# United States Patent

**Fedor**

[15] **3,685,760**

[45] **Aug. 22, 1972**


[54] **COIL HOLDER**


[72] Inventor: **Richard M. Fedor,** 2662 Shaker Road, Cleveland Heights, Ohio 44118



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[21] Appl. No.: **13,484**

[52] **U.S. Cl.** .....**242/78.7,** 242/68.7, 242/75.2, 242/76

[51] **Int. Cl.**.....**B21c 47/22**

[58] **Field of Search**.....242/78.7, 80, 68.7, 71.9, 73, 242/66, 75.2



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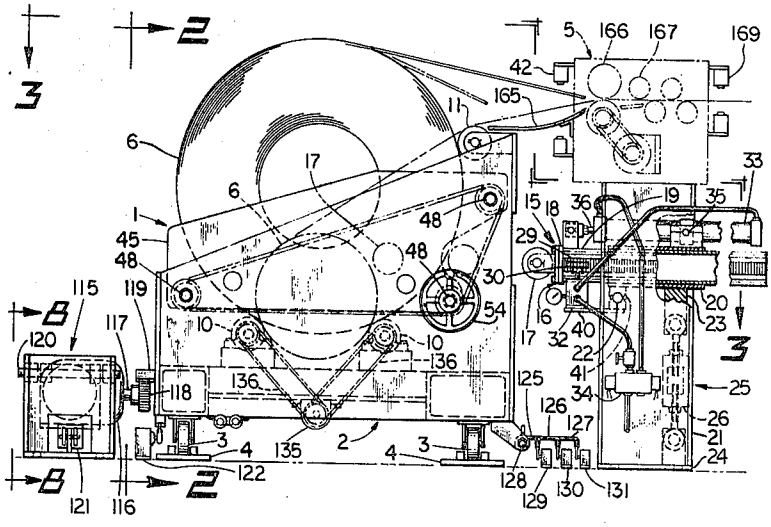
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[57] **ABSTRACT**

Coil holder has a plurality of side plates which are arranged in pairs and adjustable relative to each other to accommodate different widths of stock material therebetween. The side plates may be independently adjusted or adjusted simultaneously, as desired, and one or both side plates of each pair may be spring-loaded to accommodate for variations in width of the stock material. Apparatus may also be provided for effecting automatic or semi-automatic feeding of the stock and indexing of the holder to bring successive coils into proper alignment with a stock processing line to provide a continuous supply of material therefor.


