Sept. 22, 1970 V. J. MISTELE 3,529,785

ELECTRICAL CONTROL SYSTEM FOR TURNOVER WEB REWIND STAND

Filed Sept. 12, 1968 3 Sheets-Sheet 1

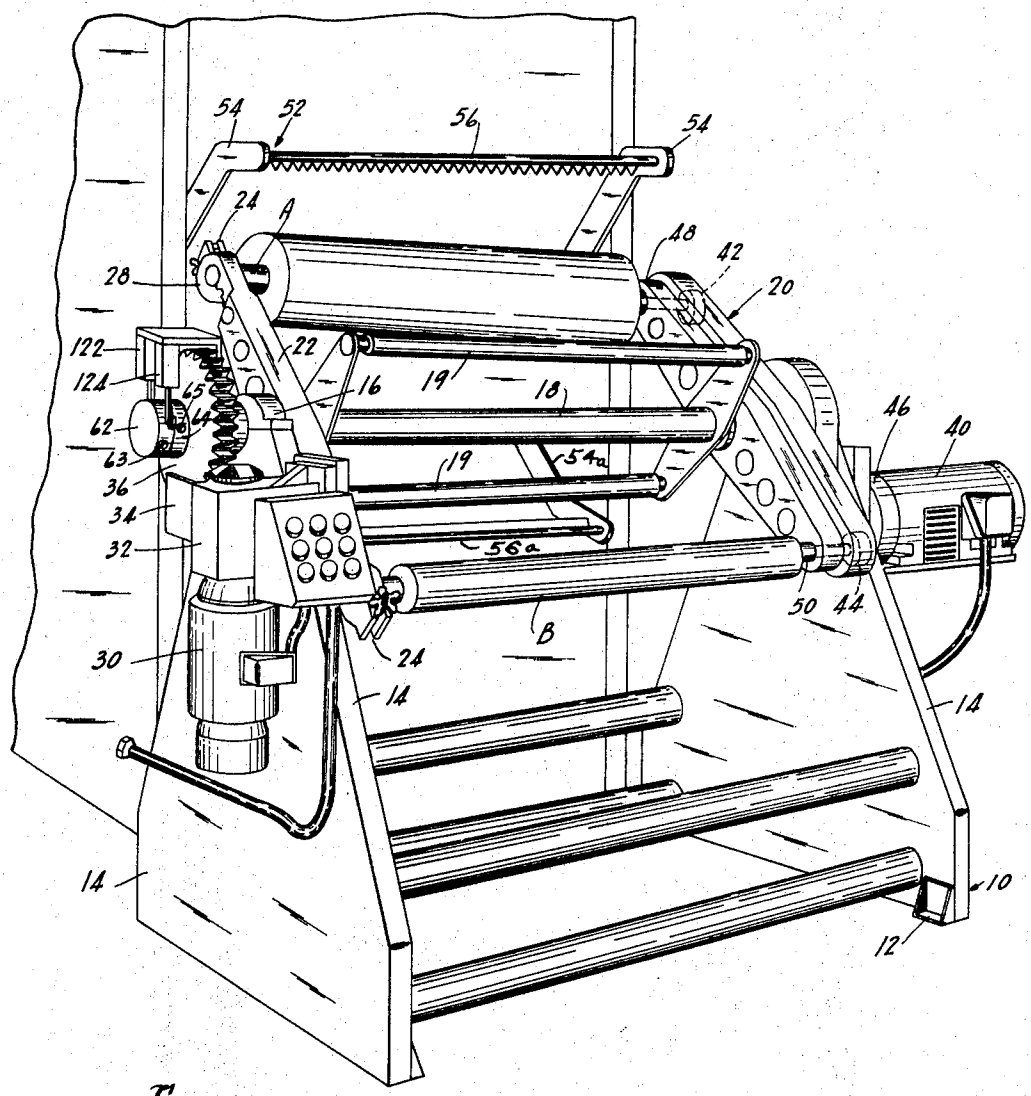


Fig. 1

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Filed Sept. 12, 1968 3 Sheets-Sheet 2

