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O'Neil et al.

[11] **3,871,594**

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[54] **RECOILER PAPER STUFFER**

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[73] Assignee: **The Yoder Company,** Cleveland, Ohio

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[21] Appl. No.: **276,978**

[52] **U.S. Cl.** ..... **242/56 R,** 83/63, 83/367, 242/56.9, 242/78.1

[51] **Int. Cl.**.. **B65h 19/04,** B65h 35/02, B65h 35/00

[58] **Field of Search**..... 242/56 R, 56 A, 56.2, 56.9, 242/67.2, 67.3, 68.4, 71.9, 68, 73, 78.1; 83/63, 367

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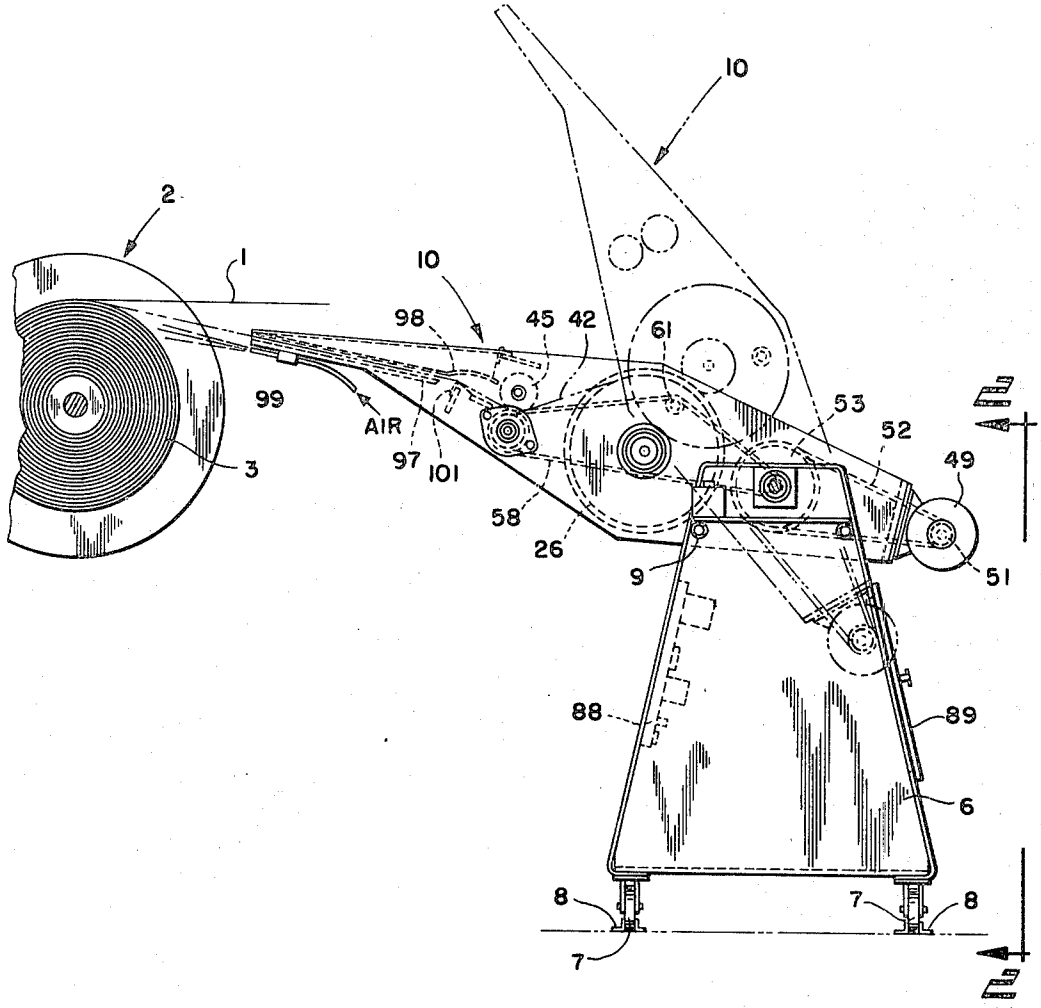
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Assistant Examiner—John M. Jillions
Attorney, Agent, or Firm—Donnelly, Maky, Renner & Otto

[57] **ABSTRACT**

A metal strip recoiler paper stuffer selectively for positioning cut paper strips between convolutions of a loosely wound strip coil including paper feed means operative to direct the paper into the nip of the outer coil convolution, a spring deflector plate between the feed means and coil along which the paper is drawn, and a knife adjacent the deflector plate having a cutting edge slightly removed from the plane of the paper. The paper is normally drawn at a faster rate by the recoiler than the drive rate of the feed means causing the spring plate to be deflected to bring the paper into severing contact with the cutting edge of the knife, the spring plate then stripping the leading severed edge of the paper clear of such knife.

