Nov. 18, 1969 H. E. ROSCOE ETAL 3,478,974

ROLL STAND FOR CONVERTING EQUIPMENT

Filed Jan. 2, 1968 4 Sheets-Sheet 1

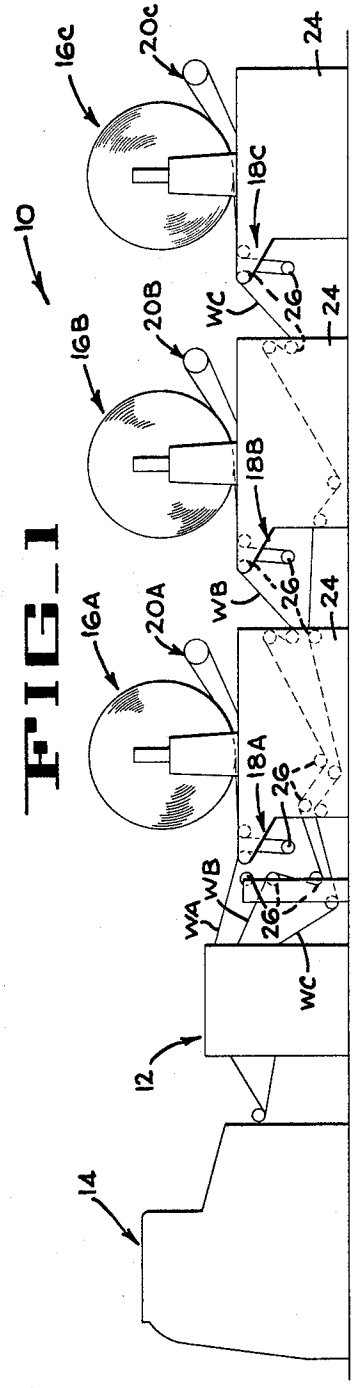


FIG_1

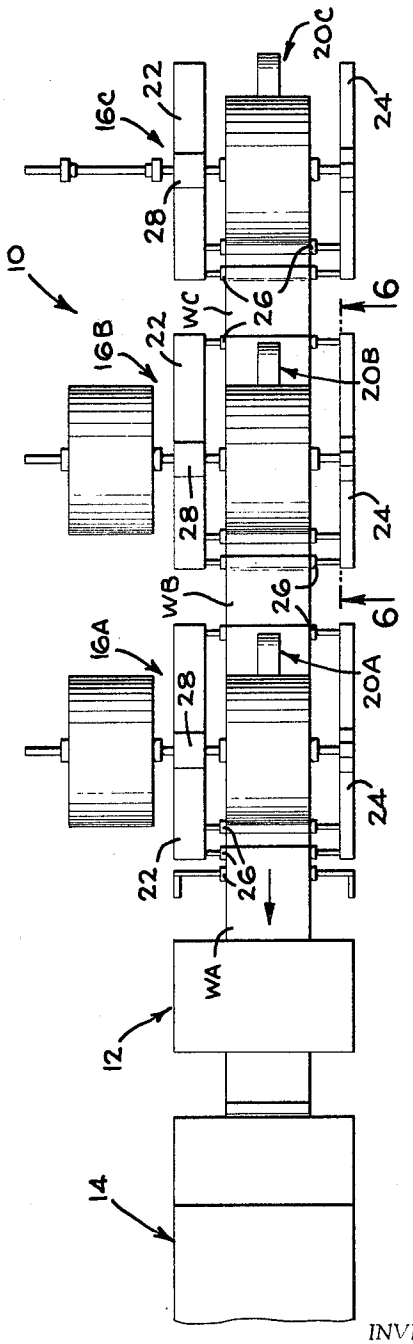


FIG_2

INVENTORS
HOWARD E. ROSCOE
EDGAR L. NELSON

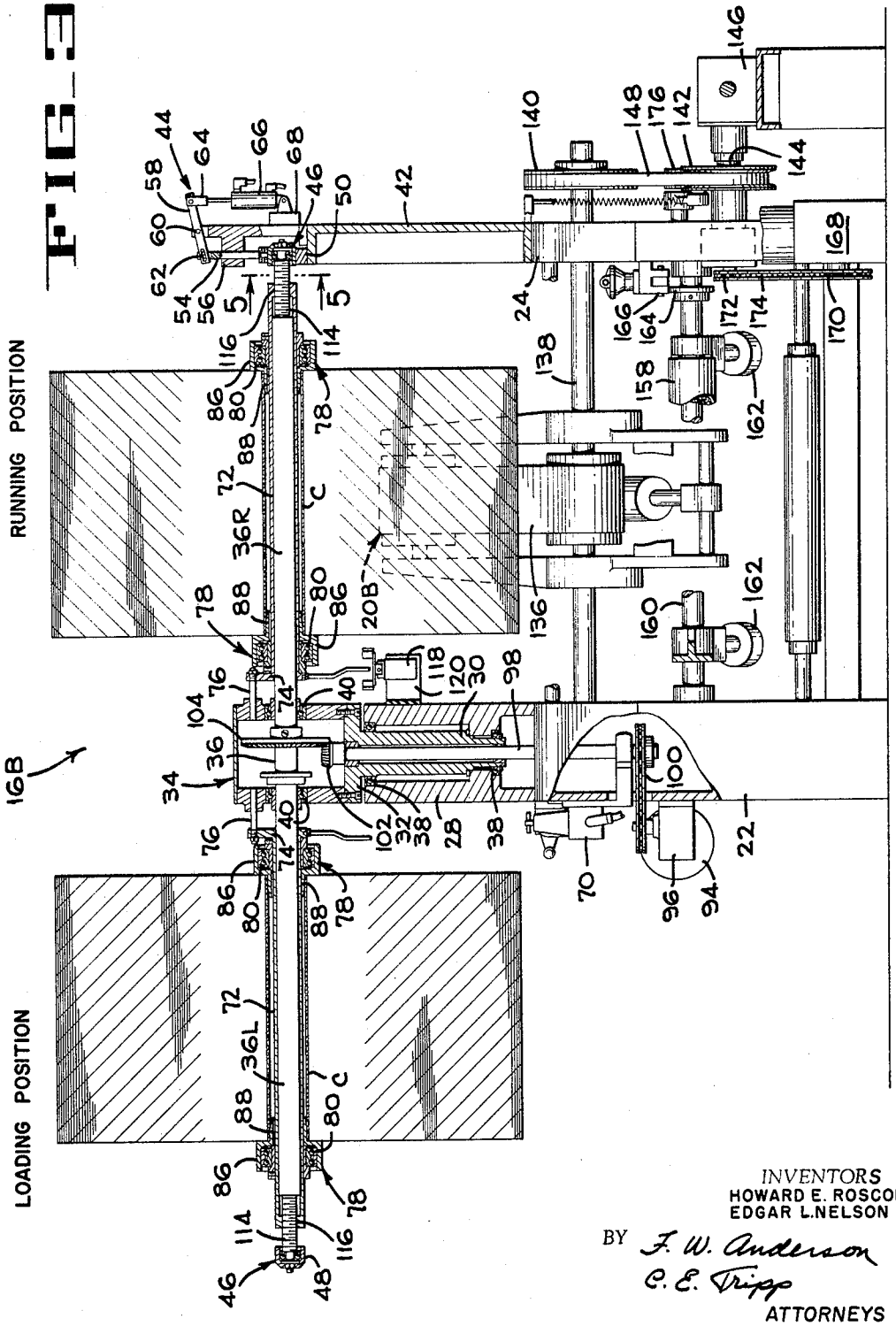
BY F. W. Anderson
C. E. Tripp
ATTORNEYS

Nov. 18, 1969 H. E. ROSCOE ETAL 3,478,974

ROLL STAND FOR CONVERTING EQUIPMENT

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FIG. 3



INVENTORS
HOWARD E. ROSCOE
EDGAR L. NELSON

BY F. W. Anderson
C. E. Tripp
ATTORNEYS

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ROLL STAND FOR CONVERTING EQUIPMENT