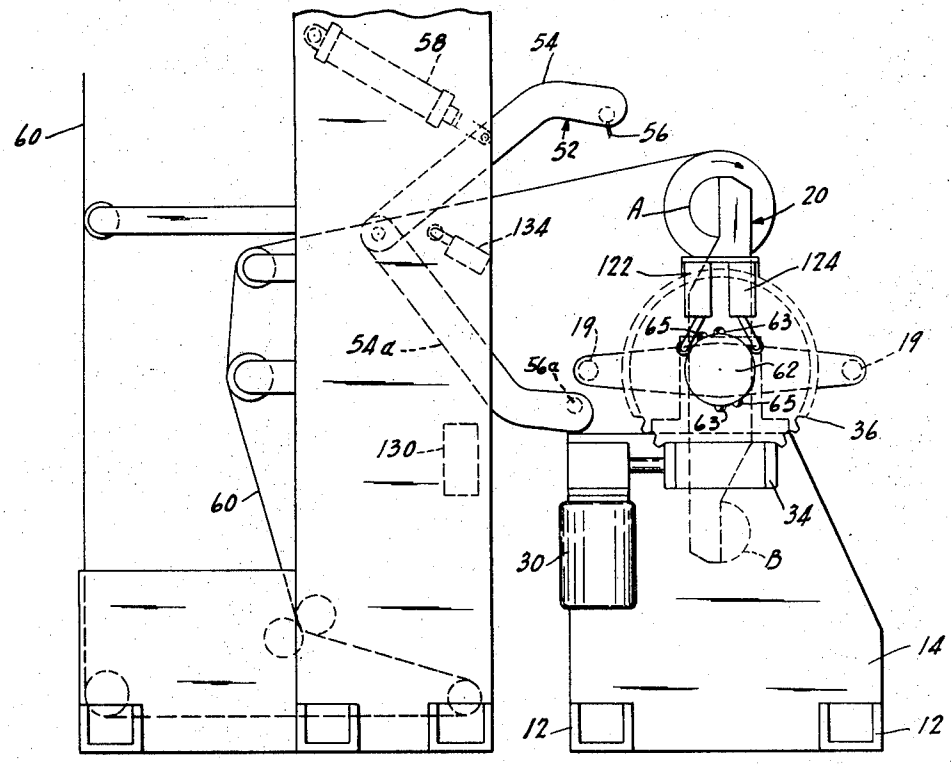


Fig. 2

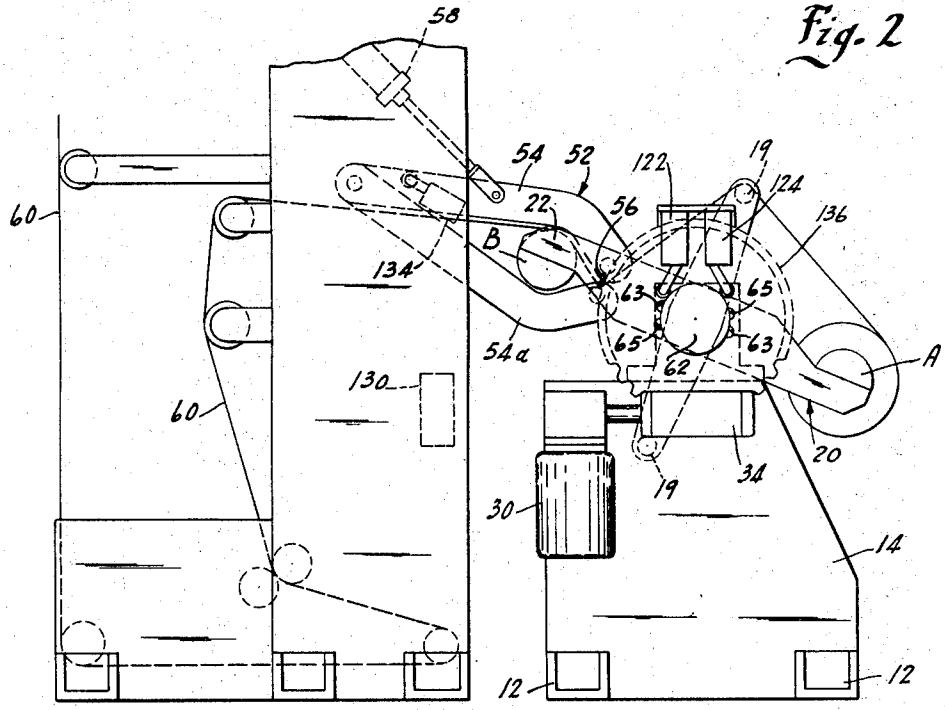


Fig. 3

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ELECTRICAL CONTROL SYSTEM FOR TURNOVER WEB REWIND STAND

Filed Sept. 12, 1968 3 Sheets-Sheet 3

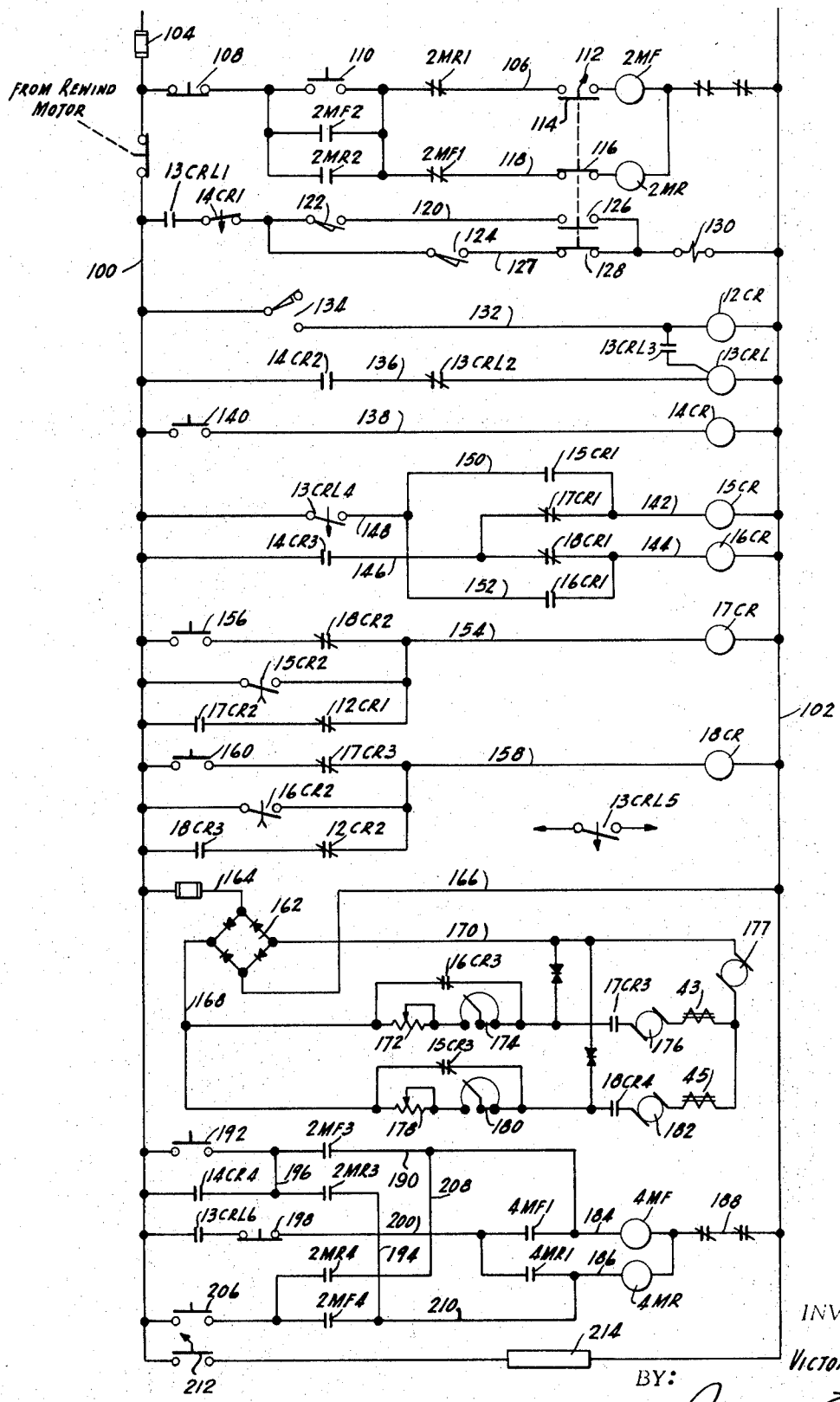


Fig. 4

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3,529,785

ELECTRICAL CONTROL SYSTEM FOR TURNOVER WEB REWIND STAND

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Int. Cl. B65h 19/20
U.S. Cl. 242—56 4 Claims

ABSTRACT OF THE DISCLOSURE

A control system for a turnover rewind stand for effecting the transfer of a moving web material from a fully wound roll to an empty spindle includes a signal means operatively associated with the spindle for determining when the spindle is in a predetermined position and for actuating a cutoff means for severing the web material from the fully wound roll and for applying the web material to the empty spindle. The control system also includes means for matching the peripheral speed of the fully wound roll and the empty spindle to insure the transfer is completed without tearing or looping the web.

BACKGROUND OF THE INVENTION

Field of the invention

The present invention relates to electrical control systems for apparatus for cutting, transferring, and winding a continuous moving web so that successive rolls of material are wound without interrupting the winding operation. Such apparatus is generally termed a turnover rewind stand as empty spools are brought into a web winding position by revolving or turning over portions of the stand.

Description of the prior art

In the processing of web materials, as for example, during paper converting, it is inefficient to stop the entire web processing apparatus each time an individual roll of the web material moves through the machine. For this reason, means for effecting "flying splices" have been developed. These devices fasten the end of the previous supply roll of web material to the forward edge of the succeeding supply roll so as to permit continuous and efficient operation of the web processing apparatus.