**26 Claims, 26 Drawing Figures**



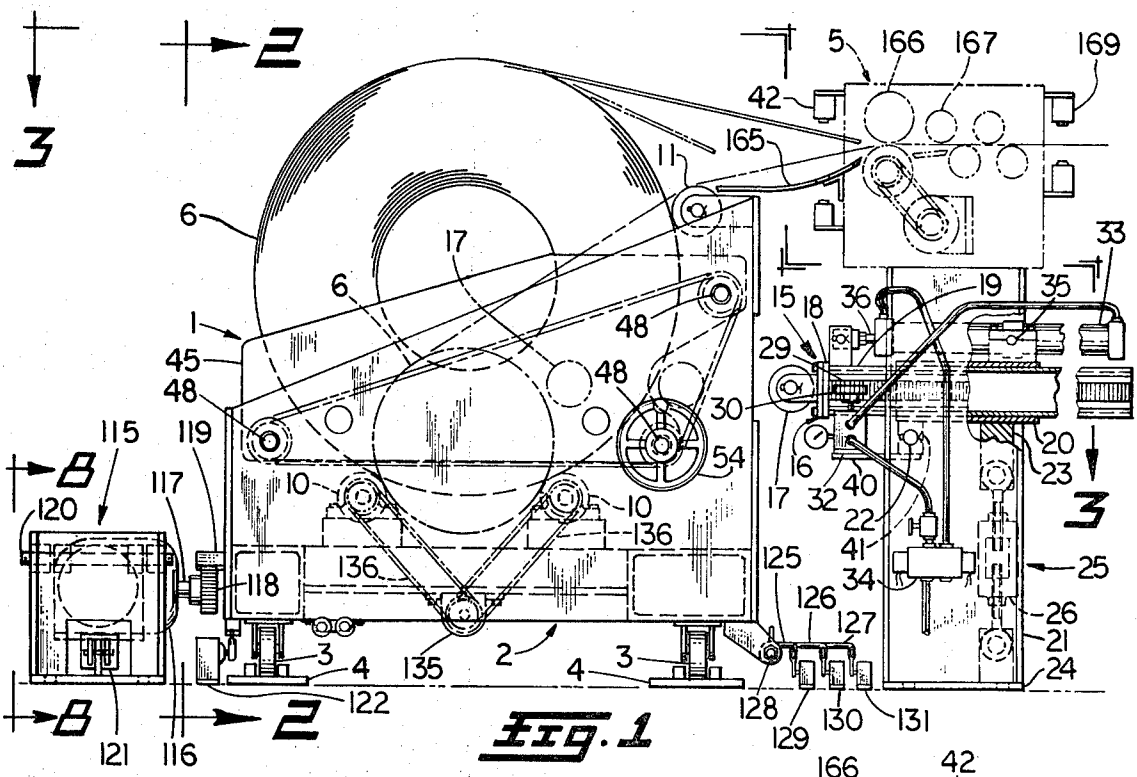



Fig. 1

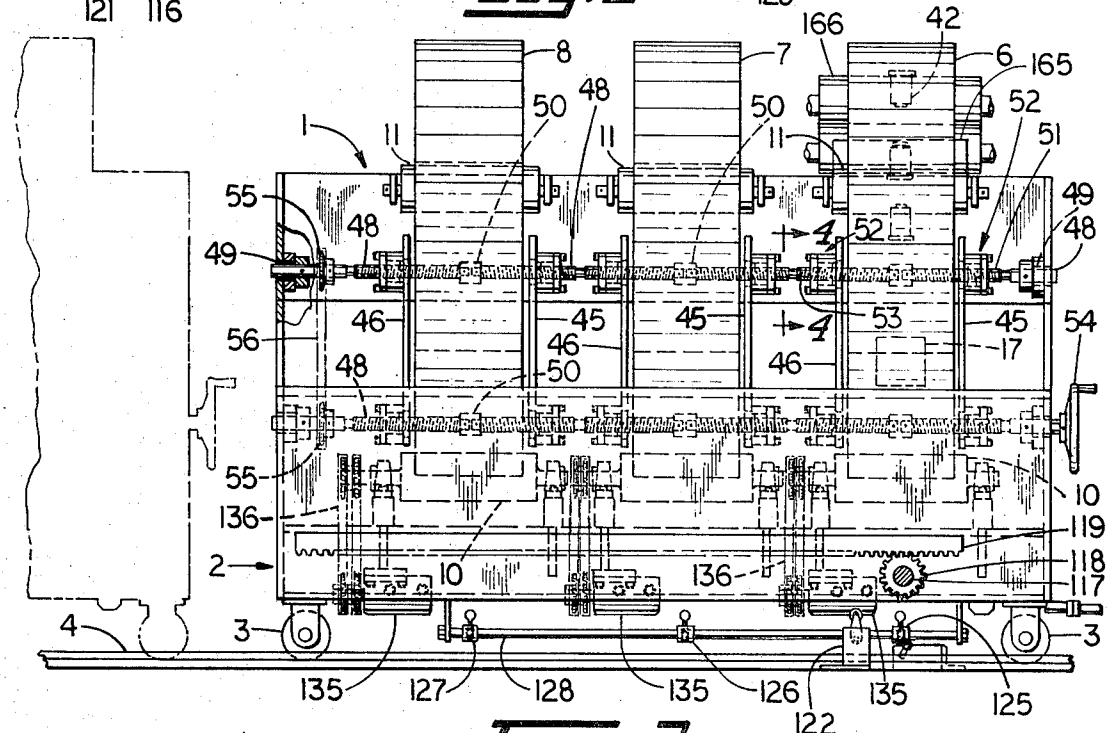



Fig. 2

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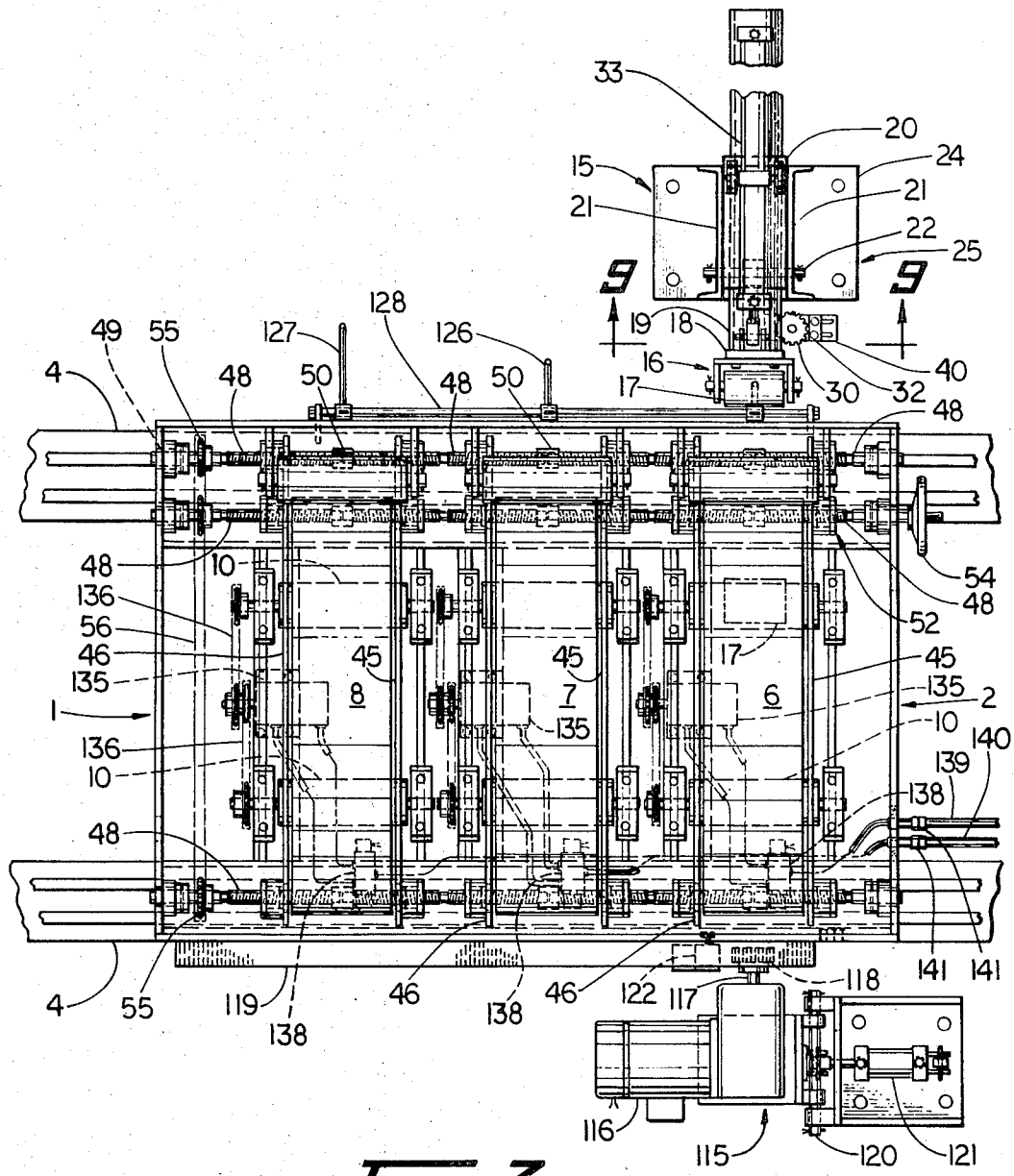



Fig. 3

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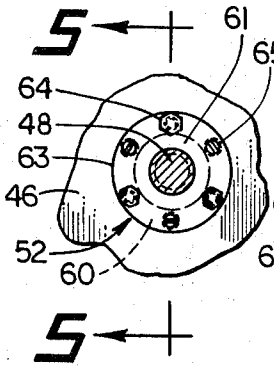



Fig. 4

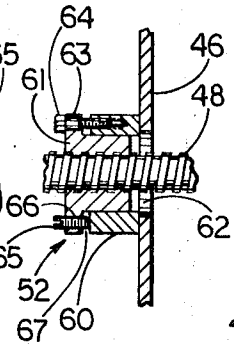



Fig. 5

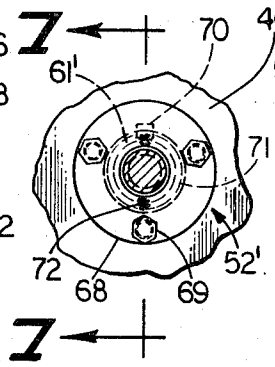



Fig. 6

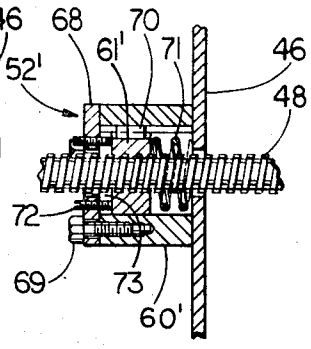



Fig. 7

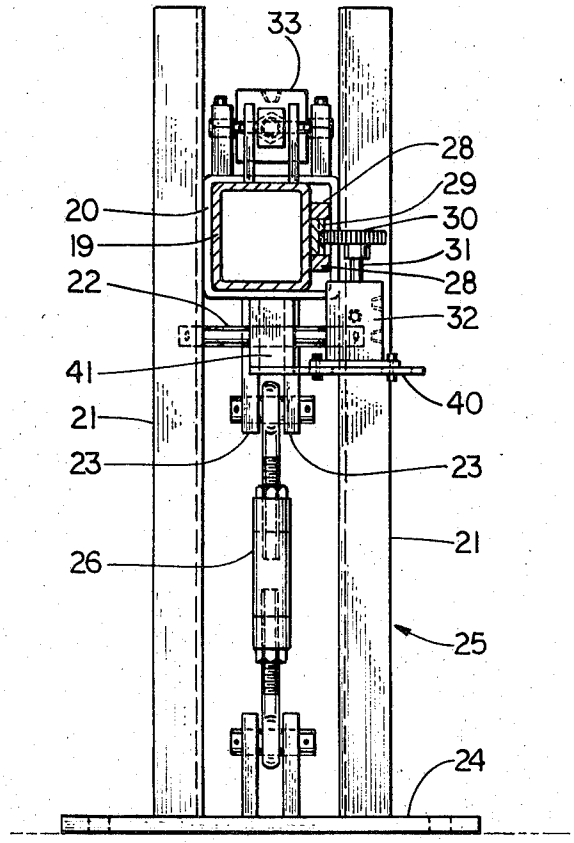



Fig. 9

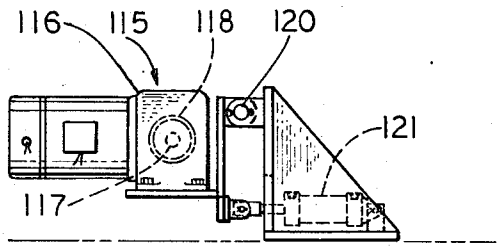



Fig. 8

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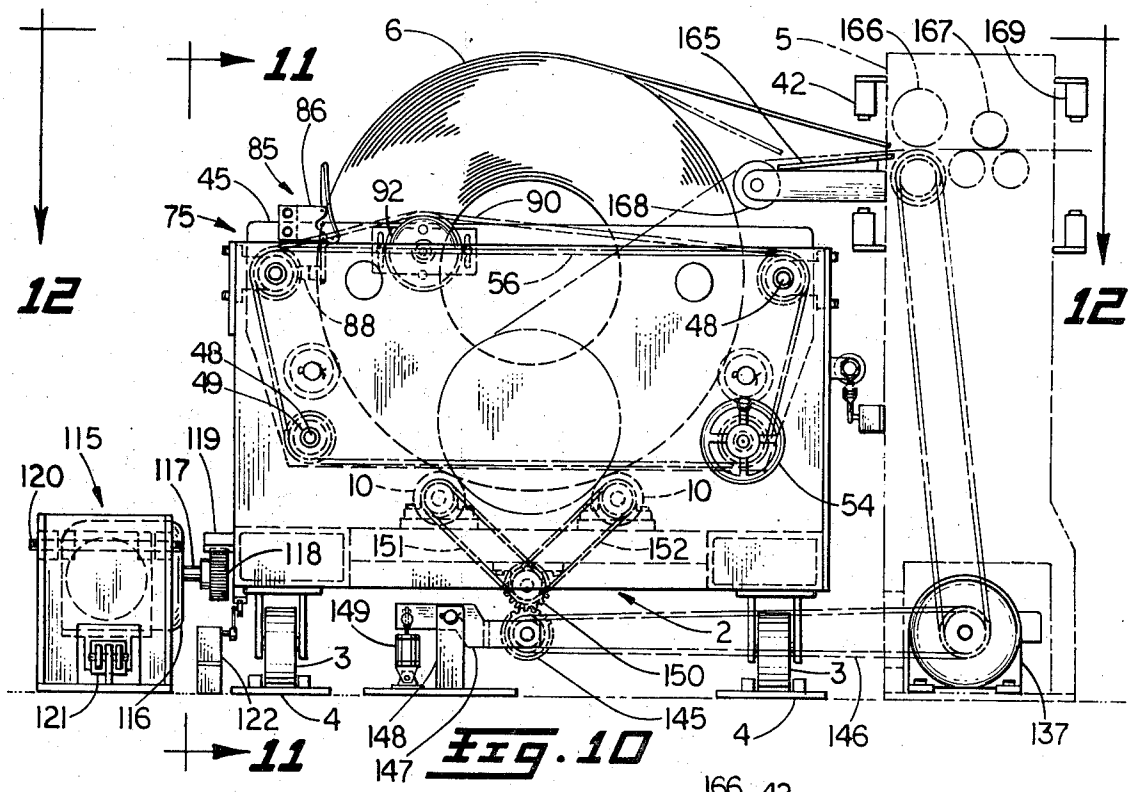