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FIG_4

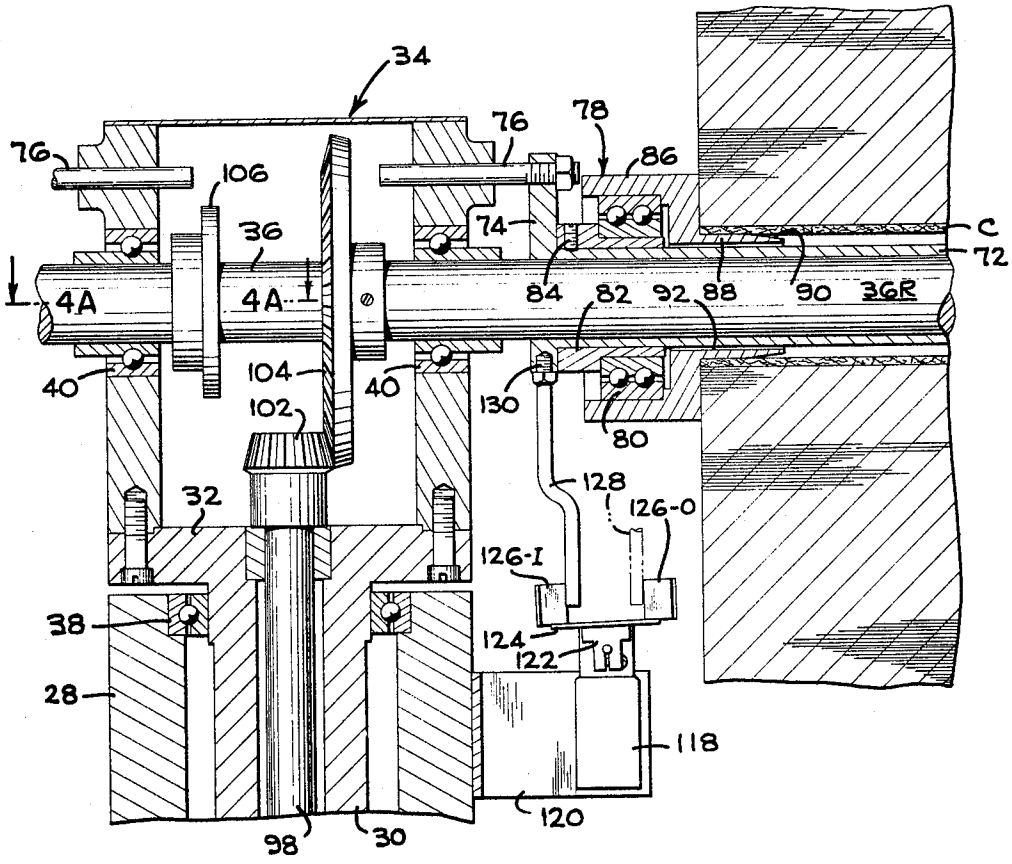
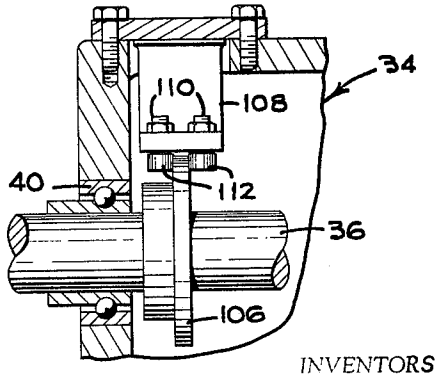