Similarly, means for severing the web when a given take-up or rewind roll is full and for affixing the severed end of the web to a succeeding empty spindle have also been devised.

One such rewind device, commonly referred to as a turnover rewind stand, includes a pair of rotatable spindles or spools to which the web may be affixed for rewinding purposes. These spindles are mounted in a turret, and by revolving or "turning over" the turret, the spindle containing the fully wound roll of web material is moved out of the rewinding position and an empty spindle is simultaneously moved into the rewinding position. Upon a severing of the web, by a knife or other means, the end of the web is affixed to the empty spindle to continue the rewinding of the web while the fully wound roll is removed from the rewind stand.

It will be appreciated that the operation of the turret and spindle portions of the rewind stand must be closely coordinated by the control system for the stand in order to effect the transfer operation. In the past, motor driven control timers have been used to effectuate such coordination, but such timers have required precise positioning of the turret and/or spindles in order to insure correct timing. The spindle positioning required by the

timers was often not always desirable, for example, it was often difficult to remove the fully wound roll from the stand under these conditions.

The aforesaid timers often had an uninterruptable timing sequence which required that the entire timing sequence was completed even though only a portion of the sequence was desired to alter the operation of the stand. In the event the timers got out of cycle with the mechanical portions of the rewind stand, it was often difficult, and required numerous cyclical operations, to restore proper control. Under such out of cycle conditions, the possibility of an unexpected actuation of the cut off knife was an ever present and dangerous possibility.

The timers also made it difficult to change the mode of operation of the stand, for example, from a mode wherein the printed side of the web material is on the inside of each wrap on the rewind roll to a mode wherein the printed side of the web is on the outside of each wrap.