Fig. 10

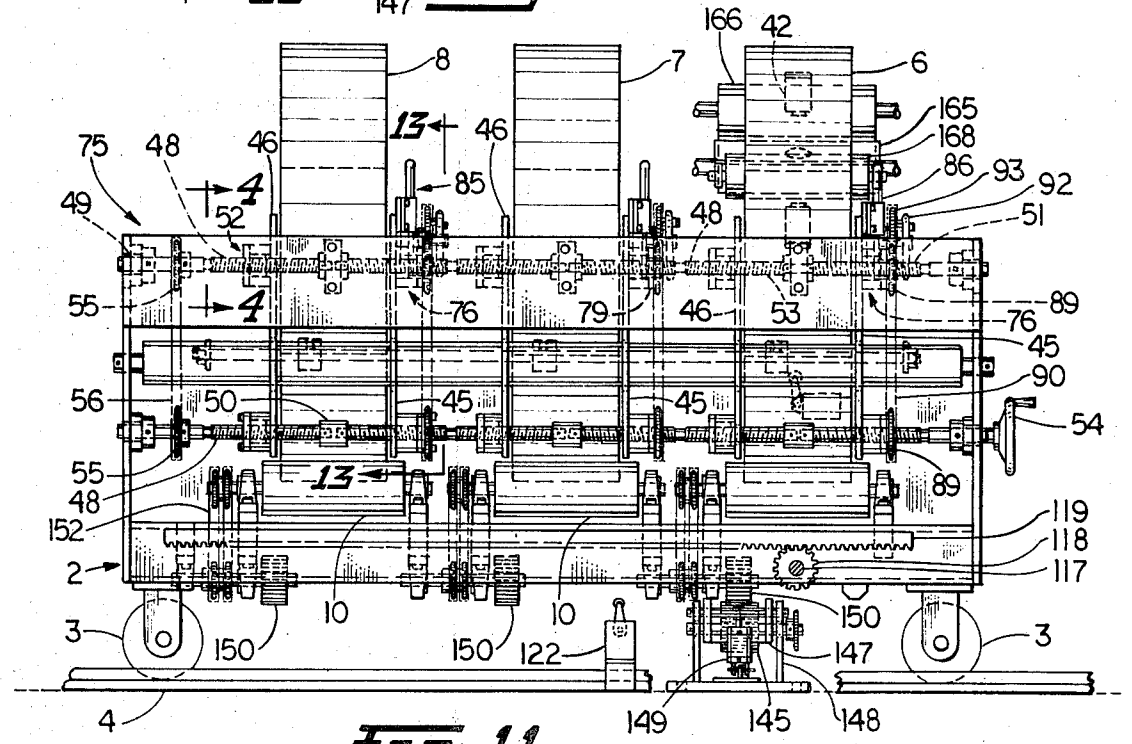



Fig. 11

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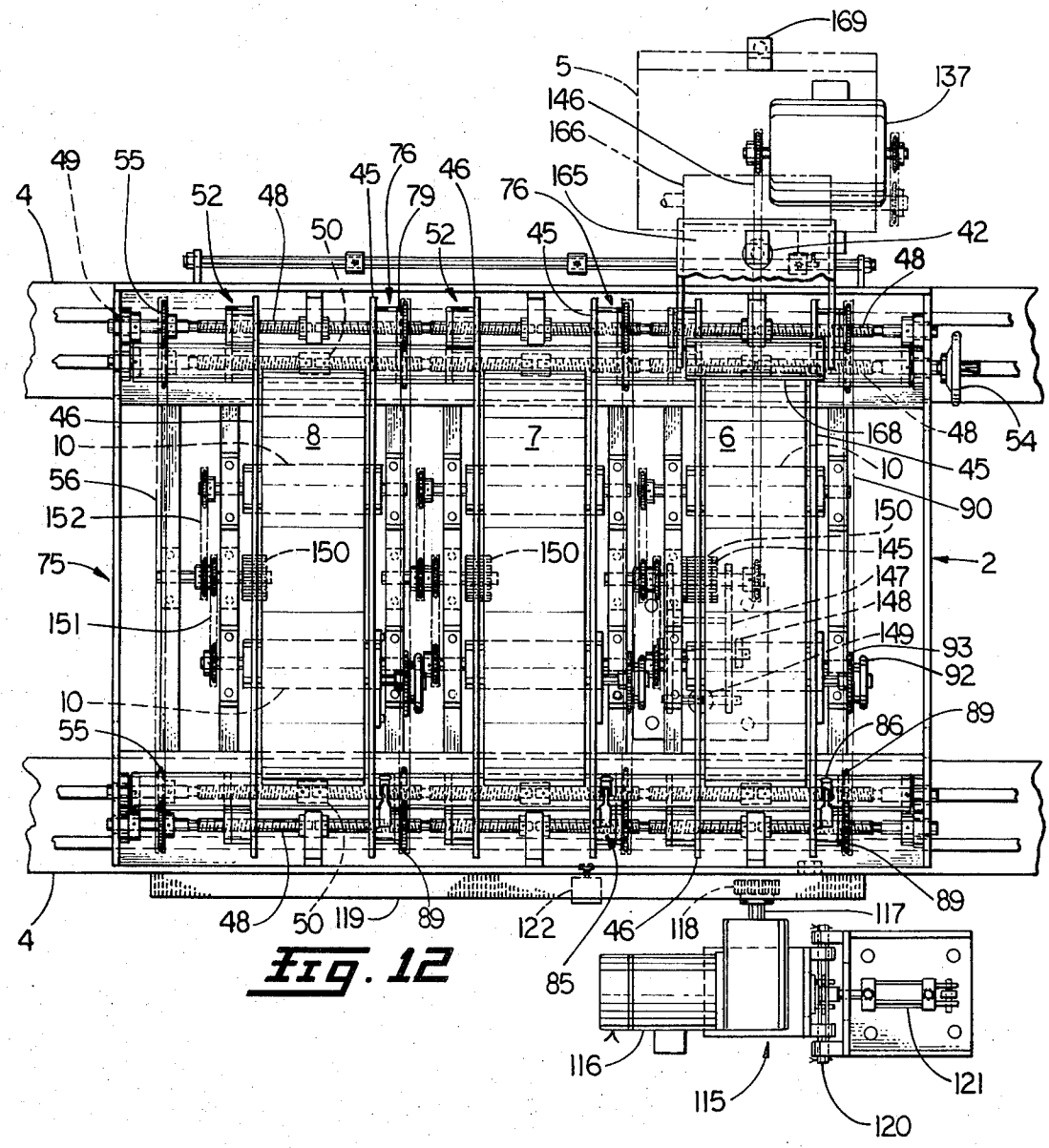



Fig. 12

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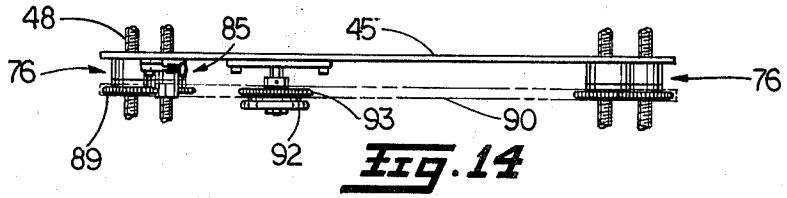