FIG_4A



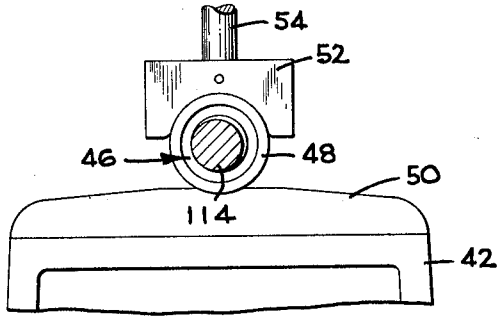


FIG_5

INVENTORS
HOWARD E. ROSCOE
EDGAR L. NELSON

BY F. W. Anderson
C. E. Tripp
ATTORNEYS

Nov. 18, 1969 H. E. ROSCOE ETAL 3,478,974

ROLL STAND FOR CONVERTING EQUIPMENT

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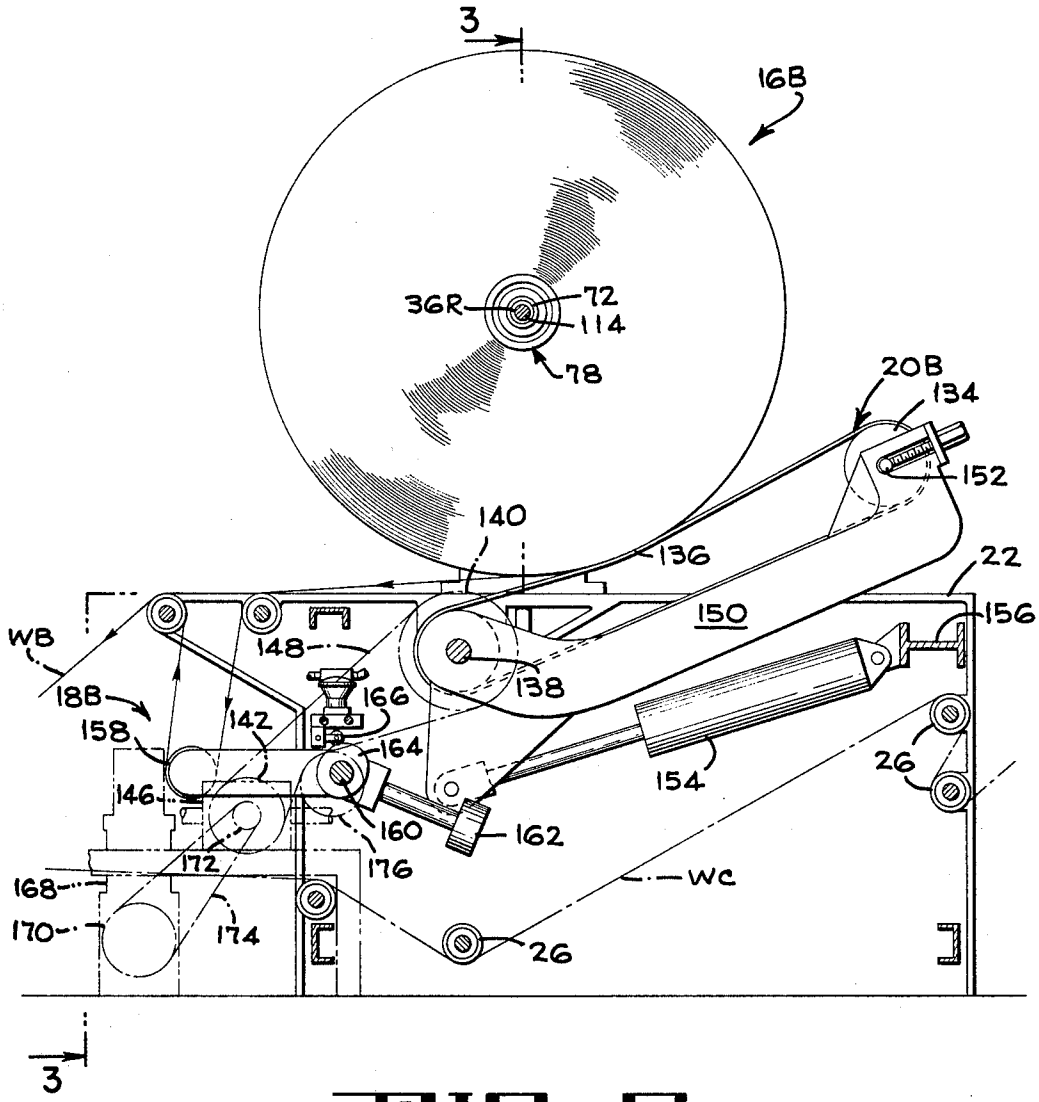


FIG_6

INVENTORS
HOWARD E. ROSCOE
EDGAR L. NELSON

BY F. W. Anderson
C. E. Tripp
ATTORNEYS

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ROLL STAND FOR CONVERTING EQUIPMENT

Howard E. Roscoe, Brown County, Wis., and Edgar L. Nelson, Menominee County, Mich., assignors to FMC Corporation, San Jose, Calif., a corporation of Delaware

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Int. Cl. B65h 19/30
U.S. Cl. 242—58 14 Claims

ABSTRACT OF THE DISCLOSURE

An elongate shaft has its mid portion mounted in a support which is rotatable about a vertical axis. The shaft is in a horizontal plane and each portion of the shaft extending from the support carries a mill web roll. The support is mounted so that each portion of the shaft carrying a mill roll can be aligned with the running line of a converting machine. When the roll on one shaft portion is exhausted, the operator rotates the support positioning the other end of the shaft carrying a full mill roll in running position. While one mill roll is being unwound the operator then mounts another mill roll on the other end of the shaft.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to an unwind stand for flexible webs used in various converting operations.

Description of the prior art

Converting equipment such as printing presses, bag machines and napkin machines are supplied with one or more mill rolls of flexible web material wound on a paper core. In printing presses it is usual to provide an unwind stand for paying out the web to the printing stations and a rewind stand for winding the printed web. To place a new roll on the unwind stand, a heavy core shaft is inserted through the core whereupon the roll is picked up by a crane and positioned on the unwind stand which is supplied with bearings, usually of a split type, for supporting the core shaft. Supplying a new mill roll to converting equipment requires interruption of production and it also requires the operator to handle a heavy core shaft.

By virtue of the present invention, the down time of the converting equipment is reduced and the steps involved in supplying a new mill roll to converting equipment is simplified by eliminating the necessity of handling heavy equipment by the operator.

SUMMARY OF THE INVENTION

It is an important feature of the present invention to provide a core shaft arrangement having a running position and a loading position such that when the web of the roll in the running position has been exhausted, the mill roll in the loading position can be quickly located in the running position. To this end, an elongate center supported core shaft is mounted on a pivotal support which permits rotation of the core shaft in a horizontal plane. When one portion of the core shaft is located in the running position, an outboard support engages the end of the shaft and thus renders it rigid as the web is unwound.