SUMMARY OF THE PRESENT INVENTION

It is, therefore, the object of the present invention to provide an improved control system for a turnover rewind stand.

It is a further object of the present invention to eliminate the timing devices incorporated in the presently available rewind stand control systems, thereby providing considerable flexibility both in the mode of operation of the rewind stand and the positioning ofthe rewind stand spindles, as well as in the timing cycle of the control.

Yet another object of the present invention is to provide a control system for a turnover rewind stand which reduces the possibility of operator errors during the web transferring process and which insures safe operation of the stand.

The present invention provides a control system for a rewind stand for effecting the transfer of a moving web from a fully wound roll to an empty spindle. The stand includes a turret mounted thereon containing a pair of drivable spindles. The turret is revolvable on the stand to move the spindle in and out of a web rewinding position. A turnover motor is connected to the turret for revolving same, while a drive motor is provided for driving the spindle through a selectively engageable clutch means. The rewind stand also includes a cut off means for severing the web from a fully wound roll and for starting the web to the empty spindle.

The control includes a means for energizing the turnover motor to revolve the turret and move one of the spindles into the web rewinding position. Means are also provided for selectively engaging the clutch means to drive the spindle in the web rewinding position to initiate the winding process and the formation of a fully wound roll of web material on that spindle.

During the web transfer operation a means in the control is energized to reduce the speed of the spindle containing the fully wound roll while the clutch means is engaged to accelerate the empty spindle so that the peripheral speeds of the roll and the spindle are approximately equal, thereby eliminating the possibility of looping or tearing the web due to overslack or overtaut conditions.

At the same time, the means for energizing the turnover motor revolves the turret to move the loaded spindle away from the rewinding position and to move the empty spindle toward the web rewinding position. A signal means operatively associated with the turret determines when the turret is in the web transfer position and actuates the cut-off means for severing the web and for starting the resulting new loading end of the web on the empty spindle to continue the web rewinding operation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a turnover web rewind stand of the type with which the present control system may be employed;

FIG. 2 is an elevational view of the rewind stand shown in FIG. 1;

FIG. 3 is a view similar to FIG. 2 but showing the turret and the cut-off knife in a different position; and

FIG. 4 is a schematic electrical diagram of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The turnover web rewind stand

A turnover stand **10** made in accordance with the present invention includes a base **12** which supports the remaining portions of the stand on the work area floor. Base **12** includes a pair of spaced vertical plates **14** each having a journal **16** at the upper edge thereof for supporting a pivot shaft **18**.

A turret **20** is mounted on pivot shaft **18** so that it may be revolved or turned over with respect to the stationary portions of stand **10**. The turret includes a pair of arms **22**, which are fixedly mounted on pivot shaft **18**, one adjacent each of journal **16**. Each of the arms **22** includes portions extending diametrically from a center portion to which shaft **18** is affixed. The opposite ends of arms **22** include slots **24** in which are journalled the spindles A and B. Arms **22** are mounted in identical angular position on pivot shaft **18** so that spindles A and B, when in slots **24**, lie parallel to pivot shaft **18**. A removable catch **28** at the end of arms **22** removably retains the spindles in the slots.

Pivot shaft **18** and turret **20** are revolved or turned over by turnover motor **30** mounted on one of plates **14**. The output shaft of turnover motor **30** may be connected through right angle gear reducer **32** to worm gear means **34**. The worm gear means **34** drives a gear **36** which is fixed on one end of pivot shaft **18** to thereby revolve the shaft and turret **20**. Turret **20** may be revolved in either the clockwise or counter clockwise direction, as viewed in FIG. 2, as hereinafter described.

Spindles A and B are selectively driven by a spindle drive motor **40** through clutches **42** and **44** located in the turret. Motor **40** is shown as being mounted on one of plates **14**, and the output shaft of motor **40** is connected, as by gearing **46**, to the driving members of clutches **42** and **44** which are of the electro-magnetic type.

The drive members of the clutches are coupled to chucks **48** and **50** into which one end of spindles A and B may be inserted for driving purposes. Motor **40** may be energized by a power supply, not shown, so as to provide constant tension or taper tension to the web as it is being rewound.

Rollers **19** may be included on turret **20** and over which the web passes so as to assist in the web transfer operation.

A cut off knife **52** is located on rewind stand **10** or on an adjacent portion of the web processing apparatus, as shown in FIG. 1. Knife **52** includes a pair of pivotally mounted spaced supports **54** across which is mounted blade **56**. Supports **54** and blade **56** are swung downwardly across the web by means of air cylinder **58** affixed to one of the supports to cut the web. As the knife severs the web, the new leading edge is also caused to be wrapped around the empty spindle. A shear bar **56***a* is mounted on arms **54***a* and swings upwardly when the knife descends so as to cooperate with the knife in effecting the shearing of the web. The position of the knife arms and shear bar arms when in the cutting position is shown in FIG. 3.

The electrical control system

The electrical control system for rewind stand **10** comprises a plurality of relays and other elements connected across a pair of power busses **100** and **102** which provide power to the control system. The control system may be protected by fuse **104** in power bus **100**.