Fig. 14

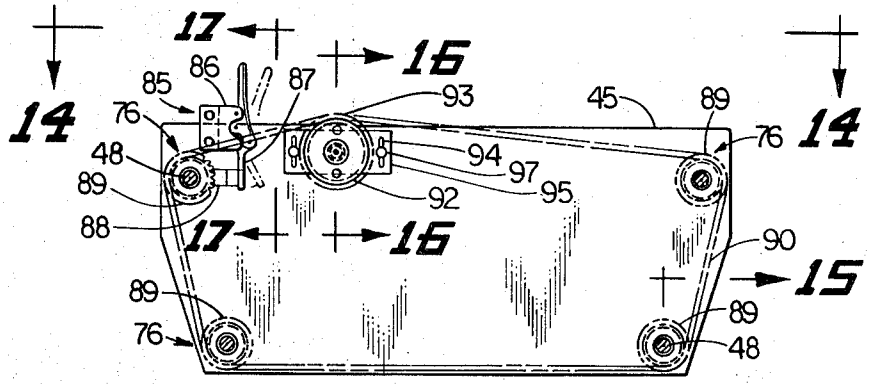



Fig. 13

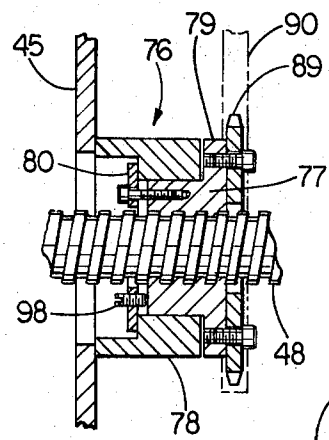



Fig. 15

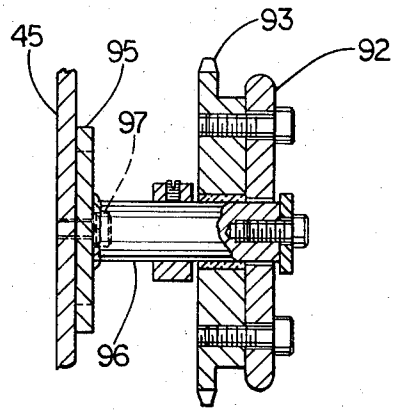



Fig. 16

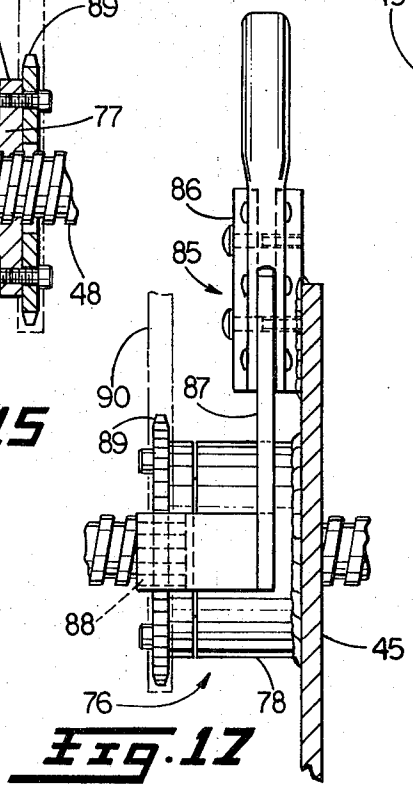


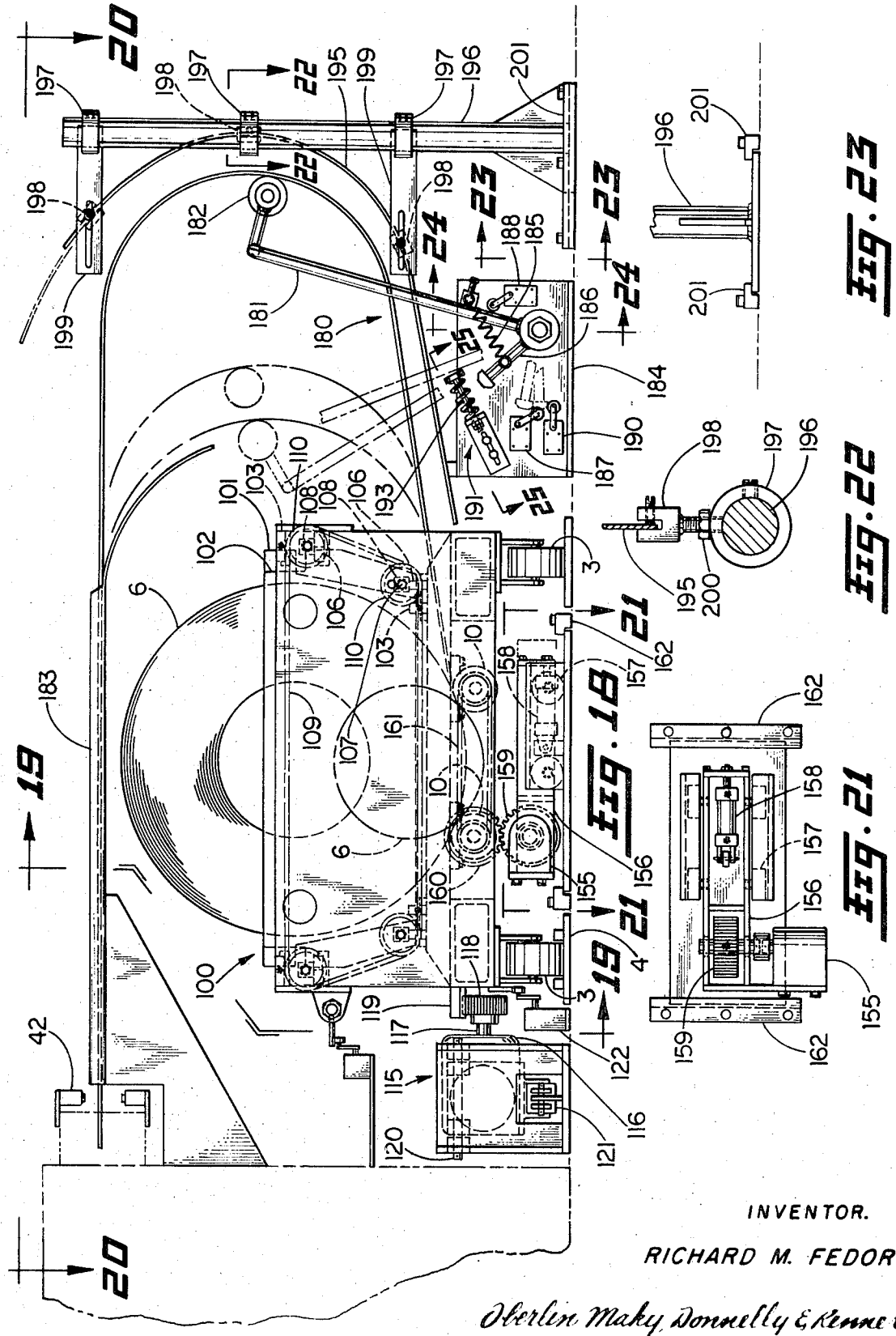

Fig. 17

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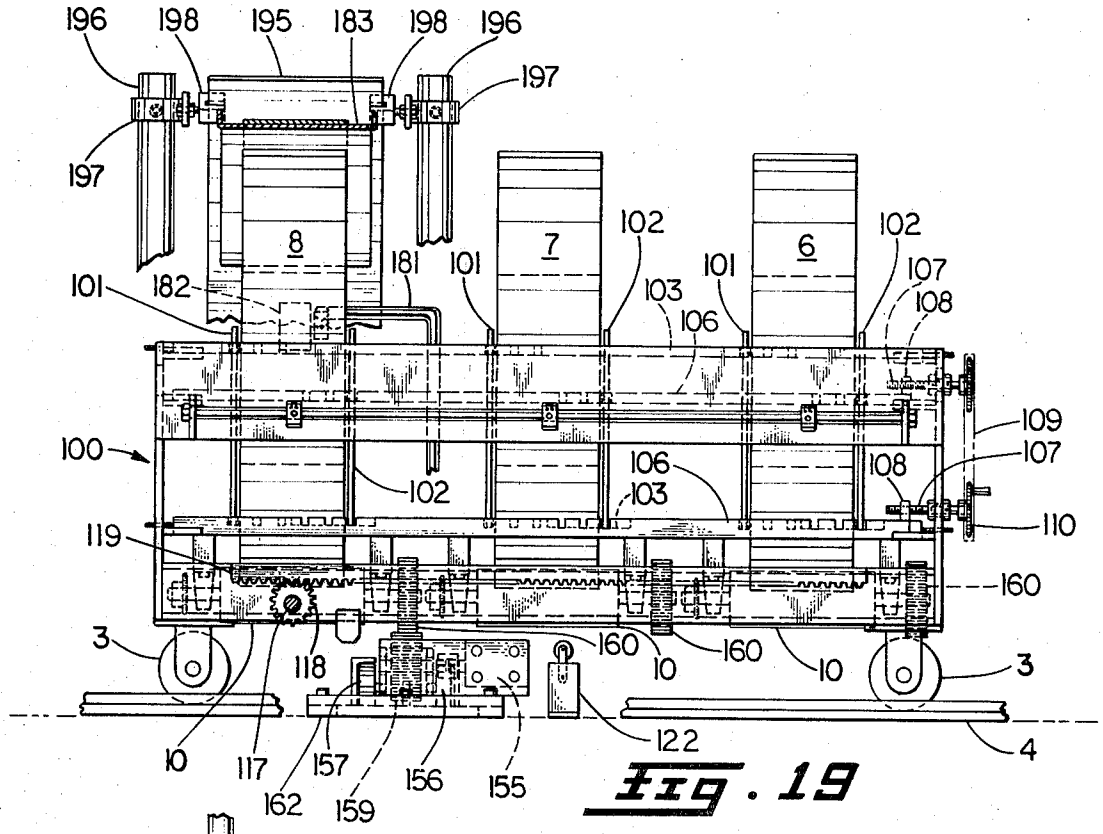