It is a further and equally important feature of this invention to simplify the procedure in mounting a mill roll on a converting machine. The method disclosed herein obviates the necessity of inserting a core shaft into the mill roll core tube since the roll supporting core shaft is arranged to provide a loading position and it is permanently carried by the machine frame. All that is required to prepare a mill roll for unwinding operation is to lift,

usually by means of a crane, the mill roll onto the core shaft while the same core shaft carries a mill roll which is being unwound. Not only does this relieve the operator of unnecessary core shaft handling, but a full mill roll is in ready postion while the converting machine is in operation.

Further, in accordance with this invention, a novel mechanism is provided for accurately centering the mill roll at the unwind position. These means preferably comprise a reversibly rotatable shaft geared to rotate the core shaft in opposite directions. The core shaft is connected to left and right hand screws which effect axial movement of the core shaft, to the left or to the right when it is rotated. Centering can be accomplished from a remote position during running of the mill roll.

BRIEF DESCRIPTION OF THE DRAWING

FIGURE 1 is a side elevation of tandem unwind stands for supplying web material to a napkin folding machine.

FIGURE 2 is a plan view of the structure shown on FIGURE 1.

FIGURE 3 is an enlarged off-set section of one unwind stand taken substantially along the line 3—3 of FIGURE 6.

FIGURE 4 is an enlarged section of the core shaft supporting structure.

FIGURE 4A is a fragmentary section taken on the line 4A—4A of FIGURE 4.

FIGURE 5 is a side elevation of the outboard support of the core shaft as viewed in the direction of the arrows 5—5 of FIGURE 3.

FIGURE 6 is a side elevation of the unwind stand taken substantially along the line 6—6 of FIGURE 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

An apparatus embodying the subject matter of the present invention is shown in FIGURES 1 and 2 and it is generally designated by the numeral **10**. It is preferably illustrated for use with a conventional embosser unit **12** and a napkin folder **14**, the constructional details of which are unimportant in understanding the principles of the present invention. The embosser unit **12** and the napkin folder **14** are shown correlated with a plurality of in-line tandem unwind stands **16A**, **16B** and **16C**, the first second and third unwind stands respectively as viewed from left to right. Each of these stands are operated concurrently to supply webs WA, WB and WC to the embosser unit where they are laminated to provide a three-ply web to the napkin folder. The napkin folder cuts and folds the laminated web and discharges the napkins in a stack on an accumulating platform. In the usual installation, each of the webs is used to supply napkins to its own discharge lane. Accordingly, it is possible, and desired in many installations to set up the napkin folder with three levels of discharge.

Each of these unwind stands includes web tension controlling means **18A**, **18B** and **18C** and surface drive belts **20A**, **20B** and **20C** coordinated with the tension control means to maintain a desired degree of web tension. Each of the roll stands **16A**, **16B** and **16B** are provided with side frame members **22** and **24** for rotatably supporting a plurality of web directing idler rolls, all of which are indicated by the numeral **26**.

On each of the side frame members **22** there is rigidly mounted an upwardly extending column or pedestal **28** shown in greater detail in FIGURE 3. The pedestal rotatably supports a tubular spindle **30** having a flanged portion **32** supporting a box-like structure of housing **34**. Through this housing a shaft **36** extends and projects outward therefrom defining cantilevered portions **36L**, the left being loading position, and **36R**, right being

the running position. The tubular spindle **30** is rotatably mounted in the column **28** by bearings **38** and the shaft **36** is mounted for rotation in the housing **34** by bearings **40**. Mounting the tubular spindle for rotation relative to the pedestal **28** enables the operator to rotate shaft **36** in a horizontal plane and thereby position the mill roll carried by the shaft portion **36L** to the running position while the shaft portion **36R** is positioned in the loading position.

When the cantilever shaft portions **36L** or **36R** are located in the running position the outboard support **42** engages the end of the shaft. As shown in FIGURE 3, the support **42** is mounted on and extends upwardly from the side frame member **24** and it includes a clamping structure **44** which is selectively engageable with a bearing **46** mounted on each end of the shaft **36**. This bearing has an outer race fitted within a cup **48**, as shown in FIGURE 5, that is clamped between a stationary jaw **50** and a movable jaw **52**. The function of the bearing is to enable the shaft to turn within the cup when clamped between the jaws and to provide support for the shaft. The movable jaw is attached to an actuator rod **54** slidably fitted through a bracket **56**. A lever **58** is pivotably connected by a pin **60** to the upper end of the outboard support **42** and it is connected at **62** to the operating rod **54**. The lever **58** is also pinned to a clevis connection **64** that is attached to the rod of an actuator **66**. As shown in FIGURE 3, the actuator is attached to a bracket **68** that is mounted to the outboard support **42**.