Conductor **106** extends between power busses **100** and **102** and contains the various electrical components required to control spindle drive motor **40**. A normally closed stop switch **108** is interposed in conductor **106** to stop motor **40** in the event shut-down is desired. A normally open start switch **110** is included in conductor **106** in a similar manner.

A portion of a print direction control switch **112** may also be interposed in conductor **106**. Such a print control switch may be used in instances wherein rewind stand **10** is employed with web processing apparatus which prints on one side of the web. The switch permits the operator of the stand to control the rewinding of the web so that the printed material is on the inside of each wrap on the rewind roll or so that it is on the outside of each wrap. The direction of rotation of spindles A and B determine whether the printed side will be in or out. Assuming, for example, in FIG. 2, that the printed side of web **60** is the upper side of the web as it leaves the web processing apparatus, if spindle A is rotated in the clockwise direction as shown, the printed side of the web will be on the outside of each wrap. If, however, spindle A is rotated in the counter clockwise direction, the web will be taken up so that the printed side is on the inside of each wrap. The direction, clockwise or counter clockwise, that turret **20** revolves, must also be coordinated with the direction of spindle rotation. For print out operation, the turret **20** is rotated in the clockwise direction as shown in FIG. 1. For print in operation, the turret is rotated in the counter clockwise direction.

To control the print direction, print direction control switch **112** includes contacts **114** in conductor **106** and contacts **116** in conductor **118** which parallels conductor **106**. Contacts **114** and **116** are mutually exclusive so that when one is closed the other must be open.

A relay coil 2MF is connected in series with contacts **114** in conductor **106** while relay coil 2MR is connected in series with contacts **116** in conductor **118**. Interlocking relay contacts 2MR1 and 2MF1 are included in conductors **106** and **118** respectively, while hold-in or lock up relay contacts 2MR2 and 2MF2 are included in parallel with starting switch **110**.

Conductor **120** extends between power busses **100** and **102** to include normally open relay contacts 13CRL1 connected in series with normally closed relay contacts 14CR1. Relay contacts 14CR1 are operated by relay coil 14CR, hereinafter described, such that the relay contacts open instantaneously upon energization of the relay coil but close with a slight delay after de-energization of the relay coil.

A limit switch **122** is connected in series with the above mentioned components in conductor **120**. This limit switch is operated by lobes **63** on cam **62** mounted on pivot shaft **18** to actuate the knife **52** when turret **20** has been turned over to a desired position. The pair of lobes **63** on cam **62** are 180 degrees apart. A second limit switch **124** is connected in conductor **127** and parallel with limit switch **122** for operation by the lobes **65** on a second cam **64** which is also fixed on the end of pivot shaft **18**. Lobes **65** are 180 degrees apart. Cam **62** actuates the knife when the turret **20** is revolving in the clockwise direction. Cam **64** actuates the knife when the turret **20** is revolving in the counter clockwise direction.

An additional pair of mutually exclusive contacts **126** and **128** of print direction control switch **112** are included in conductors **120** and **127** so that depending on which printing direction is selected by switch **112**, the proper one of limit switches **122** or **124** will actuate the knife **52**.

The coil **130** of the solenoid which energizes air cylinder **58** to cause knife blade **56** to descend is also included in conductor **120**.

Conductor **132** extends between power busses **100** and **102** and includes limit switch **134** which is operated by knife **52** at the end of its descent and relay coil **12CR** of the transfer drop out relay. The components are actuated at the termination of the web transfer operation.

Conductor **136** includes normally open relay contacts **14CR2** and normally closed relay contacts **13CRL2** connected in series. Also included in conductor **136** is relay coil coil **13CRL** of the turnover position relay. The turnover position relay is of the internal latching type which, once the coil is energized by an electrical signal, retains its contacts in the energized state even though the electrical signal is removed. The relay is de-energized by a subsequent electrical signal. This subsequent electrical signal is supplied through normally open relay contacts **13CRL3** connected to conductor **132**. The use of a latching relay avoids the necessity for hold-in or lock up contacts and a typical latching relay which may be used as the turnover position relay is that made and sold by the Allen-Bradley Company, Milwaukee, Wisc., under the numerical designation type N convertible contact relay, Catalog No. 700NMT200.

Conductor **138** includes normally open start transfer switch **140**, closure of which initiates the transfer of the web from the full take up roll to the empty spindle, and relay coil **14CR** of the transfer start relay.

Conductors **142** and **144** include the speed matching relays. One or the other of these relays is energized prior to the transfer of the web from the fully wound roll to the empty spindle. To effect the transfer, the peripheral speeds of both the roll and the spindle should be approximately the same to avoid either looping or tearing the web. Due to the larger diameter of the fully wound roll, its rotary speed must be less than that of an empty spindle in order to maintain the same peripheral speed. Energization of one of the speed matching relays causes slippage in the clutch driving the fully wound roll to reduce its speed, as for example, by reducing the voltage across its actuating coils. Conductor **142** contains relay coil **15CR** which causes clutch **42** to slip while conductor **144** contains relay coil **16CR** which causes a similar action in clutch **44**. Normally closed relay contacts **17CR1** are included in series with relay coil **15CR**. These relay contacts prevent energization of relay coil **15CR** except when spindle A is the one containing the fully wound roll. Normally closed relay contacts **18CR1** are connected in series with relay coil **16CR** to prevent energization of relay coil **16CR** except when spindle B is the one containing a fully wound roll. One or the other of relay coils **15CR** and **16CR** is energized by the closure of normally open contacts **14CR3** in conductor **146** connected to conductors **142** and **144**.

