Oct. 21, 1969 A. M. MERRILL ET AL 3,473,748

ROLL REMOVAL AND SHAFT HANDLING APPARATUS AND METHOD FOR REWINDER

Filed May 31, 1967 2 Sheets-Sheet 1

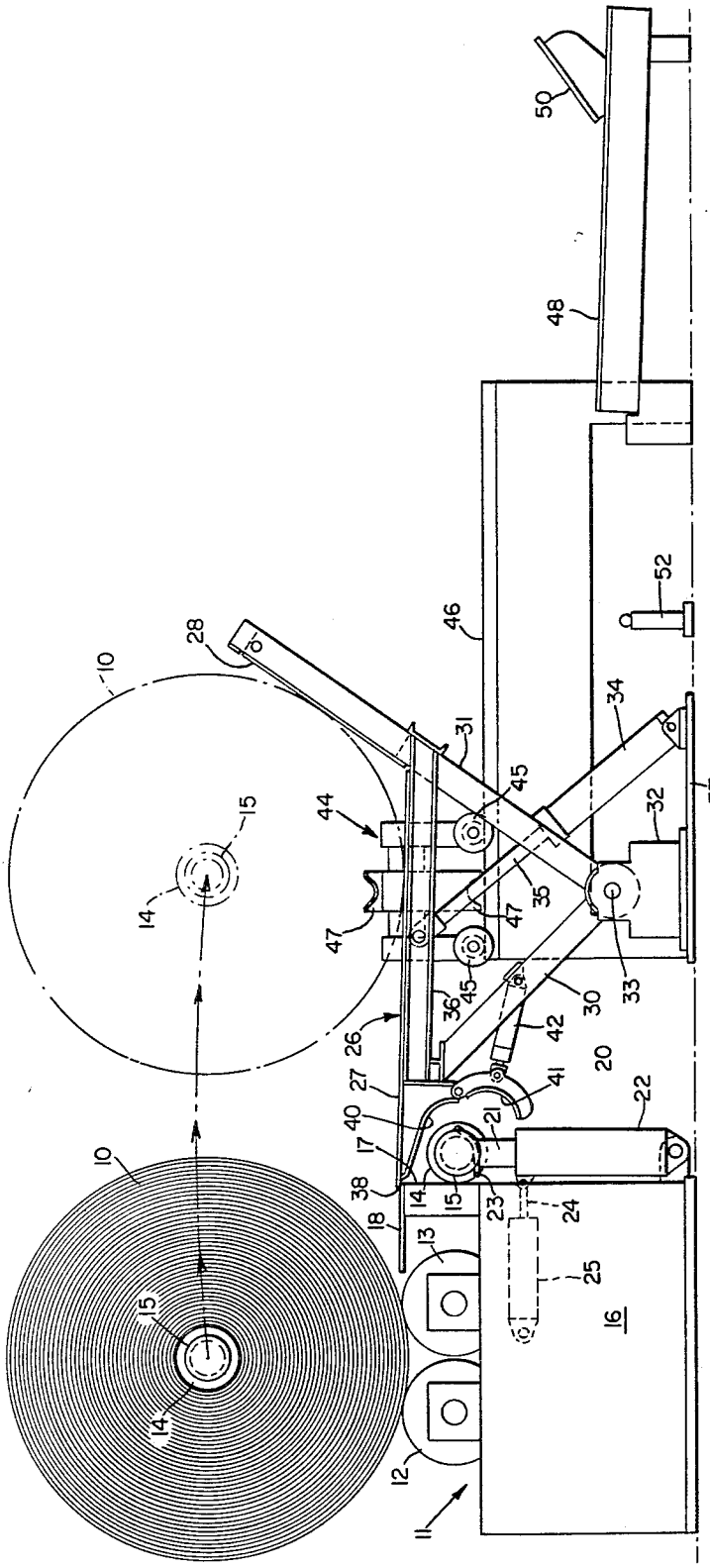


Fig. 1

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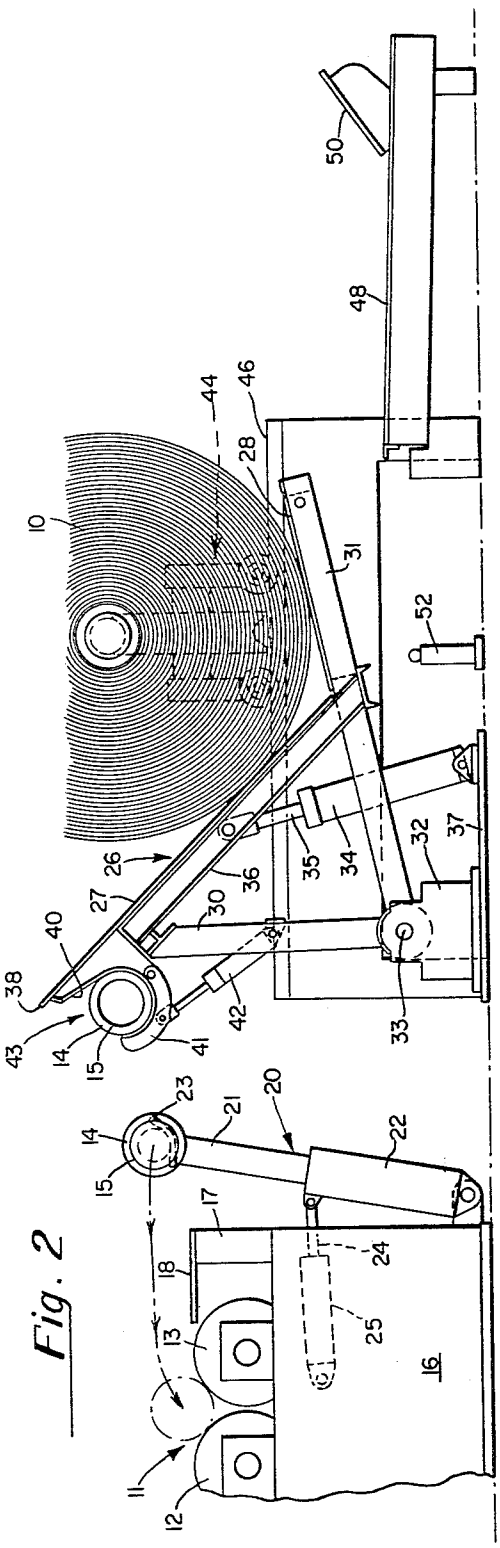