A conventional air valve **70**, shown in FIGURE 3, mounted on the side frame member **22** is connected to the actuator **66** and supplies air to retract or extend the piston rod carrying the clevis connection **64** which thereby raises or lowers the movable jaw **52**. Mere inspection of the arrangement shown in FIGURE 3 makes it apparent that upon retraction of the piston, the movable jaw **52** is raised freeing the shaft **36** for translation in a horizontal plane by the operator when it is desired to locate the other cantilevered end of the shaft to the running position.

The outwardly extending ends of the shaft **36** are slidably received in elongate tubular sleeves **72**, having inner ends provided with radially extending brackets **74**. Extending inward from the brackets are guiding rods **76** being slidably received in bores formed in the housing **34**. The guide rods **76** are for the purpose of preventing rotation of the tubular sleeves **72** while allowing axial movement relative to the shaft portions **36L** and **36R**. To mount a mill roll for rotation with respect to the sleeves **72**, core plug structures **78** are provided and they are slidably fitted on the sleeves **72**. Since each of the core plugs **78** are identical in construction, the inboard one shown in FIGURE 4 will be described in detail. The inner race of a bearing **80** is fixed to a step collar **82** which is slidably fitted on the tubular sleeve **72**. A setscrew **84** fixes the collar to the sleeve **72**. The outer race of the bearing **80** is fixed in a bell housing **86** having a reduced diameter extension **88** that is tapered at **90**. The core, indicated by the letter C, of the mill roll is fitted over the extension **88** and the tapered portion **90** facilitates location of the core thereon. Due to the fact that the bell housing **86** rotates during unwinding of a mill roll and the fact that the tubular sleeves **72** are restrained against rotation by the guide rods **76**, a bored portion **92** of the bell housing is of sufficient diameter to be spaced from the outer surface of the tubular sleeve **72**.

Since it is necessary to remove the core of an expired roll before a new mill roll can be mounted on the shaft, the outboard core plug structures **78** are removed by merely loosening the respective setscrews **84**. After a new mill roll is located on the shaft portion that is in the loading position, the core plug structure is slipped on the shaft, seated within the core and held in position by tightening its associated setscrew. It should be noted that the outside diameter of the bearing cups **48** are smaller than the inside diameter of the core plug bored portion **92** to permit removal of the core plug.

In view of the above construction, it should be readily apparent that the structure thus far described provides a core shaft having a loading and running position. While one portion of the core shaft is in the running positon, the outboard end thereof is rigidly supported to hold that portion of the core shaft steady while the mill roll is being unwound.

As mentioned in the introduction of this specification, one of the novel features of the present invention is the provision of means for accurately centering the longitudinal medium of the mill roll with respect to the desired web path of the converting machine. The particular mechanisms for accomplishing this result are shown and will be explained in connection with FIGURES 3 and 4. On the side frame member **22**, a reversible motor **94** is connected to a gear reduction **96** suitably attached to the frame member **22**. An upwardly extending shaft **98**, mounted for rotation centrally of the tubular spindle **30**, is connected to the gear reduction unit **96** by conventional sprocket chain drive **100**. Geared to the upper end of the shaft **98** is a bevel pinion gear **102** (FIG. 4) in mesh with a bevel gear **104** that is keyed to the shaft **36**. Also secured to the shaft **36** is a thrust disc **106** which serves to prevent axial movement of the shaft **36** relative to the housing **34**. FIGURE 4A shows a bracket **108** rigidly attached to the housing **34**. The bracket securely mounts stub shafts **110** which rotatably support rollers **112** to engage the opposite faces of the thrust disc **106**. This arrangement accordingly prevents axial shifting of the shaft **36**.

Referring to FIGURE 3 it will be observed that the ends of the shaft **36** are provided with reduced diameter threaded portions **114**, one portion being threaded in a right hand manner and the other portion being threaded in a left hand manner. Each threaded portion of the shaft is engaged in tapped ends **116** of the tubular sleeves **72**. Since the sleeves **72** are slidable with respect to the shaft **36** and rotation of the sleeves is prevented by virtue of the guide rods **76**, rotation of the shaft **36** causes the sleeves **72** to be displaced axially by virtue of the left and right hand threaded portions **114** threadedly engaged in the tapped ends **116**. Such lateral shifting is, as mentioned above, for the purpose of centering the mill roll with the converting machine.