A hold-in or lock up circuit is provided for each of relay coils **15CR** and **16CR**. These circuits include normally open relay contacts **13CRL4** interposed in conductor **148**. Relay contacts **13CRL4** are operated by relay coil **13CRL** in a manner such that the contacts close instantaneously upon the energization of a relay coil but open, upon re-energization of the relay, only after a delay. Normally open hold-in relay contacts **15CR1** of relay coil **15CR** are located in conductor **150** extending between conductors **142** and **148**. Normally open hold-in relay contacts **16CR1** of relay coil **16CR** are interposed in conductor **152** extending between conductors **144** and **148**.

Conductor **154** includes a normally open spindle A start switch **156** and relay coil **17CR** which engages clutch **42** to drive spindle A. An interlocking normally closed relay contact **18CR2** is connected in series with spindle A start switch **156** to prevent operation of spindle A if spindle B is being driven. A hold-in circuit including open relay contacts **17CR2** and normally closed relay contacts **12CR1** is connected in parallel with spindle A start switch **156**. An additional parallel circuit containing normally open relay contacts **15CR2** is also connected around spindle A start switch **156**. Relay contacts **15CR2** are operated by the relay coil **15CR** of the spindle A speed matching relay in a manner such that upon the energization of relay coil **15CR** the contacts are closed only after a delay. The relay contacts are reopened immediately upon the de-energization of relay coil **15CR**.

A similar circuit is provided for relay coil **18CR** which engages clutch **44** to drive spindle B. Specifically, conductor **158** includes spindle B start switch **160** and relay coil **18CR**. An interlocking normally closed relay contact **17CR3** is connected in series with spindle B start switch **162** to prevent operation of spindle B if spindle A is being driven. A hold-in circuit including normally open relay contacts **18CR3** and normally closed relay contacts **12CR2** is connected in parallel with spindle B start switch **160**. Relay contacts **16CR2**, in parallel with spindle B start switch are operated by the relay coil **16CR** of the spindle B speed matching relay in a manner such that upon energization of relay coil **16CR**, the relay contacts are closed only after a delay. The relay contacts are reopened immediately upon de-energization of relay coil **16CR**.

Relay contacts **13CRL5** operable by relay coil **13CRL** are included in the control system for causing the power supply for drive motor **40** to close constant tension operation and to drive the spindle containing the fully wound roll at a speed suitable for speed matching by the empty spindle.

A DC energization circuit for coils **43** and **45** of clutches **42** and **44** is also included in the electrical control system. The input terminals of a full wave rectifier bridge **162** are connected across power busses **100** and **102** by conductors **164** and **166**. The coil **43** of clutch **42** and coil **45** of clutch **44** are connected in parallel across the output terminals of the rectifier bridge by means of conductors **168** and **170**.

A resistive means comprising rheostats **172** and **174** are connected in series with clutch coil **43** and normally open relay contacts **17CR**. Clutch coil **43** may be energized through slip rings **176** and return slip rings **177**. A normally closed set of relay contacts **16CR3** are connected in parallel around rheostats **172** and **174**.

A resistive means comprising rheostats **178** and **180** are connected in series with clutch coil **45** and normally open relay contacts **18CR4**. Clutch coil **45** may be energized through slip rings **82** and the return slip rings. A normally closed set of relay contacts **15CR3** are connected in parallel around rheostats **178** and **180**.

Turnover motor **30**, which turns over turret **20** is actuated by the energization of one of relay coils **4MF** or **4MR** located in conductors **184** and **186** connected to power bus **102** by conductor **188**. The direction which the turret turns over, either clockwise or counter clockwise, must be coordinated with the direction of rotation of the spindles, as previously noted, so as to insure that the web continues to be wound with the printed side in or out as desired. For this reason, normally open relay contacts **2MF3** are interposed in conductor **190** connected to conductor **184**. A manual forward switch **192** is connected in series with relay contacts **2MF3**. Normally open relay contacts **2MR3** are interposed in conductor **194** connected to conductor **186** and relay coil **4MR** by means of conductor **210**. Both relay contacts **2MF3** and **2MR3** are connected in series with normally open relay contacts **14CR4**, the former by means of conductor **196**.

The turnover stop switch **198** is connected in series with normally open relay contacts **13CRL6** in conductor **200**. Conductor **200** is connected through normally open relay contacts **4MF1** and **4MR1** and conductors **184** and **186** to relay coil **4MF** and **4 MR**. A manual reverse switch **206** is connected in series with normally open relay contacts **2MR4** and **2MF4** and, by means of conductors **208** and **210** to relay coils **4MF** and **4MR**, respectively.

A knife heater switch **212** is connected in series with

heating element 214 which may be placed on knife blade 56 to assist in cutting or severing the web.