Fig. 19

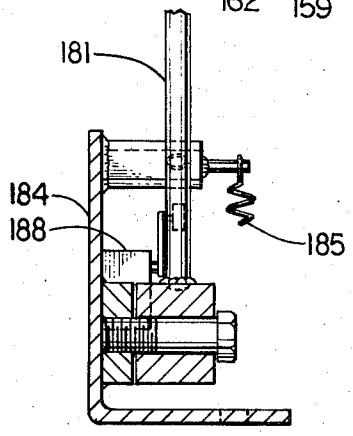



Fig. 24

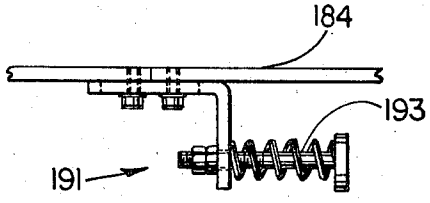
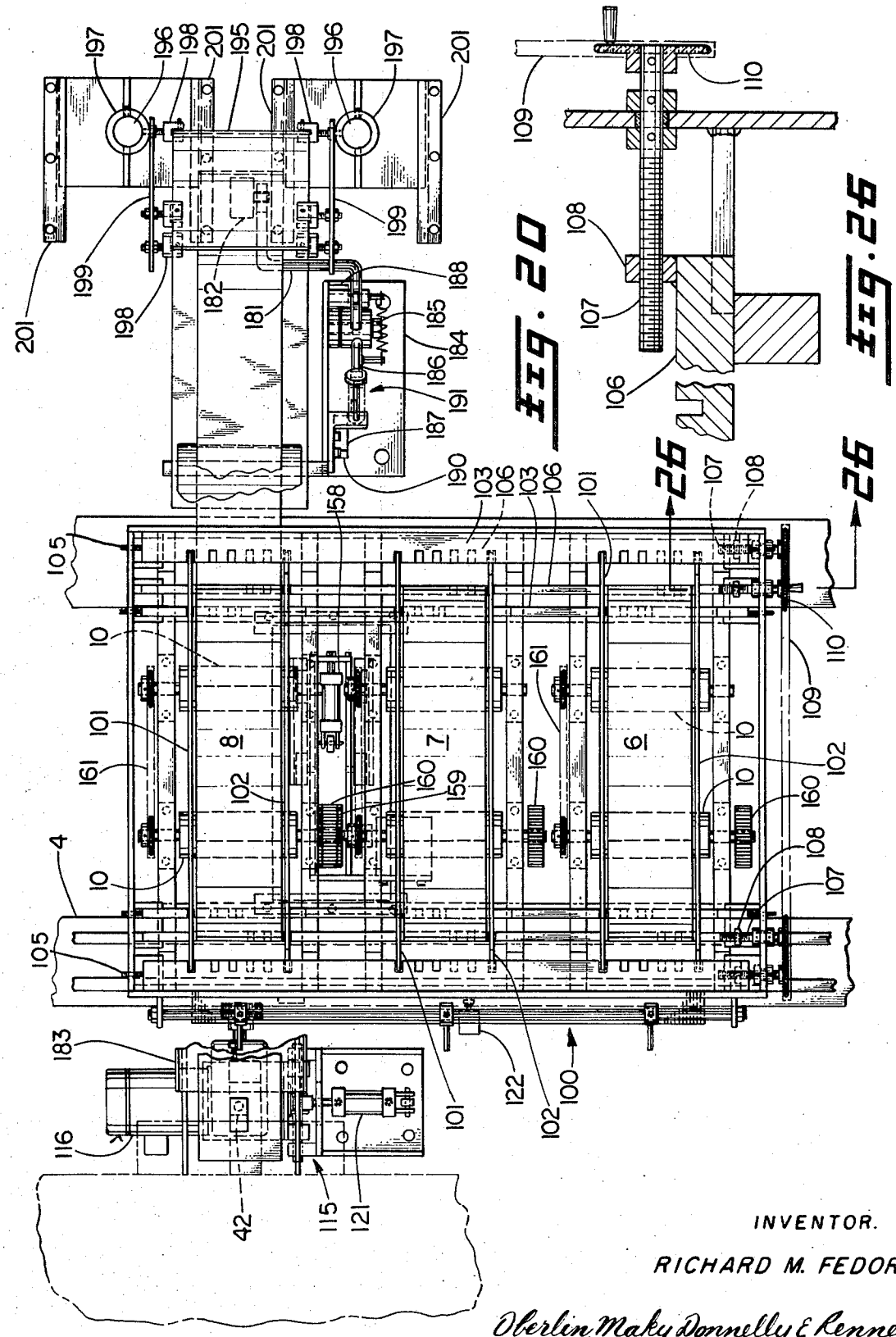



Fig. 25

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FIG. 20
FIG. 25
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# COIL HOLDER

The present invention relates generally as indicated to a coil holder, especially for use in paying out coiled stock for processing through a stock processing line, which may include a tube mill, flattener, punch press, or other machinery used in the processing of such stock material as metal, strip, paper or wire.

In most stock processing lines, it is highly desirable to have available an adequate supply of stock material of the required type and size so that the line need not be shut down for lack of stock. Ordinarily, the stock is stored in the form of compact coils, and various types of coil holders have been devised to support plural coils and facilitate unwinding of the coils in succession for processing of the stock through the line. Previous known holders have been made to be indexed after each coil is exhausted to bring the next coil into line with the stock processing equipment, and such holders have also been made adjustable to accommodate different sizes of stock. However, such prior known coil holders do not provide for automatic or semi-automatic feed of the stock material from the holders, and the manner of adjustment of such prior known holders to accommodate different widths of stock is oftentimes difficult and very time consuming. The degree of adjustment may also be inadequate for some purposes. Moreover, it is ordinarily not possible to closely control the amount of running clearance between the coils and coil side plates of previous known coil holders because of variations in the width of stock material.

With the foregoing in mind, it is a principal object of this invention to provide a coil holder including plural pairs of side plates which may be simultaneously or independently adjusted relative to each other as desired to accommodate coiled stock of the same or different widths for guiding the edges of the stock during payout. If simultaneously adjustable, the side plates may be moved together to accommodate coils of the same width, whereas if independently adjustable, coils of different widths may be loaded onto the coil holder without disturbing the other coils on the holder, and loading may also be accomplished while another coil is being paid out.

Another object is to provide such a coil holder in which the coil side plates may be spring loaded for accommodating variations in the width of a single coil of stock material, thus permitting the running clearance between the edges of the coil and coil side plates to be accurately controlled.

Still another object is to provide such a coil holder which may be readily indexed to bring any one of the coils supported thereby into accurate alignment with a strip processing line.

A further object is to provide such a coil holder with automatic or semi-automatic feeding of the coils of stock from the holder to a processing line in a desired sequence.

Yet another object is to provide such a coil holder with either a separate or common drive for the coil support rolls, and means for providing synchronous operation of the coil supported rolls on the holder and pinch rolls in the stock processing line.

These and other objects of the present invention may be achieved by providing a coil holder with plural pairs of side plates which may be quickly and readily adjusted relative to each other to accommodate different widths of stock material, and such side plates may be independently adjusted or adjusted simultaneously as desired. More precise adjustments of the spacing between side plates may also be made, and one or both of the side plates of each pair may be spring loaded to accommodate for variations in the width of a single coil of stock material. Automatic feed may also be provided for guiding the free ends of the coils to the processing line, and limit switches and the like may be used to effect automatic or semi-automatic feeding of the stock and indexing of the holder to bring successive coils of stock into proper alignment with the processing equipment.

During automatic or semi-automatic operation of the machine, the coils may be paid out from the top of the coils in an over run condition, or paid out from the bottom of the coils in an under run condition as is often desirable when feeding a machine such as a stamping press having an automatic feed that feeds a predetermined amount of stock for each stamping motion. When paying off the stock from the bottom of the coils, a loop control mechanism may be provided for maintaining the stock in a loose condition without restraint so that the feed device will operate properly.

A common drive motor may also be used for driving each of the coil support rolls, or separate drive motors may be provided for that purpose. Where a common drive motor is used, it is desirably located adjacent the processing line and is selectively engageable with the support rolls for each coil when moved into alignment therewith for driving such coil support rolls.

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 principles of the invention may be employed.

In the annexed drawings:

FIG. 1 is an end elevation view of a preferred form of coil holder constructed in accordance with this invention;

FIG. 2 is the back view of the coil holder of FIG. 1, shown partly in section, as seen from the plane of the line 2—2;

FIG. 3 is a top plan view of the coil holder of FIG. 2 and fragmentary horizontal section through a portion of the strip processing line adjacent thereto, taken on the plane of the line 3—3 of FIG. 1;

FIG. 4 is an end elevation view of an adjustable mount for the coil side plates of FIG. 2 as seen from the plane of the line 4—4;

FIG. 5 is a fragmentary longitudinal section through the adjustable mount of FIG. 4, taken on the plane of the line 5—5 thereof;

FIG. 6 is an end elevation view similar to FIG. 4 but of an alternate form of adjustable mount for the coil side plates;

FIG. 7 is a fragmentary longitudinal section through the adjustable mount of FIG. 6, taken on the plane of the line 7—7 thereof;

FIG. 8 is a side elevation view of the traverse drive mechanism for the coil holder of FIG. 1 as seen from the plane of the line 8—8 thereof;

FIG. 9 is a vertical section through the actuating mechanism of an automatic pressure compensating back-up roll for the holder of FIGS. 1–3, taken on the plane of the line 9—9 of FIG. 3;

FIG. 10 is an end elevation view of a modified form of coil holder constructed in accordance with this invention;