The degree of such lateral adjustment is determined by a limit switch **118** carried by a bracket **120** which is welded or fixed, as desired, to the pedestal or column **28**. As shown in greater detail in FIGURE 4, the operating rod of the limit switch **118** is mounted to a lug **122**, which in turn carries a plate **124** having upwardly extending laterally spaced abutment members **126** mounted thereon. Located between the members **126** is a rod **128**, attached by a nut and thread arrangement **130** to the bracket **74**. The amount of lateral translation of the sleeves **72** relative to the shaft **36** is determined by the limit switch **118**. In FIGURE 4 the full line representation of a rod **128** illustrates the limit of inward translation of the sleeve **72**, whereas the phantom outline representation of a portion of the shaft **128** illustrates the limit of outward adjustment of the sleeve **72**.

When the reversible motor **94** is energized to move the mill roll that is in running position to the left or right, as viewed in FIGURE 3, the motor is electrically deenergized in the event the rod **128** strikes the abutment member **126**–I or **126**–O thus actuating the limit switch **118**. When running mill rolls of a lesser width than that shown in the accompanying drawings, the centering function of the invention is not affected since the inboard core plug structure **78** are moved outwardly from the illustrated position a sufficient extent to locate the nominal center of the mill roll in substantial alignment with the

converting machine. Minor adjustments can be made once unwinding is commenced by actuating the reversible motor **94**. Should it be found that the limit switch **118** is actuated, electrically de-energizing the motor **94**, manual resetting of the core plug structures **78** would be required.

In view of the above explanation, it is readily apparent that the invention provides the operator with controls and mechanisms to very accurately adjust the position of the mill roll so that it is centered with that of the converting machine.

At each unwind stand, the mill roll is driven by a surface drive belt similar to belt **20B**, shown in FIGURE 6. This endless type belt is trained about a drive pulley **132** and a driven pulley **134**, and has an upper run **136** which contacts the peripheral surface of the mill roll. The drive pulley is mounted on a drive shaft **138** that is journalled within side frame members **22** and **24**, while a driven pulley **140** is mounted on the drive shaft. A variable diameter pulley **142** is mounted on an output shaft **144** (FIG. 3) of a main drive **146** and a drive belt **148** is trained about the drive pulley and variable diameter pulley. Positioned about the surface drive belt is a belt frame **150** having one end pivotally mounted upon drive shaft **138** and an opposite end in which a shaft **152** is adjustably positioned to support the driven pulley **134**. The belt frame is connected to the rod of an actuator **154** which has a cylinder portion connected to a brace **156** extending transversely between the side frame members. When the actuator contracts drawing the rod into the cylinder portion, the belt frame pivots upwardly forcing the upper run **136** of the surface drive belt into driving contact with the mill roll. A constant air-pressure is maintained within the actuator as the mill roll unwinds so that the belt frame is continuously urged upward and driving contact is maintained between the surface drive belt and mill roll.

Constant web tension is maintained on a mill roll web, such as web WB, by controlling the speed at which the surface drive belt **20B** is driven. The web is trained about a dancer roll **158** that is eccentrically supported from a pivotal shaft **160** and balanced by a pair of counterweights **162** to maintain a normal position. A cam **164** is fixed to the pivotal shaft in a position to contact an air regulator **166** as the dancer roll is lowered from the normal position. The air regulator is in flow communication with an actuator **168** that drives a sprocket wheel **170**. An adjusting sprocket **172** is coupled with the variable diameter pulley **142** and a drive chain **174** is trained about the sprocket wheel and adjusting sprocket. Rotation of the adjusting sprocket changes the diameter of the variable diameter pulley and thereby varies the speed at which the surface drive belt is driven. An idler roll **176** is resiliently urged against the drive belt to eliminate slack and maintain proper tension on the drive belt throughout the range of diameters for the variable diameter pulley.

Operation of the roll stand begins with loading of mill rolls. The outboard core plug **78** at the loading position is removed after loosening setscrew **84**. If a core C of an expired roll remains on the sleeve **72**, it is removed and a new mill roll is fitted about the sleeve and seated upon the inboard core plug **78**. The outboard core plug is seated within the core and locked in position on the sleeve by the setscrew. Clamping structure **44** is actuated to release the shaft **36**, which is then rotated in a horizontal plane to position the new mill roll in a running position. The clamping structure is then locked about the cup **48** to hold the shaft in position and support the cantilevered end. In order to align the web of the mill roll with other webs and processing stations, the roll can be shifted laterally by operating the reversible motor **94** to turn the shaft **36**. Rotation of the shaft causes the sleeves **72** to move thereon and thus position both sleeves in the same relative position on opposite sides of the tubular spindle **30**. Since bearing **46** is free to turn within the cup **48**, the shaft can be rotated while the cup is locked in place by the clamping structure. Thus, the mill roll is properly aligned in a running position and the sleeve in the loading position is also aligned for running when needed. While the mill roll is running, a standby roll is loaded on the sleeve in the loading position for use when needed.