Operation of the rewind stand control system

To initiate the operation of the rewind stand, the web 60 is threaded through the web processing apparatus and the forward edge affixed to a removable core 62 on one of the spindles, for example spindle A. As the initial rewinding operation will occur on spindle A, spindle A start switch 156 is closed to energize relay coil 17CR, closing relay contacts 17CR2, locking up relay coil 17CR and permitting release of spindle A start switch 156. Relay contacts 17CR3 are closed, allowing clutch coil 43 to be energized from rectifier bridge 162. Relay contacts 16CR3 are closed, shorting out the rheostats 172 and 174 and allowing the full voltage of the rectifier bridge to be applied to clutch coil 43. Clutch 42 is now ready to drive spindle A to rewind the web when motor 40 is energized. Relay contacts 17CR3 are open by the energization of relay coil 17CR, preventing accidental energization of relay coil 18CR which controls the operation of clutch 44 driving spindle B.

The desired print direction is selected by print direction control switch 112 so that the printed side of the web is on the inside or the outside of each wrap of the take up roll. It may be assumed, in the present instance, that it is desired to position the printed side on the outside of each wrap. Print direction control switch 112 is moved to the position shown in FIG. 4 for this purpose.

Motor 40 is energized by closing rewind start switch 110. The closure of this switch energizes relay coil 2MR because the position of print direction control switch 112. Relay coil 2MR is locked up by relay contacts 2MR2 allowing release of the rewind drive start switch 110. Relay contacts 2MR1 are opened, preventing energization of relay coil 2MF.

Motor 40 is now energized by the power source to drive spindle A in the proper direction through clutch 42 to rewind web 60 on spindle A printed side out. As noted, supra, such rewinding may provide constant tension to web 60.

Energization of relay coil 2MR also closes relay contacts 2MR3 and 2MR4, insuring that turnover motor 30 will turn over turret 20 in a direction which is coordinated with the printed side out web winding operation being performed on spindle A.

The turret 20 may be moved, if desired, during the winding operation by switches 192 and 206. The normal rewinding position for the turret is shown in FIG. 1.

Web 60 continues to be wound on spindle A until the rewind stand operator decides that a roll the proper size has been obtained. At this point, a transfer of the web from the full wind up roll on spindle A to the empty core 62 spindle B is initiated by closing start transfer switch 140. Closure of the switch energizes relay coil 14CR.

Relay contacts 14CR1 are opened instantaneously, to prevent limit switch 124 from operating solenoid 130. Relay contacts 14CR2 are closed by energization of relay coil 14CR energizing relay coil 13CRL of the turnover position relay through normally closed relay contacts 13CRL2. Energization of relay coil 13CRL opens relay contacts 13CRL2 and closes relay contacts 13CRL3 de-energizing the relay coil. However, the relay contacts of the relay remain unaffected by the de-energization of relay coil 13CRL because of its construction, as noted supra.

Energization of relay coil 13CRL by the prior energization of relay coil 14CR closes relay contacts 13CRL1. The prior energization of relay coil 14CR instantaneously opens relay contacts 14CR1 so that the closure of relay contacts 13CRL1 is ineffective in causing any operation of the control system. Such an interrelation between relay contacts 13CRL1 and 14CR1 is needed to insure that both of limit switches 122 and 124 are open during the transfer operation. Because of an inadvertent positioning of turret 20, one of the limit switches could be closed at the start of the transfer cycle causing knife 52 to descend immediately. To prevent this, relay contacts 14CR1 are opened immediately upon the energization of relay coil 14CR. These contacts close after a delay sufficient to permit turret 20 to move to a position where neither of limit switches 122 or 124 are closed.

Energization of relay coil 14CR, closes relay contacts 14CR4 to energize relay coil 4MR through closed relay contacts 2MR3. Energization of relay coil 4MR energizes turnover motor 40 to initiate the turnover of turret 20. Relay contacts 13CRL6 are closed by the energization of relay coil 13CRL to provide a locking up path for relay coil 4MR, after start transfer switch 140 is released.

In addition to turning over the spindles, it is also necessary to match a peripheral speed of the fully wound roll of web material and the empty spindles as noted above. This is accomplished by reducing the rotary speed of spindle A so that the peripheral speed of the fully wound roll matches the peripheral speed of spindle B.

Closure of start transfer switch 140 closes relay contacts 13CRL5 interrupting the constant tension operation of motor 40. Motor 40 now is in a mode so that it accelerates the core peripheral speed to match web surface speed. Relay contacts 14CR3 is also closed energizing relay coil 16CR through normally closed relay contacts 18CR1. Energization of relay coil 15CR is prevented by open contacts 17CR1 which are opened when clutch coil 43 is energized by de-energization of relay coil 17CR. Closure of relay contacts 13CRL4 and relay contacts 16CR1 hold in relay coil 16CR after start transfer switch 140 is released.

Energization of relay coil 16CR opens relay contacts 16CR3 causing a voltage drop to appear across rheostats 172 and 174 and reducing the voltage applied to clutch coil 43, causing the clutch to slip and a reduction in the rotary and peripheral speeds of the fully wound roll on spindle A.

After a slight delay, normally open relay contacts 16CR2 close, energizing relay coil 18CR, which by closing relay contacts 18CR4, energizes clutch coil 45 of clutch 44 to drive spindle B. The delay in the closure of relay contacts 16CR2 is needed to insure that relay contacts 16CR1 are closed, creating a hold-in circuit for relay coil 16CR before relay contacts 18CR1 are opened by the energization of relay coil 18CR. Relay contacts 18CR2 are also opened to prevent interference with the turnover cycle by accidental closure of spindle A start switch 156. Relay contacts 18CR3 are closed to provide a hold-in or lock up circuit for relay coil 18CR.