FIG. 11 is a back view of the coil holder of FIG. 10, shown partly in section, as seen from the plane of the line 11—11;

FIG. 12 is a top plan view of the coil holder of FIG. 10 as seen from the plane of the line 12—12;

FIG. 13 is an elevation view of one of the independently adjustable side plates for the coil holder of FIG. 11, as seen from the plane of the line 13–13;

FIG. 14 is a top plan view of the independently adjustable side plate of FIG. 13 as seen from the plane of the line 14—14;

FIG. 15 is a fragmentary longitudinal section through one of the adjustable mounts for the coil side plate of FIG. 13, taken on the plane of the line 15—15 thereof;

FIG. 16 is a fragmentary longitudinal section through the chain take-up and handwheel assembly for the adjustable side plate of FIG. 13, taken on the plane of the line 16—16;

FIG. 17 is an end elevation view of the toggle clamp and associated sprocket for releasably locking the adjustable side plate of FIG. 13 against independent adjustment, as seen from the plane of the line 17—17 of FIG. 13;

FIG. 18 is an end elevation view of still another form of coil holder constructed in accordance with this invention provided with an automatic underfeed loop control mechanism for the coil;

FIG. 19 is a back view of the coil holder of FIG. 18, shown partly in section, taken on the plane of the line 19—19 of FIG. 18;

FIG. 20 is a top plan view of the coil holder of FIG. 18 as seen from the plane of the line 20—20 thereof;

FIG. 21 is a top plan view of the coil support roll gear drive mechanism for the coil holder of FIG. 18, as seen from the plane of the line 21—21 thereof;

FIG. 22 is an enlarged horizontal section view through one of the adjustable clamps for the carry over chute of the FIG. 18 embodiment, taken on the plane of the line 22—22;

FIG. 23 is a fragmentary elevation view of the base portion of the chute support stand of FIG. 18, as seen from the plane of the line 23—23;

FIG. 24 is an enlarged vertical section through the roller support arm for the automatic underfeed loop control mechanism of FIG. 18, taken on the plane of the line 24—24 thereof;

FIG. 25 is an enlarged elevation view of the compression spring assembly for the roller support arm of FIG. 18, as seen from the plane of the line 25—25; and

FIG. 26 is an enlarged fragmentary longitudinal section through one of the adjustable mounts for the movable coil side plates of FIG. 20, taken on the plane of the line 26—26 thereof.

Referring now in detail to the drawings, and first especially to FIGS. 1 through 3 thereof, a preferred form of coil holder constructed in accordance with this invention is generally indicated by the numeral 1 and comprises a rigid container or carriage 2 supported by wheels 3 for movement along rails 4. This permits loading of coils onto the container at a remote site and thereafter transporting the container along the rails to a stock processing line 5 for direct feed of the stock through the line, which may include such apparatus as a stock flattener, blanking press, tube mill, or other apparatus used in the processing of coiled metal strip. Other coiled forms of material may also be supported by the coil holder 1 for processing, including paper, wire, plastics and so on.

By proper indexing of the coil holder 1, any one of a plurality of coils 6, 7 and 8 of stock material supported by the coil holder 1 may be moved into proper alignment with the stock processing line, in a manner to be subsequently described. The coils 6, 7 and 8 are supported in longitudinally spaced relation on the coil holder 1 with their axes in longitudinal alignment with each other by plural pairs of longitudinally spaced coil support rolls 10. Although three such pairs of coil support rolls 10 are shown, it will be apparent that a greater or lesser number may be provided depending upon the desired number of coils to be supported by the coil holder. The coil support rolls 10 of each pair are laterally spaced from each other in substantially the same horizontal plane for engagement with the bottom portion of the coils, and additional rolls 11 may also be mounted within the container 2 in line with each pair of support rolls 10 but located at a substantially higher level on the stock pay-off side of the coil holder as shown in FIGS. 1 and 2 to provide a back-up for the coils of stock, resisting any tendency of the coils to become disengaged from the main support rolls 10 during pay-off. Such back-up rolls 11 also act as a carry over for the stock without creating much friction or marring the stock during pay-off of the stock from the top of the coil in an over run condition after the size of the coil has been substantially reduced during pay-off as shown in phantom lines in FIG. 1.

An automatic pressure compensating back-up roll assembly 15 may also be provided adjacent the entry end of the stock processing line 5 as illustrated in FIGS. 1, 3 and 9 to provide additional back-up for each of the coils of stock during pay-off. The back-up roll assembly 15 desirably includes a bolted-on roll assembly 16 to permit various widths of back-up rolls 17 carried thereby to be employed for use with coiled stock of various widths. Using a narrow width roll 17 when running narrow width coils has the advantage that it permits full travel of the pressure compensating back-up roll, in a manner to be subsequently fully described.

As apparent from FIGS. 1 and 9, the roll assembly 16 is bolted or otherwise secured to the front end plate 18 of a rectangular tube 19 slidably received within a correspondingly shaped guide tube 20 pivotally connected between a pair of vertical supports 21 by a horizontal pivot shaft 22. Rearwardly of the pivot shaft 22 are downwardly projecting lugs 23 from the guide tube 20 which are connected to the base plate 24 of the main frame 25 by a turn buckle assembly 26 to permit angular adjustment of the guide tube 20 and roll assembly 16 supported thereby to suit desired conditions.

Secured to one side of the roll support tube 19 is a pair of guide bars 28 with a gear rack 29 therebetween (see FIG. 9) which is engaged by a spur gear 30 forwardly of the guide tube 20. The spur gear 30 is mounted on the shaft 31 of a pressure reducing valve

32 through which air pressure is supplied to the head end of a cylinder 33, urging the roll assembly 16 toward the coil in alignment therewith through proper actuation of a double solenoid valve 34. The cylinder 33 is mounted on the guide tube 20 by a center fixed trunnion 35 on the cylinder, with its rod 36 connected to the roll support tube 19 adjacent the forward end of the guide support tube, whereas the pressure reducing valve 32 is carried by a plate 40 attached to the bottom surface of the pivot lug 41 for the guide tube 20.

During movement of the roll assembly 16 toward the adjacent coil of stock material in response to air pressure being applied to the head end of the cylinder 33, the rack 29 on the roll support tube 19 causes the spur gear 30 to rotate in a direction resulting in an automatic reduction in pressure supplied to the cylinder 33 by the pressure reducing valve 32. Accordingly, as the coil of stock is uncoiled and gets progressively smaller in diameter, the back-up roll 17 is urged against the coil with progressively less pressure as required in accordance with the size and weight of the coil to retain the coil in position while the stock material is being pulled from the coil by a machine in the stock processing line, such as a flattener.

The initial setting of the pressure reducing valve 32 may be varied as desired for any position of the guide roll 17 by loosening the bolts which hold the valve 32 on the plate 40 and sliding the spur gear 30 and pressure reducing valve 32 away from the gear rack 29 to permit turning of the spur gear 32. When using heavy coils, the operator may want to increase the pressure setting of the pressure reducing valve, whereas when light coils are being used, he may want to reduce the pressure setting. While an air pressure system is shown, it will be apparent that a suitable fluid system may be substituted therefor if desired.

Retraction of the roll assembly 16 after unwinding of the coil is achieved by actuating the double solenoid valve 34 to admit air pressure to the rod end of the cylinder 33, which may be done automatically by a signal from the control lights 42 when the stock material is no longer passing therebetween, or by hand.

For accurately positioning the coils of stock on the respective pairs of coil support rolls 10 and guiding the edges of the coils during pay-off, there is provided a pair of side plates 45 and 46 for each coil. One or both side plates 45 and 46 of each pair may be adjustable toward and away from each other to vary the spacing therebetween for accommodating different widths of stock material, and such side plates may also be adjustable simultaneously or independently or each other, as desired, in a manner to be described hereafter.

In the holder of the FIGS. 1 through 3 embodiment, a plurality of longitudinally extending spaced apart screw shafts 48 are provided having opposite ends supported for rotation in suitable bronze bearings 49 at opposite ends of the container 2. The screw shafts 48 are desirably made up of a plurality of shorter shafts joined together at their ends by straight couplings 50 pinned to the shafts. Each of the shafts 48 has plural spaced apart threadedly portions 51 of one hand threaded engaging adjustable mounts 52 secured to one of the side plates 45 of each pair, and additional threaded portions 53 of the opposite hand threadedly engaging similar adjustable mounts 52 secured to the other side plates 46 of each pair, whereby rotation of the screw shafts 48 in opposite directions will cause simultaneous movement of each pair of coil side plates 45, 46 toward and away from each other for accommodating coils of lesser or greater width. A hand wheel 54 may be mounted on the end of one of the screw shafts 48 for rotation thereof, and the other screw shafts 48 may be simultaneously rotated by providing sprockets 55 on each of the screw shafts connected together by an endless chain 56 engaging the sprockets 55 as clearly shown in FIGS. 1 and 3.