Fig. 2

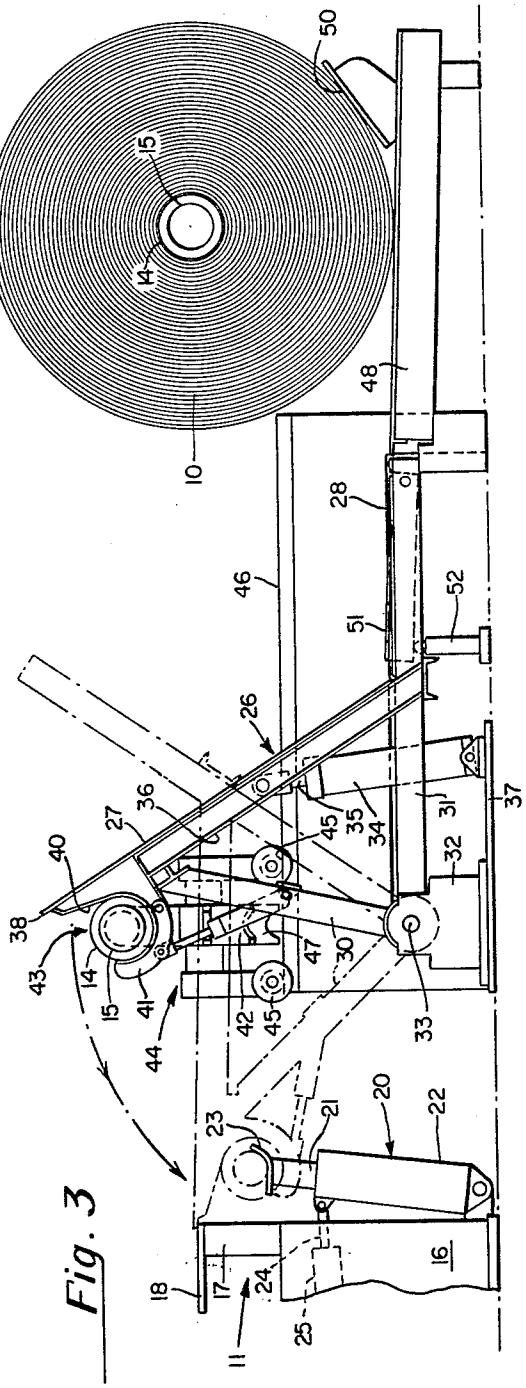


Fig. 3

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ROLL REMOVAL AND SHAFT HANDLING APPARATUS AND METHOD FOR REWINDER

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Int. Cl. B65h 75/02
U.S. Cl. 242—55 3 Claims

ABSTRACT OF THE DISCLOSURE

A method and apparatus are disclosed for removing winder shafts from wound web rolls and for repositioning them on a winder to commence the winding of a new web roll thereon. In the method, a winder shaft, which has been withdrawn by a shaft puller from a mound web roll disposed on a roll transfer table spaced from the roll removal end of the winder, is moved by the shaft puller to a position nearer to the winder and inserted into a receiving pocket in the roll transfer table, the receiving pocket being adjacent the roll removal end of the winder. The winder shaft is axially inserted into the receiving pocket below the roll carrying surface of the roll transfer table and does not pass through the roll carrying surface. The winder shaft is released by the receiving pocket directly onto shaft injection means which are adapted to elevate the shaft into a position for insertion onto the winder when the roll transfer table is temporarily spaced from the roll removal end of the winder during the handling of a successive wound web roll. Roll cores are conveniently placed in the receiving pocket and gripped thereby for facilitating the recording of a winder shaft which generally occurs during axially insertion of the winder shaft into the receiving pocket.

The apparatus disclosed involves a roll transfer table adapted to receive a wound web roll from a winder or rewinder. The roll transfer table has a receiving pocket beneath the roll supporting surface thereof and adjacent its edge nearest the end of the winder. The roll transfer table is tiltable through a plurality of positions in which the wound web roll is received upon the table, the winder shaft is withdrawn from the wound web roll, the wound web roll is removed from the roll transfer table, the winder shaft is inserted into the receiving pocket, preferably into roll cores carried in the receiving pocket, and the cored winder shaft is returned to the winder to commence the winding of a new web roll. A shaft puller is positioned alongside the roll transfer table and arranged to withdraw a winder shaft from a wound web roll on the roll transfer table, to move a winder shaft toward the roll removal end of the winder and axially insert it into the receiving pocket of the roll transfer table. Preferably, the receiving pocket and transfer table are arranged relative to the shaft puller so that the winder shaft may be inserted into the receiving pocket while the transfer table is in its roll removal position. The receiving pocket is adapted to release the winder shaft carried therein directly onto shaft injection means disposed between the winder and the roll transfer table. The shaft injection means are arranged to elevate the winder shaft into a position for insertion upon the winder when the roll transfer table is spaced from the winder during the handling of a successive wound web roll and winder shaft.

BACKGROUND OF THE INVENTION

Field of the invention

The present invention relates to roll removal and shaft handling in a winder and, more particularly, to a method and apparatus for removing winder shafts from wound web rolls and repositioning them to commence the winding of a new roll thereon.

Description of the prior art

In the past, wound web rolls carrying winder shafts therein have been removed from the winder or rewinder and have been transferred to a roll transfer table adjacent the roll removal end of the winder. The winder shaft has been axially withdrawn from the wound web roll by a shaft puller disposed alongside the roll transfer table. The wound web roll has then been removed for subsequent processing to a receiving table adjacent the end of the roll transfer table opposite the winder from which it has been transferred. The return of the winder shaft to the winder to commence the winding of a new web roll thereon has been accomplished by a variety of methods as described below.

In removing a winder shaft from a wound web roll and returning it to a winder, travel in several directions is required. In the past, roll transfer tables have been movable vertically and sometimes horizontally and have had some movable portions articulated for causing rolling movement of the web roll thereon from one point to another, such as from the point where the shaft is removed to a position on the roll receiving table. Because of different winder machine heights, oftentimes the entire roll transfer table is lowered from a position where a web roll containing a winder shaft is received from a winder to a position where a winder shaft is engaged by a shaft puller and axially withdrawn from the web roll, and again raised when the winder shaft is deposited on the roll transfer table by the shaft puller after withdrawal from the wound roll and prior to return to the winder.

