIG. 1. Doffer shaft 2 is rotatably mounted on a frame (not fully shown) of the doffing apparatus. To the rotatable doffer shaft 2 are affixed sliver can engaging collars 4 and 6. Rollers 8 and 10 are pivotally mounted upon one end of each collar 4 and 6 respectively. The collars 4 and 6, and the rollers 8 and 10 mounted thereon, cooperatively engage the sliver cans. A sliver can 13 is shown in packaging position and a packed sliver can 14 is shown in the doffed position. A guide rail 7 (FIG. 4) directs the course of the sliver cans as the doffer shaft 2 is rotated.

Also shown is a support column 9 connected to the coiler head which is inside sliver can 13. The coiler head is of the movable type described in the above-mentioned co-pending Robinson et al. application.

The sliver gathering means is best seen in FIG. 1, and FIG. 4. Located on doffer shaft 2 above the can engaging collars 4 and 6 are spokes 16, 18, 20 and 22. Spokes 16 and 20, which for purposes of clarification shall be called finger support spokes, have attached near their ends finger support rods 24 and 26 respectively. The finger support rods 24 and 26 in turn support horizontal sliver support fingers 28 and 30. Spokes 18 and 22 have affixed near their ends upright sliver gathering posts 32 and 34 which are polished to prevent snagging the sliver 36. In the preferred embodiment spokes 18 and 22 have rotatably mounted at their ends rollers 19 and 21 respectively. Spokes 18 and 22 serve the additional function of stabilizing the relatively long and narrow sliver cans as the cans are moved and assist in the movement.

Sliver guide post 38 is also a part of the sliver gathering means. However, it is not connected to the doffer shaft 2 but depends from an independent support plate 40. Support plate 40 also functions to support the sliver severing means and the knife actuating means.

The sliver severing means comprises a flying blade 42 and a stationary blade 44. Referring to FIG. 3, the flying blade 42 is shown at rest and the dotted line representation

shows the flying blade during the severing step. Flying blade **42** is pivotally mounted upon pin **46** and held in a neutral position by spring **48**. Flying blade **46** is operated by linking rod **50**. The cutting of the sliver **36** results from the scissor action of the flying blade **42** in cooperation with the stationary blade **44**, which blade is shown recessed in support plate **40**.

The knife actuating means is located atop support plate **40** and is best illustrated in FIG. 2. There the upper portion of blade **42** and spring **48** are shown with spring **48** retaining the blade in its neutral position. Actuating rod **50** is connected to a pivoted lever **52** which in turn is caused to move by a connecting rod **54** actuated by solenoid **56**. The solenoid **56** is energized by the closing of switch **58** mounted upon support **60**. Switch **58** is electrically connected to solenoid **56** by wires (not shown). Switch **58** is closed by the movement of cam follower **62**. Cam follower **62** follows trip cam **64** which in turn is keyed to doffer shaft **2**.

FIG. 4 is a schematic plan view showing the relationship of the empty, and filled sliver cans in the doffing cycle and the sliver gathering and positioning means. The purpose of FIG. 4 is primarily to aid in the illustration of the sliver gathering means. Therefore, the sliver can engaging collars are not shown nor is the severing means. An empty sliver can **12** is shown in standby position while can **13** is being packed and can **14** ejected. Also represented is the rotating plate portion **66** of a coiler head (not shown). Sliver **36** is packed into can **13** via the opening **68** in the rotating plate **66**.

In describing the operation of the preferred embodiment the sliver can doffing apparatus, principal reference will be made to FIG. 1. That figure shows sliver can **13** in the packaging position and sliver can **14** in the ejected or doffed position. It is understood, however, that immediately prior to the initiation of the doffing cycle sliver can **14** had been in the packaging position of sliver can **13**. It must further be visualized that the doffer shaft **2** and all parts connected thereto had been positioned one-half turn counterclockwise of the positions of FIG. 1.

The sequential operation of the mechanism commences when the sliver can being packaged becomes filled, and the coiled head operation is stopped. At that time the movable coiler head is lifted from sliver can **14** to a position above the top of the sliver can thereby permitting the sideway movement of the sliver can. By control and drive means (not shown), doffer shaft **2** is rotated one-half turn clockwise per doffing cycle. Thus, can engaging collar **6**, which partially encompasses sliver can **14**, is moved in a clockwise direction carrying with it sliver can **14**. The travel of sliver can **14** is directed by guide rails **7** (see FIG. 4). Due to the divergent path of sliver can **14**, collar **6** disengages after approximately 160° turn of the doffer shaft **2**. Smooth disengagement is enhanced by the roller **10**.

Simultaneously, sliver can **13**, formerly in standby position, (as is can **12** in FIG. 3) is impelled into packaging position by the movement of collar **8** and the cooperative engagement of the can with the guide rail **7**. Once sliver can **13** is in packaging position the movable coiler head with its rotating plate portion **66** is thrust downwardly into the can and the packaging of can **13** is commenced.

Since the coiler head is stationary in a lateral sense (i.e. in constant position over the packaging station) it is evident that during the doffing of sliver can **14** a length of sliver **36** is drawn from can **14**. To continue the sliver packaging operation the sliver extending between the doffed can **14** and the opening **68** of the rotating plate portion **66** of the coiler head must be cut before the coiler head starts downward.

As can **14** is being doffed flexible finger **30** carried by the rotation of spoke **20** passes beneath the length of sliver **36** which is being extended from the rotating plate **66** of the now raised coiler head to the sliver can **14**. Flexible finger **30**, which is relatively rigid along the vertical axis,

supports sliver **36** until the sliver is cut and for a brief period thereafter. The sliver support finger **30** is situated so that it not only supports the sliver **36** but holds the severed end lightly against the bottom of support plate **40**. This has the advantage of holding the severed sliver end until the weight of additional sliver entering through opening **68** is sufficient to pull the severed sliver end off the sliver support finger **30**. Thus the extended length of sliver is deposited at the bottom of the empty sliver can **12** to insure the proper commencement of the next packaging operation.