More precise adjustments of the relative positions of each of the movable coil side plates 45, 46 of the FIGS. 1 through 3 embodiment may be obtained through individual adjustment of the mounts 52 for the side plates to achieve the desired vertical orientation of the side plates and also obtain fine lateral adjustment thereof. FIGS. 4 and 5 show the details of one of the mounts 52 which is typical of all of the mounts, consisting of a boss 60 welded or otherwise secured to the outer surface of said plates 45, 46 and a threaded bushing 61 extending into the boss 60 in alignment with openings 62 in the side plates through which the screw shafts 48 extend for threaded engagement with the bushings 61. A flange or shoulder 63 on the outer end of the bushing 61 overlies the end of the boss 60 to permit clamping of the bushing 61 to the boss by screws 64 passing through the flange 63 and received in tap openings in the boss.

Intermittently spaced set screws 65 received in tapped openings 66 in the bushing flange 63 engage the end of the boss 60 to provide a clearance 67 between the boss 60 and flange 63 which may be varied by loosening the screws 64 and adjusting the set screws 65 to the desired extent, followed by retightening of the screws 64. Greater adjustments in the spacing between the movable side plates 45, 46 may also be obtained by removing the screws 64 to permit rotation of the bushings 61 for effecting axial movement of the bushings in the desired direction along the screw shafts 48, after which the screws 64 are replaced to secure the side plates to the bushings 61 in their newly adjusted positions.

A modified form of adjustable mount 52′ for the movable side plates 45, 46 is shown in FIGS. 6 and 7, which also includes a boss 60′ welded or otherwise secured to the outer surfaces of the side plates and a threaded bushing 61′ having threaded engagement with the screw shafts 48. However, in place of the flange 63 on the bushing 61′, there is provided a cap plate 68 secured to the end of the boss 60′ as by fasteners 69. The bushing 61′ is keyed to the boss 60′ at 70 to permit relative axial movement of the boss 60′ relative to the bushing 61′, but not relative rotation therebetween. Interposed between the bushing 61′ and associated side plate is a spring 71 which urges the side plate toward the adjacent side of a coil on the holder.

Such a mount 52′ permits setting of the spacing between the pairs of side plates 45, 46 to be somewhat less than the actual width of the coil of stock material to be placed therebetween so that the side plates press lightly against the edges of the coil due to the spring pressure to maintain accurate edge control of the coil during pay-off. Usually, however, the spacing between the respective pairs of side plates is set to closely receive a particular size coil therebetween, and the

spring loading of the side plates permits limited movement of the side plates away from each other to accommodate for slight variations in the width of the coil during rotation thereof.

Variations in the spring loading of the mounts **52'** of FIGS. **6** and **7** may also be achieved by providing set screws **72** having threaded engagement with the cap plate **68** which when adjusted vary the spacing **73** between the bushing **61'** and cap plate. A spacer may also be interposed between the bushing **61'** and cap plate **68** for varying the spring tension as desired.

In FIGS. **10** through **12** there is shown a modified form of coil holder **75** in which the plural pairs of coil side plates **45, 46** may be simultaneously moved toward and away from each other upon rotation of the screw shafts **48** for the coil side plates, similar to the FIGS. **1** through **3** embodiment. In addition, however, at least one side plate **45** of each pair is independently adjustable relative to the other side plates. This has the advantage that after one coil is exhausted, its associated side plates may be opened up for loading or another coil therebetween while still another coil is being paid out from between another pair of side plates, thereby avoiding the necessity of having to shut down the stock processing line during reloading of the coil holder. Reference may be had to FIGS. **13** through **17** for a full understanding of the details of construction which permit independent adjustment of such side plates. As best seen in FIGS. **13** through **15**, the adjustable mounts **76** for the independently movable side plates **45** desirably consist of a threaded bushing or nut **77** having threaded engagement with the screw shafts **48**. The bushing **77** is rotatably received in a boss **78** on the outer surface of the side plate **45** and retained in place by a flange **79** on one end of the bushing an end plate **80** secured to the other end which overlie shoulders on the boss **78**.

A locking device **85** shown in detail in FIGS. **13** and **17** is also provided for selectively locking the bushings **77** against rotation. Preferably, such locking device **85** comprises a toggle clamp **86** having a lever arm **87** which carries a sprocket segment **88** for movement into and out of engagement with one of the sprockets **89** attached to the bushings **77**. A chain **90** interconnects the sprockets **89** of all of the adjustable mounts **76** as shown in FIGS. **13** and **14**, whereby only one locking device **85** need be provided for releasably locking all of the bushings **77** against rotation, since the chain itself acts as a locking device for the other bushings.

With the bushings **77** locked against rotation by the locking device **85** and chain **90**, rotation of the screw shafts **48** will cause axial movement of all of the movable side plates **45** simultaneously. However, upon release of the locking device **85**, the side plates **45** may be moved independently of each other by rotating the bushings **77** using a hand wheel **92** which drives a sprocket **93** engaging the chain **90** (see FIGS. **13** and **16**). any slack in the chain **90** may conveniently be taken up by providing a pair of vertical slots **94** in the mounting plate **95** for the hand wheel shaft **96**, with bolts **97** extending through the slots **94** for adjustably securing the mounting plate to the side plate **45**.

Provision may also be made in the adjustable mounts **76** for adjusting the amount of end play in the bushings **77** by providing set screws **98** in the end plates **80** for varying the spacing between the end plates **80** and associated bushing flanges **79**.

In FIGS. **18** through **20**, there is shown still another form of coil holder **100** in accordance with this invention in which one of the coil side plates **101** of each pair is relatively fixed and the other side plates **102** of each pair are simultaneously movable to adjust the relative spacing between each pair of side plates. The relatively fixed side plates **101** are positioned in a first set of slotted bars **103** which may be longitudinally adjusted to a slight extend to adjust the vertical position of the side plates **101** by turning the set screws **105** which engage opposite ends of the slotted bars **103**. The relatively fixed side plates **101** may also be removed from the slotted bars **103** and repositioned in other slots in the bars, and other side plates **101** may be added to vary the spacing and number of relatively fixed side plates within the holder, as required.

The other side plates **102** are also retained in slotted bars **106**, but these latter slotted bars **106** are longitudinally adjustable over a much wider range through rotation of a plurality of screw shafts **107** which engage threaded lugs **108** attached to the slotted bars **106** (see FIG. **26**). A chain **109** engaging sprockets **110** on each of the screw shafts **107** permits simultaneous adjustment of all of the screw shafts through turning of one of the screw shafts. The movable side plates **102** may also readily be removed from the slotted bars **106**, and additional side plates **102** may also be positioned in the slots in the bars **106**.

By making one or both coil side plates of each pair simultaneously adjustable with the side plates of the other pairs as previously described, such side plates may be quickly and easily adjusted for receipt of the same width coils therebetween. Making one or both side plates of each pair further independently adjustable as previously described also permits loading of one or more coils in the holders while another coil is being paid out to avoid having to shut down the stock processing line during reloading of the holders.

Initial loading of the holders is desirably performed at a station remote from the processing line, after which the holders may be moved to the stock processing line for immediate use of the coils or stored for future use, as desired. In the vicinity of the stock processing line, a traverse drive mechanism **115** such as shown in FIGS. **1, 3, 8, 10** and **18** may be employed for advancing the coil holders laterally with respect to the stock processing line for locating any one of the coils supported by the holders in proper alignment with the center line of the stock processing line. The traverse drive mechanism **115** desirably consists of a gear motor **116** with brake having a drive shaft **117** on which is mounted a spur gear **118** engageable with a gear rack **119** carried by the containers. The gear motor **116** is carried by a frame mounted on a pivot shaft **120** to permit raising and lowering of the gear motor upon actuation of a cylinder **121** connected thereto so that the spur gear **118** may be moved out of the path of the gear rack **119** to avoid damage thereto when the coil holders are first moved into position with the use of a fork lift truck or other means.

A limit switch **122** may be located adjacent the traverse drive mechanism **115** for engagement by the coil holders to provide a signal for dropping the gear motor **116** out of driving position when the coil holders are initially moved into position. After the coil holders have come to a stop, the gear motor **116** is raised to

bring the spur gear 118 into meshing engagement with the gear rack 119, whereby continued advancement of the coil holders may be achieved through actuation of the gear motor 116.

Operation of the gear motor 116 may be controlled either by the operator or by a plurality of adjustable stops 125, 126, 127 carried by a support rod 128 on the container engageable with limit switches 129, 130, 131 fixed with respect to the stock processing line (see FIGS. 1 and 2). Preferably, the stops 125, 126 and 127 are of different lengths and the limit switches 129, 130 and 131 are laterally spaced to permit each to be contacted by only one of the stops for correct positioning of each coil, and the stops 125, 126 and 127 may also be adjustable along the length of the rod 128 to vary the stopping position for each coil. Engagement of the stops with the respective limit switches interrupts the operation of the traverse drive mechanism 115 to precisely locate the coil associated with that particular stop in line with the processing equipment. After each coil is unwound, the gear motor 116 is again actuated to move the containers until the next stop 126 engages it associated limit switch and again interrupts the operation of the gear motor 116 to locate the next coil in proper alignment with the stock processing equipment, and so on.