Obviously, the above movement requires a large number of heavy-duty actuation devices. It is tremendously complicated and expensive to provide means for lifting the entire roll transfer table assembly including the roll and winder shaft supported thereon. Furthermore, there are many plant installations where the use of actuating devices below the floor level is not possible or practicable due to existing plant construction. It is prohibitive in most instances to elevate the entire existing winder to accommodate the roll removal apparatus presently available.

Movement of the winder shaft in a horizontal direction toward the winder from the point where the winder shaft is withdrawn from the wound web roll is also required and has been accomplished in several ways. In some instances, the winder shaft is inserted into a recess in the upper surface from which it is removed for positioning on a winder after the passage of a successive wound web roll over the roll supporting surface of the roll transfer table and over the recess receiving the winder shaft.

One of the problems associated with this prior art apparatus has been the inefficient and extremely dangerous handling of the relatively heavy winder shaft, which sometimes is on the order of several thousand pounds, to return it from the transfer table to winding position on a winder. In some instances, the roll transfer table has been inclined toward the winder and the shaft has been manually rolled down the table and onto the winder. Obviously such a procedure involves considerable risk of injury to the workers. Makeshift mechanical mechanisms employed in the past to control the movement of the winder shaft from the recess in the roll carrying surface of the roll transfer table onto the winder have not been entirely satisfactory as considerable time and effort by an operator have been involved in accomplishing the transfer. Furthermore, the web roll removed from the winder normally cannot be handled until the shaft in the recess has been transferred to the winder, thus lengthening the cycle time of the operation. In addition, movement of the relatively

heavy wound web roll over the recess containing a winder shaft can result in damage to at least the outer web layers of the roll due to temporary support of the roll on the edges of the recess.

In summary, in spite of the complexity of roll handling equipment employed in the past and the extensive mechanical handling of the wound web roll and the winder shaft, no method or apparatus has been devised for mechanically returning a winder shaft to a winder after removal from a wound web roll.

In view of the above-mentioned difficulties and shortcomings, it is an object and advantage of the present invention to provide a method and apparatus for facilitating the removal of winder shafts from wound web rolls and their reposition on a winder to commence the winding of a new web roll thereon.

Additional objects and advantages of the invention will becomes apparent from the detailed description below.

BRIEF SUMMARY OF THE INVENTION

In the method of the invention, the winder shaft and the wound web roll carried thereon are transferred from a web winding position on a winder to an adjacent roll transfer table having a roll supporting surface disposed in its roll receiving position. The roll transfer table carrying the winder shaft and the wound web roll is moved to a winder shaft removal position. The winder shaft is axially withdrawn from the wound web roll by a shaft puller while the wound web roll is supported upon the roll transfer table. The winder shaft is held on the shaft puller while the wound web roll is removed from the roll transfer table. The shaft puller and the winder shaft held thereby are moved toward the winder to a shaft insertion position where the winder shaft may be inserted into a receiving pocket below the roll supporting surface of the roll transfer table and adjacent the end of the roll supporting surface which is adjacent the winder when the transfer table is in its roll receiving position. The roll transfer table is moved into a shaft receiving position after which the winder shaft is axially inserted into the receiving pocket by means of the shaft puller. The roll supporting surface of the roll transfer table is returned to its roll receiving position adjacent the winder. The winder shaft is then deposited upon injector means disposed adjacent the winder and beneath the edge of the roll supporting surface. Finally, the winder shaft is elevated for insertion into web winding position upon the winder by means of the injector means after the roll transfer table has received a successive wound web roll from the winder and is temporarily withdrawn from its roll receiving position adjacent the winder. In most instances, an empty roll core is inserted into the receiving pocket prior to axial insertion of the winder shaft. It is gripped within the receiving pocket while the winder shaft is axially inserted.