18 Claims, 7 Drawing Figures



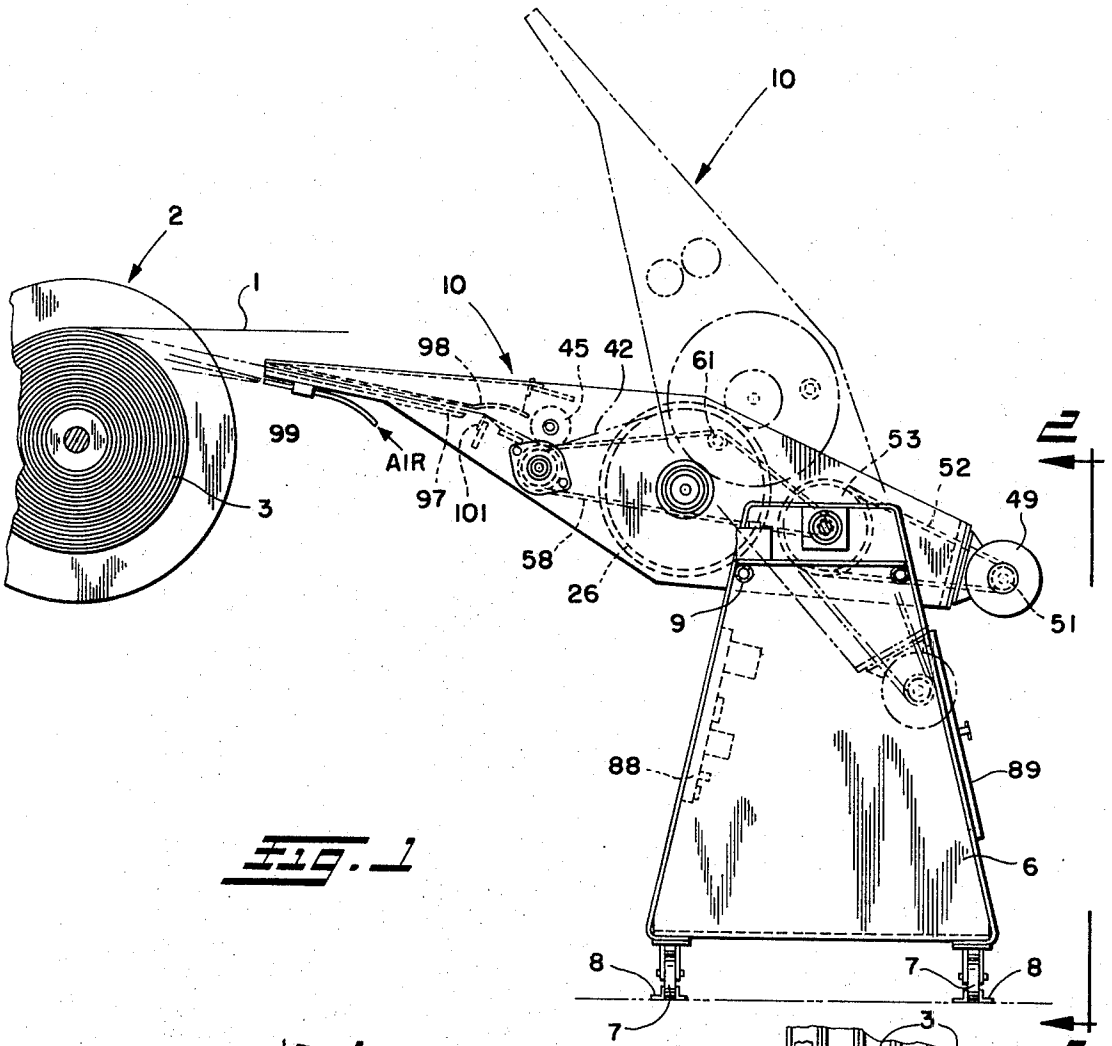

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FIG. 1

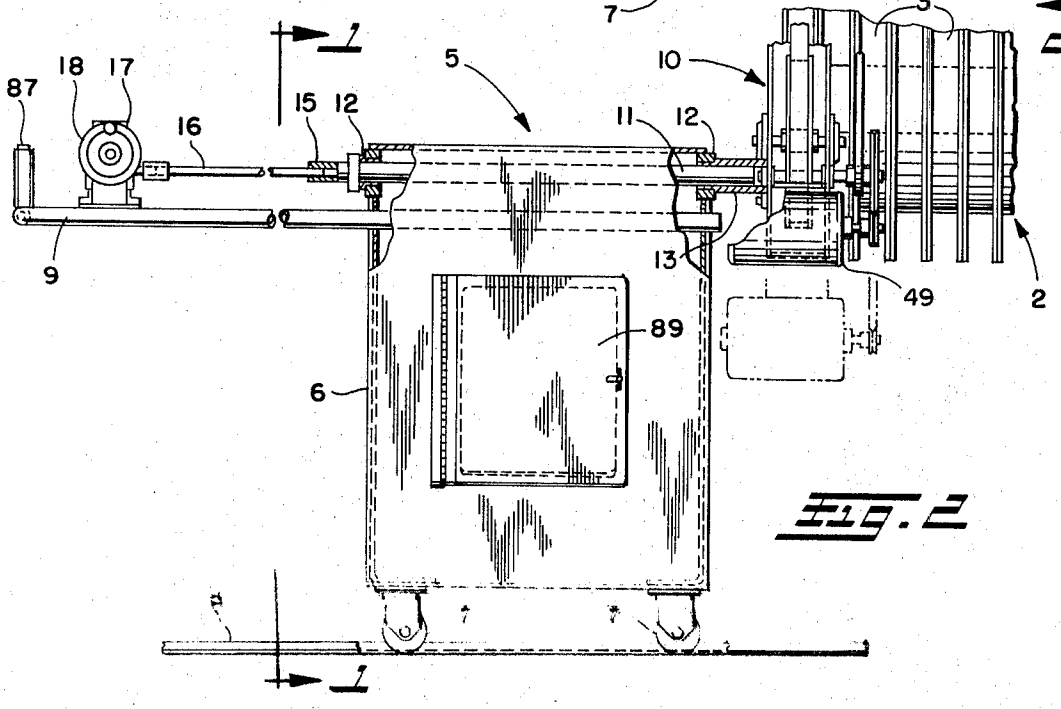