Although the best mode contemlated for carrying out the present invention has been herein shown and described, it will be apparent that modification and variation may be made without departing from what is regarded to be the subject matter of the invention as set forth in the appended claims.

Having completed a detailed description of the invention so that those skilled in the art could practice the same, we claim:

1. A web roll supporting apparatus comprising a horizontal shaft having its mid portion mounted in a housing and having cantilevered end portions extending outwardly from opposite sides of the housing, means on each shaft end portion for supporting web rolls to rotate relative to said shaft, means mounting said housing for rotation about a vertical axis whereby the shaft end portions can be alternately positioned in running and loading positions, and means for supporting the outermost end of one of said shaft end portions when it is located in running position.

2. A web roll supporting apparatus as described in claim **1**, including means for locking the outermost end of one of said shaft end portions to the supporting means when in running position.

3. A web roll supporting apparatus as described in claim **1**, including means for spacing simultaneously the roll supporting means on each shaft end portion is positions equal distance from the vertical axis about which the housing rotates.

4. A web roll supporting apparatus as described in claim **1**, wherein said means for supporting web rolls for rotation include a pair of core plugs removably mounted about one shaft end portion, each core plug having a stationary mounting portion and a rotatable portion for supporting the web roll.

5. A web roll supporting apparatus comprising a housing mounted for rotation about a vertical axis, a shaft extending from said housing along a horizontal axis, means on said shaft for supporting a web roll for rotation relative to the shaft, and means for spacing the web roll supporting means at a desired distance from the vertical axis.

6. A stand for supporting a roll of flexible web material from which the web is unwound for processing operations comprising a housing mounted for rotation about a vertical axis, a shaft extending through said housing with opposite ends extending outwardly from opposite sides of the housing and having end portions threaded in opposite directions, a pair of sleeves fitted about the outwardly extending shaft ends and each sleeve being threadably connected to an end portion of the shaft for movement longitudinally of the shaft, a pair of core plugs for plugs removably attached to each sleeve with portions for supporting said roll for rotational movement about said sleeve, each of said sleeves being slidably connected to the housing in a manner as to prevent rotation relative thereto, and means for rotating said shaft within said housing causing the threadably connected sleeves to travel along said shaft.

7. A stand as described in claim **6**, wherein each sleeve has a bracket on opposite sides of said housing, a rod projecting towards said housing from each bracket and said housing having holes drilled therein to slidably receive said projecting rods and lock said sleeves against rotation relative to the housing.

8. A stand as described in claim **6**, including a support having a stationary jaw positioned to receive an outermost end of said shaft and a movable jaw adapted to

clamp the outermost end of said shaft to the stationary jaw for holding the shaft in a roll unwinding position.

9. A stand as described in claim **6**, wherein said means for rotating said shaft within said housing include a bevel gear keyed to said shaft, a bevel pinion gear in mesh with the bevel gear and fixed to an end of a vertical shaft, and means for turning said vertical shaft.

10. A plurality of stands as described in claim **6**, each stand being aligned to discharge a web towards a common processing station and each stand being adjustable to position the web discharged therefrom in alignment with the web discharged from an other stand.

11. A method of mounting a mill roll on a converting machine comprising the steps of lifting the mill roll to a position where the mill roll core is in alignment with a projecting shaft, fitting the mill roll upon the projecting shaft in a loading position spaced from alignment with a line of web processing, and rotating said shaft in a horizontal plane to a running position where the mill roll is in alignment with the line of web processing.

12. The method of mounting a mill roll on a converting machine as described in claim **11**, including supporting the projecting shaft at the distal end when the mill roll is in a running position.

13. The method of mounting a mill roll on a converting machine as described in claim **11**, including spacing the mill roll on the shaft in the loading position with relationship to the running position so that upon rotation of the shaft in a horizontal plane to the running position, the mill roll will be properly aligned.

14. The method of supplying mill rolls to a converting machine which includes the steps of lifting a first mill roll to a position where the core is aligned with the distal end of a first projecting shaft, fitting the first mill roll upon the first projecting shaft in a loading position spaced from the running line of the converting machine, rotating the first small roll and shaft in a horizontal plane to a running position where the first mill roll is in alignment with the running line of the converting machine, and loading a second mill roll on a second projecting shaft in the loading position while the first mill roll is being unwound in the running position.

References Cited

UNITED STATES PATENTS

2,327,906	8/1943	Kiefer	242—79
3,032,289	5/1962	Fredericksson et al.	242—79

LEONARD D. CHRISTIAN, Primary Examiner

U.S. Cl. X.R.

242—58.6; 214—130