In the apparatus of the invention, a roll transfer table is included which has a roll transfer surface and a roll removal surface which intersect so as to form a cradle for retaining a wound web roll received from a winder. The roll transfer table has a receiving pocket adjacent the edge nearest to the winder and beneath the roll transfer surface. The roll transfer table is tiltable from a first position in which the roll transfer surface is substantially horizontal for receiving a wound web roll from the winder, to a second position in which the roll removal surface is substantially horizontal, through at least one intermediate position in which the winder shaft is removed from the wound web roll. A shaft puller is disposed adjacent one side of the roll transfer table and mounted for movement alongside the roll transfer table at least from the position of a winder shaft disposed in a wound web roll when said roll transfer table is in an intermediate position for removal of the winder shaft from the wound web roll to a position where a winder shaft is inserted into the receiving pocket when the roll transfer table is in another position. Shaft injection means are disposed between the winder and the roll transfer table and are adapted to receive a shaft from the receiving pocket and to elevate it for insertion upon the winder when the roll transfer table is tilted out of the first position and away from the winder. In a preferred embodiment of the invention, the winder shaft is inserted into the receiving pocket when the roll transfer table is at the second position described above and while the wound web roll is being removed from the roll removal surface.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURES 1, 2 and 3 are side elevation views of apparatus of the invention progressively showing sequential positions of elements of the apparatus during its operation when carrying out the method of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, a web roll **10** is positioned on a drum-type paper roll winder **11** including a pair of roll winding drums **12** and **13** rotatable about substantially horizontal parallel axes, the drums being driven by a suitable source of power (not shown). The drums **12** and **13** cooperatively support thereon the paper web roll **10** formed of successive layers of paper wound about a core **14** peripherally enclosing a winder shaft **15**. During winding the ends of winder shaft **15** are normally rotatably carried upon a hydraulic supporting mechanism (not shown) which supports an increasing proportion of the combined weight of the wound roll **10** and the winder shaft **15** during the progess of the wind. In this manner, the nip pressures between the paper roll **10** and the roll winding drums **12** and **13** remain substantially constant thereby preventing physical damage to the paper during winding due to the weight of the roll **10**.

Winding drums **12** and **13** are rotatably carried on a base **16** having an upstanding extension **17** along the roll removal end of winder **11**. The upstanding extension **17** is surmounted by an apron **18** which serves to support a wound web roll **10** being removed from the winding drums **12** and **13** of the winder **11**. The base **16** of the winder **11** has a pair of spaced injector arms, indicated generally by reference numeral **20**. Each injector arm **20** includes a piston **21** carried in a cylinder **22** which is attached to the base **16** at the roll removal end of winder **11**. The piston **21** has a shaft retaining flange **23** on the upper end thereof which is adapted to carry one end of the winder shaft **15**. Another piston **24** is pivotably attached to cylinder **22** and disposed within a cylinder **25** pivotably attached to base **16**. Means (not shown) are provided for supplying fluid pressure to cylinders **22** and **25** to actuate pistons **21** and **24** in a predetermined manner.

Piston **24** is arranged for generally horizontal movement and is adapted to move piston **21** away from base **16** as piston **21** moves upward carrying a winder shaft **15** in retaining flange **23**. When the winder shaft **15** is elevated to the height of apron **18**, the piston **24** and cylinder **25** coact to draw piston **21** and retaining flange **23** quickly toward base **16** so that the winder shaft **15** carried thereon is rolled off of flange **23** transferred across apron **18**, and into winding position upon drums **12** and **13** of winder **11**.

A roll transfer table, indicated generally by reference number **26**, is disposed adjacent the winder **11**. The roll transfer table **26** serves to support a wound web roll **10** while the winder shaft **15** is removed therefrom. It also assists in returning the winder shaft **15** to the winder **11** by depositing the winder shaft **15** on injector arms **20** when received from a shaft puller to be described.