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FIG. 2

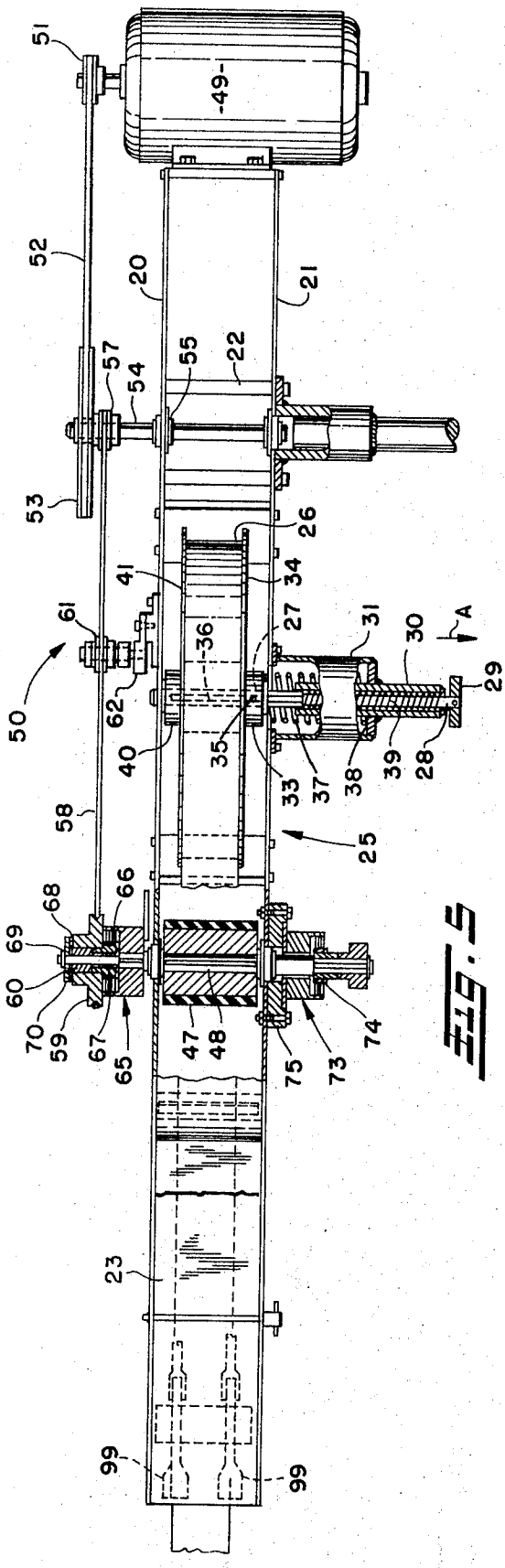


FIG. 5

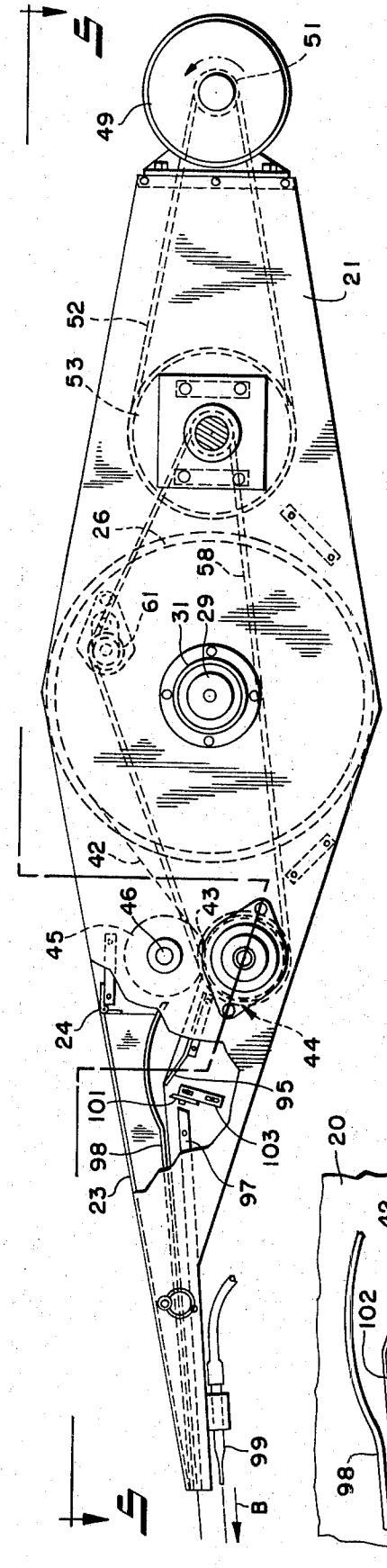
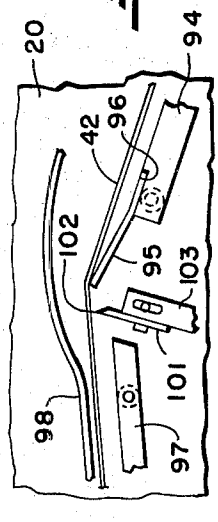