The rotary motion of doffer shaft **2** also causes sliver gathering post **34** to rotate about the doffer shaft axis. In so doing, sliver gathering post **34** contacts sliver **36**. The continued revolution of sliver gathering post **34** thus forces the sliver **36** against guide post **38** which post is fixed in a position radially inward of gathering post **34**. Thus, flexible finger **30**, guide post **38**, gathering post **34** and their respective movements cooperate to locate the sliver **36** between the blades **42** and **44** of the severing means. Because of the pressure of support finger **30** against sliver **36** held between the finger **30** and the support plate **40** and the movement of sliver gathering post **34**, the length of sliver between guide post **38** and gathering post **34** is held taut while it is also to be noted that the relative positions of all the cooperating parts causes the sliver tails from the doffed can be cut at constant lengths.

Since finger **30** is laterally flexible, it remains in contact with depending guide post **38** for a brief period as finger support rod **26** continues its arc about doffer shaft **2**. During this period sliver **36** is prevented from sliding inwardly off finger **30** or downwardly under post **38**. This insures the maintenance of proper sliver position during the severing cycle.

The moment at which the severing means is actuated is controlled by trip cam **64**. Cam **64** is keyed to doffer shaft **2** and designed to close switch **58** via cam follower **62** once during every one-half rotation of doffer shaft **2**. The closing of switch **58** energizes solenoid **56** thereby actuating flying blade **42** via the linkage of parts **50**, **52**, and **54**. Because the trip cam **64** and the movements of the can doffing means and the sliver gathering means are all keyed to the doffer shaft **2** it follows that the severing means is actuated at the same relative moment in each doffing cycle. Therefore, the sliver tail ends are cut at uniform lengths regardless of the relative stop position of opening **68** in rotating plate portion **66**.

The doffing cycle above described involves one-half rotation of the doffer shaft **2**. In the next succeeding doffing sequence the doffer shaft **2** is rotated through the second half of its arc. During the second half rotation the parts corresponding to those above discussed perform comparable functions. Thus, for example flexible finger **28** would support sliver **36** and sliver gathering post **32** would bring the sliver to bear against guide post **38**.

The foregoing discussion has been made with respect to a preferred embodiment of the invention. The numbers of the elements (e.g. the number of sliver support fingers) could be varied as well as the specific structure shown without departing from the spirit of the invention.

I claim:

1. In a sliver packaging apparatus wherein each of a succession of cans is positioned below a coiler head to be filled with sliver from the coiler head, the improvement of a sliver-can doffing mechanism which comprises:

(a) a support plate.

(b) a rotatable shaft extending through said plate,

(c) a can positioning means carried by said shaft for moving a filled can away from the coiler head and for moving an unfilled can toward the coiler head thereby extending the sliver between the filled can and the coiler head.

(d) sliver severing means carried by said support plate,

(e) sliver positioning means including means carried by the shaft in a fixed position relative to the can positioning means and rotatable by said shaft for positioning the extended sliver at the severing means, and

(f) means operatively associated with said shaft upon rotation thereof for actuating said severing means when the sliver is positioned at the severing means to be severed thereby.

2. Apparatus according to claim 1 wherein said cans are disposed generally vertically and below said severing means such that the severed end of sliver, extending from said coiler head, will be deposited at the bottom of said empty can.

3. Apparatus according to claim 1 wherein said shaft and cans are disposed generally vertically and the means included in said sliver positioning means carried by said shaft comprises:

(a) a first spoke extending generally radially from said shaft,

(b) a sliver gathering post which is carried by a portion of said first spoke remote from the shaft, and against which said sliver from a filled can is drawn as the shaft is rotated,

(c) a second spoke extending generally radially from said shaft and spaced from said first spoke,

(d) a sliver support finger carried by a portion of said second spoke remote from the shaft, for supporting said sliver before and after it is severed, and

(e) said sliver positioning means further comprises a sliver guide post extending from said support plate for cooperating with said gathering post to guide said sliver to said severing means.

4. Apparatus according to claim 1 wherein said sliver severing means comprises:

(a) a stationary shear blade, and

(b) a shear blade mounted for movement toward said stationary blade, said sliver being severed by scissor action of the blades.

5. Apparatus according to claim 1 wherein said can positioning means is a collar which is attached to said rotatable shaft and which partially encircles a can and engages same upon the rotation of said shaft.

6. Apparatus according to claim 4 wherein said means for actuating said severing means includes:

(a) a cam carried by said rotatable shaft,

(b) a switch carried by said support plate and operated by said cam,

(c) a solenoid carried by said support frame, and operably connected to said movable shear blade.

7. Apparatus according to claim 3 further comprising:

(a) means on said support plate for rotating said shaft intermittently, and

(b) said gathering post being disposed radially outward of said guide post,

(c) said support finger comprising a body part fixedly attached to said second spoke and a generally horizontal part extending inwardly from said body part, the extended sliver being supported between said horizontal part and the bottom of said support plate.

8. Apparatus according to claim 7 wherein said guide post and said gathering post are disposed substantially parallel to said shaft.

9. Apparatus according to claim 7 wherein:

(a) said support finger is horizontal, and

(b) said guide post is disposed radially outward of the arc described by the inner end of said flexible finger during rotation of said shaft.

10. Apparatus according to claim 9 wherein there are two similar and adjacent sliver positioning means and two similar and adjacent can engaging means, such that a doffing cycle occurs with each half revolution of said shaft.

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