Roll transfer table **26** includes a roll transfer surface **27** and a roll removal surface **28**. The surfaces **27** and **28** are arranged at an angle to one another so that they intersect along a line, forming a cradle for retaining a

wound web roll therein. The roll transfer table **18** also includes frame members **30** and **31** which are attached to surfaces **27** and **28** and are pivotally attached to a pedestal **32** by a shaft **33**, allowing their pivotal movement about the rotational axis of shaft **33**. A hydraulic cylinder **34** and piston **35** are provided for tilting roll transfer table **26** through a number of positions about the rotational axis of shaft **33**. Piston **35** is pivotably attached to a frame **36** beneath roll transfer surface **27**, and cylinder **34** is pivotably attached to a base plate **37** to which pedestal **32** is also secured. The edge **38** of roll transfer surface **27** of roll transfer table **26** nearest the winder **11** extends beyond the edge of base **16** and rests upon apron **18** when the roll transfer table **26** is in its roll receiving position as shown in FIGURE 1.

A first clamp member **40** is secured to the underside of roll transfer surface **27** of transfer table **26** adjacent the winder **11**. A second clamp member **41** is pivotably attached to the first clamp member **40** and also to one end of a hydraulic cylinder **42**, the other end of which is pivotably attached to the frame member **30**. Upon actuation of hydraulic cylinder **42**, second clamp member **41** is moved toward first clamp member **40** to form a shaft receiving pocket **43** into which a winder shaft **15** may be inserted and gripped. The disposition of the shaft receiving pocket **43** beneath roll transfer surface **27** is such that when the roll transfer table **26** is in its roll receiving position, as shown in FIGURE 1, a winder shaft **15** carried in the shaft receiving pocket **43** may be placed upon shaft retaining flanges **23** of injector arms **20** for subsequent elevation and insertion onto the winder **11**.

A shaft puller, indicated generally by reference numeral **44**, is disposed alongside the roll transfer table **26** and mounted for movement upon wheels **45** along ways **46** in response to a cog drive (not shown). The ways **46** are aligned generally perpendicular to the tilt axis of the roll transfer table **26** so that shaft puller **44** travels along one side of roll transfer table **26**. The ways **46** extend along the roll transfer table **26** for a distance at least equal to the distance between the point where a winder shaft **15** is withdrawn from a wound web roll **10** and the point where a winder shaft **15** is inserted into the receiving pocket **43**. The shaft puller **44** may be of the type disclosed by U.S. Patent 2,736,507, issued Feb. 28, 1956 to Neese et al. The shaft puller **44** includes a movable chain (not shown) looped about two spaced rotatable sprockets (not shown) and having a plurality of dogs **47** disposed therealong which are adapted to engage a peripheral flange on the through-extending end of a winder shaft **15** when the chain is moved along its path. Upon continued movement of the chain, the shaft **15** is withdrawn from a wound web roll **10** to a position laterally disposed relative to roll transfer table **26**.

The roll transfer table **26** is moveable in a tilting manner about rotational axis of shaft **33** from a roll receiving position shown in FIGURE 1 where the roll transfer surface **27** is substantially horizontal and on a level with apron **18** allowing a wound web roll **10** to be transferred from the winder **11** to the roll transfer table **26**. The roll transfer table **26** can also be moved or tilted to a position where the roll removal surface **28** is substantially horizontal in which position the wound web roll **10** which has had its winder shaft **15** removed can be transferred to an adjacent receiving table **48** and disposed against a stop **50**. Roll removal surface **28** has a hinged portion **51** which is adapted to bear against a support member **52** during the final stage of the tilting movement of the roll transfer table **26** to its removal position shown in FIGURE 3. This results in inclination or tilting of the hinged portion **51** of the roll removal surface **28** which causes the wound web roll **10** to automatically roll off of the roll transfer table **26** and onto the receiving table **48**. Roll transfer table **26** can be moved by tilting about the axis of shaft **33** to a number of intermediate positions between the roll receiving position and the roll removal position, such as the shaft removal position shown in FIGURE 2.

The tiltable arrangement of roll transfer table **26** allows a wound web roll **10** carrying a winder shaft **15** to be elevated to the desired height as it is carried along an arc path and held within the cradle formed by roll transfer surface **27** and roll removal surface **28**. This permits the through-extending end of a winder shaft **15** to be aligned with the dog **47** on shaft puller **44** regardless of the diameter of the wound web roll, which often varies from about 20 inches to about 7 feet.