FIG. 3

FIG. 4



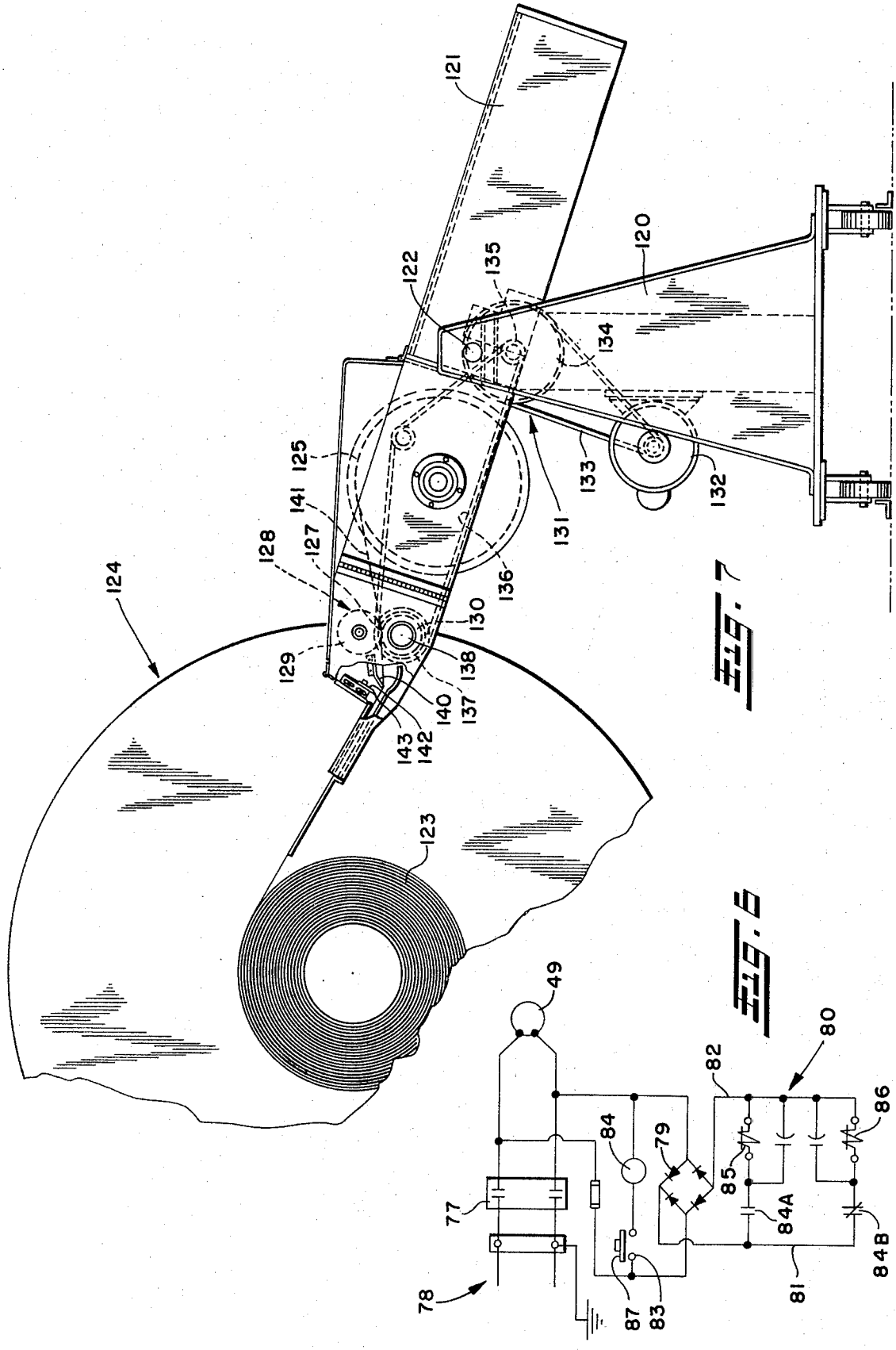

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FIG. 7

FIG. 8

RECOILER PAPER STUFFER

This invention relates as indicated to a recoiler paper stuffing apparatus and, more particularly, to a paper stuffing apparatus operative selectively to position cut paper strips between convolutions of a loosely wound slit strip or band coil.