At this point in the operating cycle, clutch coil 43 of clutch 42 is partially energized from rectifier bridge 162 so as to reduce the rotary and peripheral speed of the fully wound roll on spindle A. Clutch coil 45 of clutch 44 is fully energized so as to accelerate spindle B to approximately the same peripheral speed as that of the fully wound roll.

At the same time, the entire turret 20 is turning over as shown in FIG. 2. When the turret revolves to a position at which a cut off may be effected, limit switch 124 is tripped by lobes 65 on cam 64 to energize solenoid 130 and air cylinder 58 to cause cut off knife 52 to descend across the web to cut or sever it. The knife also pushes the web over spindle B to affix the web to that spindle to continue the winding operation. The outer surface of the core 62 may be covered with glue to assist in fastening the web to the core.

When cut off knife 52 reaches the end of its travel, it trips limit switch 134 energizing relay coil 12CR of the transfer dropout relay. Energization of relay coil 12CR opens relay contacts 12CR1, de-energizing relay coil 17CR, opening relay contacts 17CR3 and de-energizing clutch coil 43 of clutch 42. This allows the fully wound roll on spindle A to coast to a stop after which it may

be removed and another empty spindle and core placed in the turret for a subsequent rewind transfer operation.

Energization of relay coil **12CR** also opens relay contacts **12CR2**, but as relay contacts **16CR2** are closed, relay coil **18CR** remains uneffected and in the energized state so that clutch **45** remains engaged.

The tripping of limit switch **134** also provides an unlatching signal to relay coil **13CRL** through closed contacts **13CRL3** causing the relay contacts operated by that relay coil to revert to their original states. Relay contacts **13CRL1** are reopened, de-energizing solenoid **130** and causing cut off knife **52** to revert to its initial position. This reopens limit switch **134** and de-energizes relay coil **12CR** reclosing relay contacts **12CR1**.

Relay contacts **13CRL2** are reclosed and relay coil **13CRL3** is reopened to prepare relay coil **13CRL** of the turnover position relay for a subsequent operation. Relay contacts **13CRL5** are reopened allowing the power supply for motor **40** to revert to constant tension operation.

The re-opening of relay contacts **13CRL4** is delayed with respect to the de-energization of relay coils **12CR** and **13CRL**. This insures that normally closed relay contacts **12CR2** will be reclosed before relay contacts **16CR2** are reopened by the de-energization of relay coil **16CR** caused by the reopening of relay contacts **13CRL4**, thereby insuring that relay coil **18CR** and clutch coil **45** remain energized through relay contacts **18CR3** and **12CR2** to drive spindle B through clutch **44**. Relay contacts **14CR4** and **13CRL6** are also reopened.

The turnover transfer operation from spindle A to spindle B has now been completed. The transfer of the web from the full roll subsequently wound on spindle B to an empty core on spindle A is completed in an analogous manner as is a rewinding of the web with the printed side in rather than out, as described above.

What is claimed is:

1. A control system for a web rewind stand providing wind up in both the print-in and print-out modes, said control system effecting the transfer of a moving web from a fully wound roll to an empty spindle, said stand including a revolvable turret mounted thereon for rotation in either direction, said turret having opposite ends and a driven spindle on each end for driving the roll located thereon, a turnover motor for revolving said turret in either direction, a reversible drive motor, a selectively engageable clutch means for each spindle for selectively coupling said drive motor to said spindles for driving said spindles in either direction of rotation, and a cut off means for severing said web from the fully wound roll and for starting said web on the empty spindle, said control system comprising:

first reversing means for energizing said turnover motor to revolve said turret in a preselected direction to move one of said spindles into a web rewinding position;

second reversing means for energizing said reversible drive motor in a preselected rotary direction;

interlocking relay means coupled to said first and second reversing means for automatically coordinating the direction of turret and spindle rotation to thereby select the mode of web wind up on the spindle;

means for selectively engaging one of said clutch means to drive its associated spindle in the preselected direction of said reversible drive motor when the spindle is in the web rewinding position to thereby wind the web thereon to form a wound roll;

means to reduce the speed of the spindle containing said wound roll and for engaging the other of said clutch means to accelerate the empty spindle upon the commencement of a web transfer operation to thereby cause the peripheral speeds of said wound roll and empty spindle to be approximately equal;

said first reversing means again being operative to revolve said turret in the preselected direction to move the resulting fully wound roll away from said web rewinding position and simultaneously moving the empty spindle into the web rewinding position; and

signal means operatively associated with said turret and responsive to the rotation of the turret in either direction for actuating said cut off means to thereby sever said web at a location between said wound roll and empty spindle and to start the resulting new leading end of said web on said empty spindle.

2. A control system as set forth in claim **1** including limit switch means actuated by movement of the turret in either direction for actuating said cut off means.

3. A control system described in claim **2** including cam means located on said turret for actuating said limit switches upon predetermined rotation of said turret.

4. A control system as set forth in claim **1** further characterized in that said means to reduce the speed of the spindle containing said wound roll comprises means for partially engaging the clutch associated with that spindle.

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