In the operation of the apparatus, the roll transfer table **26** containing a wound web roll **10** having a winder shaft **15** therein is tilted to a position where the axis of the winder shaft **15** crosses the horizontal path of the shaft engaging dogs **47** of the shaft puller **44** as it moves along its ways **46**. The transfer table **26** is stopped at that position for removal of the winder shaft **15**. The tilting movement of the roll transfer table **26** is automatically stopped when the table reaches this position by breaking an electrical control circuit with the through-extending end of the winder shaft **15** which cuts off a photoelectric beam set at the level desired. While the roll transfer table **26** is maintained in this shaft removal position, the shaft puller **44** is advanced along its ways **46** and stopped by a similar electrical control circuit at a position where it is aligned with the through-extending end of the winder shaft **15**. After engagement of the peripheral flange on the end of the winder shaft **15** with one of the dogs **47** on the shaft puller chain, and withdrawal of the winder shaft **15** from within the wound roll **10**, the roll transfer table **26** is then tilted to its roll removal position shown in FIGURE 3.

In the embodiment shown, roll transfer table **26** is maintained in its removal position while the winder shaft **15** is inserted in the receiving pocket **43**. This is accomplished by constructing the receiving pocket **43** in a position so that when the roll transfer table **26** is in its removal position, the receiving pocket **43** is at a height equal to the height of a winder shaft **15** carried on the shaft puller **44**. The shaft puller **44** is moved along its ways **46** toward the winder **11** to the point where the winder shaft **15** may be axially inserted into the receiving pocket **43**. With different designs and other embodiments, it may be necessary to move the roll transfer table **26** to a fourth position in order to make the receiving pocket **43** coincide with the level of a winder shaft **15** carried on the shaft puller **44**.

If a coreless collapsible shaft is used as the winder shaft **15**, it is merely inserted into the receiving pocket **43** and transferred to the winding drums **12** and **13**. However, if a roll core **14** is utilized, the roll core **14** is inserted into the receiving pocket **43** and gripped between first clamp member **40** and second clamp member **41** before insertion of the winder shaft **15** therein. The core **14** is normally clamped firmly to the winder shaft **15** by clamping sleeves or nuts (not shown) threadedly mounted on the ends of the winder shaft **15**.

What is claimed is:

1. A method for removing a winder shaft from a wound web roll and for repositioning it to commence the winding of a new web roll thereon, comprising

transferring said winder shaft and the wound web roll carried thereon from a web winding position on a winder along a path perpendicular to the axis of said winder shaft to a winder shaft removal position,

axially withdrawing said winder shaft from said wound web roll,

moving said winder shaft toward said winder along a path parallel to and spaced from said first path and perpendicular to said winder shaft to a shaft insertion position,

axially moving said winder shaft into a position adjacent and parallel to said winder, and

elevating and inserting said winder shaft into said web winding position upon said winder.

2. A method according to claim 1, including the step of axially inserting said winder shaft into an empty roll core simultaneously with the axial movement of said winder shaft into a position adjacent and parallel to said winder.

3. Apparatus for removing a winder shaft from a wound web roll and for repositioning it to commence the winding of a new web roll thereon, comprising

a roll transfer table having two inclined surfaces which intersect so as to form a cradle for retaining a wound web roll received from a winder, said roll transfer table having means defining a shaft receiving pocket adjacent the edge nearest to said winder and beneath the inclined surface nearest to said winder, said roll transfer table including support means adapted to permit rotational movement of said entire roll transfer table through a limited arc path about an axis substantially parallel to the axis of said winder shaft,

a shaft puller disposed adjacent one side of said roll transfer table and mounted for movement in a horizontal direction perpendicular to the rotational axis of said roll transfer table at least from the position at which said winder shaft is withdrawn from said wound web roll to a position where said winder shaft is inserted into said shaft receiving pocket, and

shaft injection means disposed between said winder and said roll transfer table for receiving a shaft from said shaft receiving pocket and for elevating it to a position where it may be inserted upon said winder.

References Cited

UNITED STATES PATENTS

2,736,507	2/1956	Neese et al.	242—55
2,772,838	12/1956	Lenz	242—81 X
2,953,821	9/1960	Ingham	242—68.7 X
3,131,880	5/1964	Miller et al.	242— 81 X
3,231,210	1/1966	Miller	242—81 X

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U.S. CL. X.R.

242—81