Rolled strip coils are frequently slit into a number of smaller width bands, and such bands are then wound on a single recoiler into a plurality of coils. Rolled strip coils are known to vary slightly in thickness from edge to edge which results in non-uniformity and looseness in some of the rewound band coils. Specifically, the bands of greater thickness upon winding will have a greater coil diameter and taut feed, but the greater diameter causes an increased linear feed rate so that the bands of less thickness and smaller coil diameter have a slack feed resulting in coil looseness. Reference may be had to Foulon et al U.S. Pat. No. 3,386,679, which is assigned to the assignee of the present invention, wherein the slit strip coil looseness problem, methods or apparatus for solving the same, and a particular tensioning device are disclosed. One of the methods discussed in such patent, namely paper insertion between coil convolutions, is employed by the machine or apparatus of the present invention to correct the coil looseness problem.

The common industry procedure in the past, when using the paper stuffing method, has been to hand feed the paper to the loose coil. However, hand feeding is unsatisfactory because of difficulty in gaining access to the inner coils and the possibility of operator injury. Accordingly, the assignee began developing the present invention. The first apparatus developed employed a paper drive means operative to direct the paper web into the nip of the outer coil convolution, the drive means being driven at a slower rate than the recoiler to break up the paper web by tension. This apparatus was unsatisfactory because there was no control over paper length, the paper web often broke between the paper supply and the drive means, and the paper web frequently jammed.

Assignee has continually changed the first apparatus in an attempt to eliminate the problems of the same. Such changes have included a knife actuated in one manner or another by the operator to cut the paper. However, such changes still did not completely eliminate uncontrolled paper web breakage due to tension and paper web jamming between the supply and the drive means or cutting knife. Prior to the present invention, a reliable paper stuffer capable of a sustained continuous feed has not been achieved.

Accordingly, a principal object of the present invention is to provide a recoiler paper stuffing apparatus that dependably positions upon actuation cut paper strips between convolutions of a loose band coil to reestablish uniform diameters for all simultaneously wound coils on the recoiler.

Another principal object of the present invention is to provide a recoiler paper stuffing apparatus that selectively positions controlled lengths of cut paper strips between convolutions of a loose band coil. The lengths of the paper strips are controlled by a spring plate which deflects under preselected paper web tension so that the paper web is drawn into a stationary knife for cutting before tension sufficient to break the web is developed, such plate then stripping the leading severed edge of the paper web clear of the knife.

Still another important object of the present invention is to provide a recoiler paper stuffing apparatus that substantially eliminates paper web jamming in the feed arm.

A further important object is the provision of a paper stuffer having a simplified knife and associated spring loaded stripper plate permitting reliable continuous operation.

Yet another object of the present invention is to provide a recoiler paper stuffing apparatus that is both transversely adjustable for alignment with any coil on the recoiler and adaptable to feed paper in widths corresponding to the width of the bands.

Other objects and advantages of the present invention will become apparent as the following description proceeds.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawings setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

IN THE DRAWINGS

FIG. **1** is a side elevation partially in section of a recoiler paper stuffing apparatus in accordance with the present invention, the phantom lines indicating the angular adaptability of the pivotally mounted paper feeding arm;

FIG. **2** is a fragmentary front elevation of the invention taken along line **2—2** in FIG. **1**;

FIG. **3** is an enlarged elevation of the paper stuffing arm partially broken away for clarity of illustration of the paper web severing mechanism;

FIG. **4** is an expanded detail of the spring deflector plate and paper web cutting apparatus;

FIG. **5** is a top plan partially in section taken substantially along line **5—5** of FIG. **3**;

FIG. **6** is a schematic wiring diagram of the electrical control circuit of the present invention; and

FIG. **7** is a side elevation similar to FIG. **1** of a second embodiment of the present invention.

Referring now in more detail to the drawings and initially to FIGS. **1** and **2**, the narrowly slit strips or bands **1** are simultaneously drawn onto driven recoiler **2**. As the winding of the slit strips progresses, the variations in thickness of the same result in coils **3** of different diameter being formed on the single recoiler. The larger coils obviously have a greater circumference resulting in a faster linear feed rate for the slit strips, such faster feed rate keeping the feed taut to the larger slit strip coils but causing slack feed and coil looseness in the smaller diameter slit strip coils. Therefore, the slit strip coils on the recoiler need to be maintained at uniform diameters during winding to provide taut feed to the same. The present invention is adapted readily to perform the necessary diameter maintenance function by insertion of paper strips between convolutions of loosely wound coils.

The operator at the recoiling station visually observes the recoiling of the slit strips and, upon detecting a loose coil or variations in coil diameter, he adjusts the lateral position of the paper stuffing apparatus indi-

cated generally at 5 to be in alignment with such loosely wound coil so that paper may be inserted between the convolutions thereof to reestablish uniform winding diameters and tightness in such loosely wound coil. For this purpose, the frame or housing 6 of the paper stuffing machine is mounted on casters 7 which are constrained to lateral movement parallel to recoiler 2 by angle guides 8.

To facilitate lateral adjustment by the operator, an outwardly extending U-shape handle member 9, as best shown in FIG. 2, is welded to housing 6 and enables the operator by pushing or pulling readily to change the position of the paper stuffing machine for alignment with the loosely wound coil. Other alternatives for alignment of the paper stuffer with the loose coil include an automatic lateral position control means (not shown) or an operator controlled drive means for the stuffer. In addition, plural stuffer units may be employed to eliminate the necessity for lateral adjustment.

The paper stuffing arm indicated generally at 10 is pivotally mounted to housing 6 so that the angular position of the same may be varied to correspond to the diameter of the loosely wound coil. Such pivotal mounting of the arm is effectuated by pivot shaft 11 journalled in aligned bearings 12 mounted in opposed side walls of frame 6. The inner end of shaft 11 is secured in flange 13 mounted on arm 10. A sleeve coupling 15 is mounted to the outer end of shaft 11 and receives one end of extension shaft 16, the other end of shaft 16 being coupled to gear reducer 17 having hand wheel 18. The operator can thus adjust the angular position of arm 10 tangentially to correlate the end thereof with the diameter of the coil by rotating hand wheel 18 as needed.

Referring now to FIGS. 3 and 5, arm 10 includes side walls 20 and 21 which are substantially open at top and bottom and are stabilized by tie bars 22. A plate 23 is hinged to the side walls at 24 and covers the top of the front portion of arm 10.

The paper feeding and severing mechanism housed in arm 10 and indicated generally at 25 includes a paper supply coil 26 on arbor 27. The outer end of arbor 27 has a reduced diameter extension 28 with knob 29 at the end thereof. Extension 28 is received in concentric sleeve 30 which is welded to spring housing 31, the concentric sleeve being just slightly larger in diameter than arbor 27 so that the latter may slide within such sleeve as described below. A pusher disc 33 for side plate 34 is slidably mounted on arbor 27 by a pin 35 received in slot 36 in the arbor. Such pin and slot connection requires arbor 27, pusher disc 33 and side plate 34 to rotate at the same angular speed while allowing side plate 34 to move axially with relation to arbor 27. A spring 37 is seated against the blind end 38 of spring housing 31 and urges pusher disc 33 and connected side plate 34 against the side of paper coil 26. A spring 39 is positioned in the annular space between extension 28 and sleeve 30, one end of such spring being seated in the blind end of sleeve 30 while the other end biases arbor 27 into the operative position shown in FIG. 5.

The inner end of arbor 27 is removably journalled in side wall 20 and has a spacer block 40 keyed thereto. The inner face of the block 40 carries a side plate 41 that forms a guide and stop surface for paper supply coil 26.

By the structure just described, paper coil 26 may easily be replaced when depleted or when a different width coil is desired. Specifically, knob 29 may be pulled by the operator in the direction of arrow A axially to displace arbor 27 in a like direction. The next paper coil may then be lowered into the arm through the open top of the same, with one lateral side of coil 26 abutting plate 41. Knob 29 may then be released to allow spring 39 to push arbor 27 through the central aperture in the paper coil spool. Side plate 34 is urged by pusher disc 33 and spring 37 against the outer side surface of the newly inserted paper coil. The two side plates thus maintain the vertical orientation of the paper coil and also permit paper coil 26 and arbor 27 to rotate without relative slippage.

The paper is removed from coil 26 by drawing web 42 through the nip 43 of pinch rollers 44. Top roller 45 has a shaft 46 journalled in side walls 20, 21 of arm 10 for free rotation. Bottom roller 47 is keyed to shaft 48 and is powered by motor 49 through a drive train indicated generally at 50, such motor being mounted to the rear end of arm 10 for counterbalancing purposes.

As best shown in FIGS. 3 and 5, such drive train 50 includes motor sheave 51 that drives V-belt 52 passing at its other end about sheave 53. Sheave 53 is keyed to intermediate shaft 54 which is journalled in side walls 20, 21 of arm 10 by bearings 55. A change sheave 57 is keyed to intermediate shaft 54 immediately inside sheave 53. A V-belt 58 is passed about sheaves 57 and 59, the latter being journalled to roller shaft 48 by bushing 60. A pivotally adjustable idler sheave 61 is connected to side wall 20 of arm 10 by adjustable arm 62 to maintain tension in V-belt 58.

An electromagnetic clutch 65 has a clutch drive gear 66 connected to shaft 48 by flanged bushing 67. The entire clutchsheave assembly is maintained on shaft 45 by thrust washer 68, end washer 69, and snap ring 70. Electrical energization of the clutch coil will couple sheave 59 to shaft 48 to drive roller 47, as will be described in more detail below.

At the other end of shaft 48, an electromagnetic brake 73 with brake drive gear 74 is secured to side wall 21 by suitable fastening means passed through adapter 75. Energization of the coil of brake 73 will stop the rotation of shaft 48 and preclude further rotation until deenergization of the brake.

The drive and braking of bottom roll 47 of pinch rollers 44 is controlled by the electrical circuit disclosed in FIG. 6. A first manual switch 77 when closed connects the AC power supply 78 to motor 49 for continuous operation of the same. The alternating current of the power source is converted to direct current by bridge rectifier 79 for the clutch and brake circuit 80, line 81 of such circuit having positive polarity while line 82 has negative polarity. A second manual switch 83, when closed, energizes coil 84 of the relay which in turn energizes normally open contact 84A and normally closed contact 84B of the relay to close and open the same, respectively. Clutch coil 85 and brake coil 86 are thus alternately energized, with the clutch being energized by the relay when second switch 83 is closed.

Accordingly, when switches 77 and 83 are closed, coil 85 of clutch 65 is energized to couple sheave 59 to shaft 48, and coil 86 of brake 73 is deenergized to permit rotation of such shaft. If second switch 83 is opened, coil 85 of clutch 65 is deenergized to uncouple shaft 48 and sheave 59, and coil 86 of brake 73 is in turn energized to stop shaft rotation thereby to avoid further paper web payout.

It will be appreciated that during operation of recoiler 2, first switch 77 is retained in its closed position and the operator controls the drive of roller 47 through second switch 83. The push button 87 of such second switch is mounted at the end of handle 9 for easy access by the operator. The circuitry is mounted on control panel 88 inside housing 6, such panel being readily accessible through hinged door 89 on such housing.

Referring now to FIGS. 3 and 4, paper web 42, after leaving nip 43 of pinch rollers 44, is drawn over bracket 94 and spring steel deflector plate 95, the latter being connected at one end to bracket 94 as shown at 96. Web 42 then passes between bottom guide 97 and top guide 98 and subsequently passes from arm 10. An air cushion to support the paper web between arm 10 and coil 3 may be provided by passing compressed air through flattened ducts 99 in the direction of arrow B.

A knife 101 with cutting edge 102 is mounted on bracket 103 so that such cutting edge is a preselected distance below paper web 42. Such web upon insertion between the outer convolution of coil 3 and the strip feed 1 will be drawn by recoiler 2 at a linear speed directly related to the angular speed of the same. The angular speed of recoiler 2 is usually greater than the angular speed of driven roller 47, thereby to place web 42 in tension between pinch rollers 44 and coil 2. Such tension on the web results in spring steel plate 95 being deflected downwardly which draws web 42 into severing contact with cutting edge 102 of knife 101, thereby to cut such web. The tension required to sever the web may be varied as desired by adjusting the height of knife 101. Spring steel plate 95 quickly returns to its original upper position after web severance to clear knife 101 and to reestablish the feed path for the paper web.

The recoiler paper stuffer unit may also be used when the paper demand is either equal to or less than the paper drive speed. When the recoiler speed equals paper drive speed, paper separation occurs by the operator releasing push button 87 to open switch 83, such operator release resulting in energization of brake 73 and deenergization of clutch 65 to discontinue paper web payout, thereby to place the web between recoiler 2 and pinch rollers 44 in tension for severing of the same through deflection of spring plate 95. By selectively depressing and releasing push button 83, known as switch jogging, the operator may feed either severed lengths or a continuous ribbon of paper to the loose coil. When the recoiler speed is such that paper demand is slower than paper drive speed, the operator may insert either discrete lengths or a continuous ribbon of paper by switch jogging, with the resulting paper overfeed being serially taken up by the recoiler.

It will thus be appreciated that by pushing button 87, severed lengths of paper web 42 may be inserted or stuffed between convolutions of loose coil 3. By controlling button 87, the operator can sequentially feed as many paper lengths as required to restore tightness and coil diameter uniformity.

Referring now to FIG. 7, a second embodiment of the present invention is illustrated which includes a laterally adjustable housing 120. An arm 121 is pivotally mounted to housing 120 by journalled shaft 122 for angular adjustment tangentially to align the end of the same with the outer convolution of a coil 123 on recoiler 124. A paper coil 125 is rotatably and removably mounted in arm 121, the paper being drawn from such coil by passing through the nip 127 of pinch rollers 128. The upper roller 129 is journalled in arm 121 for free rotation, while bottom roller 130 is keyed to a shaft selectively rotated by drive train 131.

Such drive train 131 includes motor 132 mounted on a vertical support frame in housing 120. Motor 132 when energized drives belt 133 and sheave 134, which in turn is coupled to change sheave 135 for driving belt 136. Belt 136 drives a sheave 137 which may be coupled to shaft 138 by a clutch. Shaft 138 has a clutch and a brake mounted to its opposite ends as described in context with the other embodiment. Such clutch and brake are alternately selectively energized by a control circuit identical to that disclosed in FIG. 6.

A deflector plate 140 is positioned downstream of pinch rollers 128 and defines the feed path for paper web 141. Knife 142 is mounted to arm 121 a preselected distance above the web, such knife having a lower cutting edge 143. The web may be drawn at a faster rate by recoiler 124 than by pinch rollers 128, which results in the web being placed in tension and in plate 140 being deflected upwardly. Such upward deflection draws the web into severing contact with cutting edge 143 of knife 142; the leading severed edge of the web is then stripped away from the knife by deflector plate 140 returning to its original position. It will be appreciated that the second embodiment of the paper stuffer is likewise adapted through switch jogging to feed either discrete lengths or a continuous ribbon of paper to recoiler 124 when paper demand is equal to or is less than paper drive speed. Such switch jogging intermittently drives pinch rollers 128 so that the web is placed in tension for knife severing when bottom drive roller 130 is not rotating.

Operation by the attendant of the paper stuffer according to the second embodiment is the same as described above in context with the first embodiment.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A paper stuffer selectively for positioning cut paper strips between convolutions of a loosely wound strip coil or the like on a driven recoiler comprising paper feed means operative to direct the paper into the nip of the outer convolution of the coil and severing means between the coil and the feed means, the paper being drawn by the recoiler at a rate faster than the drive rate of the feed means to place the paper therebetween in tension, the severing means being operative to cut the paper when a preselected tension is obtained, said severing means including a spring deflector plate over which the paper is drawn and a knife which has a cutting edge slightly removed from the plane of the paper, the tension developed in said paper being operative to deflect said plate to draw the paper into severing contact with said cutting edge of the knife, the leading severed edge of the paper then being stripped away from the knife by the deflector plate returning to its original position.

2. A paper stuffer selectively for positioning cut paper strips between convolutions of a loosely wound strip coil or the like on a driven recoiler comprising paper feed means operative to direct the paper into the nip of the outer convolution of the coil and severing means between the coil and the feed means, the paper being drawn by the recoiler at a rate faster than the drive rate of the feed means to place the paper therebe-

tween in tension, the severing means being operative to cut the paper when a preselected tension is obtained, said severing means including a spring deflector plate over which the paper is drawn and a knife which has a cutting edge slightly removed from the plane of the paper, the tension developed in said paper being operative to deflect said plate to draw the paper into severing contact with said cutting edge of the knife, the leading severed edge of the paper then being stripped away from the knife by the deflector plate returning to its original position.

3. A paper stuffer selectively for positioning cut paper strips between convolutions of a loosely wound strip coil or the like on a driven recoiler comprising paper feed means operative to direct the paper into the nip of the outer convolution of the coil and severing means between the coil and the feed means, means to place the paper between said feed means and coil in tension, and means responsive to a preselected tension of such paper being obtained to cause the severing means to cut the paper.

4. The paper stuffer of claim **3** wherein the paper feed means and severing means are mounted in a pivotal arm that is angularly adjustable tangentially to align the paper feed with the periphery of the slit strip coil.

5. The paper stuffer of claim **4** wherein the arm is pivotally mounted to a frame adapted to be moved in a direction parallel to the recoiler, whereby the machine may selectively be positioned in alignment with any strip coil on the recoiler.

6. The paper stuffer of claim **3** wherein the paper feed means includes driven pinch rollers and a paper supply coil, the pinch rollers being between such supply coil and the paper severing means.

7. The machine of claim **6** further including power means selectively to drive one of the pinch rollers for dispensing paper, such one roller being disengaged from the power means by a clutch and held against rotation by a brake when paper is not being fed.

8. The paper stuffer of claim **7** wherein the power means clutch and brake are controlled by an electric circuit operative upon actuation continuously to run said power means during selective energization of the brake and clutch coils according to machine function.

9. The paper stuffer of claim **6** wherein the pinch rollers and paper supply coil are mounted in a pivotal arm that is angularly adjustable tangentially to align the paper feed with the periphery of the slit strip coil, the paper supply coil releasably being held in said arm by arbor means for subsequent replacement by a same or differently sized paper supply coil.

10. The paper stuffer of claim **9** wherein the arbor means includes a paper spool shaft, which is spring loaded into operative position but adapted for movement against said spring for paper replacement, and a spring loaded side plate urged against a lateral surface of the paper coil, said side plate having a pin and slot connection with said core to preclude relative rotation therebetween while allowing axial movement under spring bias for said side plate, whereby paper coils of varying widths may be received in said arm for rotation on said core without slippage.

11. The paper stuffer of claim **1** wherein the knife is below said paper and the position of such knife relative to the paper is adjustable for selection of the tension necessary before said paper is cut.

12. The paper stuffer of claim **1** wherein the feed means, the deflection plate and the knife are positioned in a pivotal arm that is angularly adjustable tangentially to align the paper feed with the periphery of the slit strip coil, the arm having guide means properly to direct the paper from said arm and air cushion means to support said paper between said arm and said slit strip coil.

13. A paper stuffer selectively for positioning cut paper strips between convolutions of a loosely wound strip coil or the like on a driven recoiler comprising paper feed means operative to direct the paper into the nip of the outer convolution of the coil and severing means between the coil and the feed means, and means selectively to place the paper in tension between the coil and feed means, and means responsive to a preselected tension being obtained to cause the severing means to cut the paper.

14. The paper stuffer of claim **13** wherein the paper feed means includes driven pinch rollers and a paper supply coil, the pinch rollers being between such supply coil and the paper severing means.

15. The paper stuffer of claim **14** wherein the means selectively to place the paper in tension includes power means selectively to drive one of the pinch rollers for dispensing paper, such one roller being disengaged from the power means by a clutch and held against rotation by a brake when paper is not being fed.

16. The paper stuffer of claim **15** wherein the power means, clutch and brake are controlled by an electric circuit operative upon actuation continuously to run said power means during selective energization of the brake and clutch coils according to machine function.

17. The paper stuffer of claim **16** wherein said electric circuit includes means selectively to actuate the brake to place the paper in tension for severing when the paper feed is equal to or greater than recoiler demand.

18. The paper stuffer of claim **13** wherein the means selectively to place the paper in tension includes means to draw the paper into the nip of the coil faster than the paper is paid out by the paper supply means.

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