Feeding of the coiled stock from the coil holders may be accomplished by rotating the coil support rolls 10 or pulling the stock from the coil by the stock processing equipment. In the FIGS. 1 through 3 embodiment, separate drive motors 135 are provided on the container 2 for driving the respective pairs of coil support rolls 10 through chain and sprocket drives 136, whereas in the FIGS. 10 through 12 embodiment, a single drive motor 137 is provided for selective actuation of each of the pairs of support rolls 10 when brought into alignment therewith. The plural drive motors 135 on the container 2 are independently controlled by double solenoid valves 138 on the container which are connected to air and electrical cables 139 and 140 through quick disconnect couplings 141 as shown in FIG. 3.

Where a single drive motor 137 is provided for actuation of the support rolls 10 as in FIGS. 10 through 12, the drive motor is desirably positioned adjacent the stock processing line and is connected to a spur gear 145 located beneath the path of movement of the coil holder in line with the stock processing equipment through a chain drive 146. The spur gear 145 is mounted for limited vertical movement on a support arm 148 pivotally connected to a stationary support 148. Raising and lowering of the support arm 147 is achieved by actuation of a cylinder 149 connected thereto which raises and lowers the spur gear 145 into and out of engagement with any one of a plurality of spur gears 150 on the coil holder 75, one such spur gear 150 being provided for each pair of coil support rolls 10 and connected thereto by drive chains 151 and 152. Accordingly, rotation of any one of the spur gears 150 by engagement by the spur gear 145 will cause rotation of the associated coil support rolls 10 for driving the coil supported thereby.

In the FIGS. 18 through 20 embodiment, a single drive motor 155 is also provided for driving each set of coil support rolls 10, but instead of locating the drive motor to the side of the coil holder as in the FIGS. 10 through 12 embodiment, the drive motor is located between the guide rails beneath the path of movement of the coil holder thereover. As best seen in FIGS. 18 and 21, the drive motor 155 is carried by a frame 156 supported on rollers 157 to permit limited lateral movement of the frame 156 upon actuation of a cylinder 158 for engaging and disengaging the drive gear 159 on the drive motor 155 with a gear 160 associated with one of the rolls 10 of each pair when brought into alignment therewith. Moreover, limited longitudinal adjustment of the frame may be achieved for proper orientation of the drive motor 155 with respect to the stock processing line by loosening the clamping bars 162. A roller chain 161 connects the rolls 10 of each pair for driving of both rolls during rotation of one of the rolls by the drive motor 155.

When paying off the stock from the top of the coil in an over run condition, a deflector plate or chute 165 may be provided adjacent the entry end of the stock processing line 5 as shown in the FIGS. 1 through 3 embodiment to guide the leading end of the stock between the pinch rolls 166 and flattener rolls 167, or a fixed roll 168 may be provided adjacent the entry end of the stock processing line as shown in the FIGS. 10 through 12 embodiment for automatic feeding of the stock material to the processing equipment.

The light scanner 42 adjacent the pinch rolls 166 will detect the presence or absence of stock material passing through the line. When the signal light beam is interrupted, the flattener drive is caused to start, and an additional light control beam 169 may be provided to signal other equipment in the stock processing line to start up, such as a stamping press and the like. When the stock of one coil is exhausted, the light scanner 42 may also be used to actuate the traverse drive mechanism 115 for the holder to bring the next coil into proper alignment with the stock processing line, which is determined by engagement of its associated stop with the respective limit switch as previously described. Tripping the limit switch may also be made to actuate the drive mechanism for the associated coil support rolls to commence feeding of stock from the next coil into the processing line.

A separate drive may be provided for rotating the pinch rolls 166, but where a single drive motor 137 is provided for selectively driving each of the pairs of support rolls 10 as shown in the FIGS. 10 through 12 embodiment, it is preferred that such drive motor 137 also be used to drive the pinch rolls 166 and/or flattener rolls 167 to provide for synchronous operation of the rolls. Overrunning clutches may of course be provided for the drive motors which drive the coil support rolls 10 to permit the stock to be pulled from the coils by the stock processing equipment without causing damage to the motors.

When feeding the coiled stock material to a machine such as a stamping press that has a feed device attached, the feed device ordinarily feeds a predetermined amount of stock for each stamping motion, in which event it is desired to maintain the stock from the coil holder to the press in a loose condition without restraint so that the feed device will operate properly. This may be effectively accomplished using an automatic loop control device 180 associated with the coil

holder as shown in FIGS. 18 through 20 which provides a loop in the stock as the stock is paid off from the bottom of the coils in an under run condition. Preferably, the automatic loop control device 180 comprises a roller arm 181 on which is mounted a roller 182 about which the stock material is looped for movement onto a carry over chute 183 or the like fixed with respect to the stock processing line. The roller arm 181 is pivotally connected to a stationary support 184 as shown more clearly in FIG. 24, and the roller arm is urged in a direction away from the coil by a tension spring 185 having one end connected to the stationary support 184 and the other end connected to a tripper arm 186 movable with the roller arm 181 as shown in FIG. 18.

As the stock is pulled from the coil by the feed device in the stock processing line, the roller 182 is pulled toward the coil as shown in phantom lines in FIG. 18 until the tripper arm 186 engages a start drive limit switch 187 on the stationary support to start the coil drive motor 155, which feeds additional stock from the coil until the roller arm 181 moves back to a position engaging the stop drive limit switch 188 on the stationary support 184, again stopping the coil drive motor 155. This results in a pulsing type of drive for the coil support rolls 10, and since the coil drive speed is faster than the feed device on the stock processing equipment, a relatively large loop of stock will always be maintained by the automatic loop control device 180 during the feed cycle.

When the coil of stock reaches the last several wraps during pay-out, the pull of the stock increases and tends to move the roller arm 181 beyond the normal start drive limit switch 187 into engagement with an emergency stop limit switch 190. To resist such movement, a spring assembly 191 is located on the stationary support 184 to provide additional back tension or controlled restraint to the roller arm 181 when it reaches this position to allow the remainder of the stock to be pulled from the coil by the feed device on the stock processing equipment. However, should the drive motor 155 for the coil rolls fail to operate or some other malfunction occur, the roller arm 181 will be pulled beyond the start drive limit switch 187 positioned by the feed device on the stock processing equipment to cause engagement of the tripper arm 186 with the emergency stop limit switch 190 to completely shut down the stock processing line. An adjustable bolt 193 may be provided for the spring assembly 191 as shown more clearly in FIG. 25 to permit changing of the tension of the spring assembly 191, as desired.

A feed chute 195 may also be employed to guide the stock onto the carry over chute 183. Preferably, the feed chute 195 is made adjustable to permit variations in the contour of the feed chute along the length thereof to suit the thickness and width of the coil stock being fed to the stock processing equipment. As shown in FIG. 18 and also in FIGS. 22 and 23, such adjustment of the contour of the feed chute may be accomplished by providing a pair of support stands 196 for the feed chute, with vertically adjustable collars 197 thereon having chute clamps 198 mounted directly on the collars 197 or on the outer ends of slotted plates 199 welded to the collars. The chute clamps 198 may readily be rotated to adjust the angle of the feed chute 195 by loosening the nuts 200 and turning the chute clamp, followed by locking of the nuts.

The base of the support stand 196 may also be mounted for movement toward and away from the coil holder by loosening clamp bars 201 which overlie the edges of the support stand as more clearly shown in FIG. 23. Movements of the entire support stand further air in obtaining the desired feed chute contour and desired relation of the feed chute to the carry over chute.

From the foregoing, it should now be apparent that the various coil holders disclosed herein provide for quick and accurate adjustment of the coil side plates relative to each other for accommodating different sizes of coils therebetween. The relative positions of the side plates may either be adjusted simultaneously, or they may be adjusted independently to facilitate replacement of one coil while another coil is feeding stock material to the processing line. Such side plates may also be spring loaded to maintain accurate side control of the coils during pay-off and accommodate variations in the width of the stock material. Automatic feed may also be provided for the stock material, and a single drive motor may be used to selectively rotate the support rolls for each coil when brought into alignment therewith and permit synchronous operation of the coil support rolls and other rolls in the stock processing line.

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

1. A holder for rotatably supporting a plurality of coils thereon for unwinding comprising a container, means for supporting such coils on said container, a plurality of pairs of side plates on said container for receipt of a coil between each pair of side plates, and means for simultaneously adjusting the position of at least one side plate of each pair to permit simultaneous variation in the spacing between said plural pairs of side plates.

2. The holder of claim 1 wherein said means for simultaneously adjusting the position of at least one side plate of each pair comprises a plurality of mounts on said one side plate of each pair having threaded engagement with a plurality of screw shafts extending through said side plates, whereby rotation of said screw shafts causes said one side plates to move simultaneously.

3. The holder of claim 2 further comprising chain drive means interconnecting all of said screw shafts, whereby rotation of one of said screw shafts causes rotation of all of said screw shafts.

4. The holder of claim 2 wherein each of said mounts includes a threaded bushing having threaded engagement with said screw shafts, a boss on said side plates for receipt of said bushing, means for clamping said bushing to said boss, and set screw means for varying the axial position of said bushing within said boss to obtain precise adjustment of said one side plates.

5. The holder of claim 2 wherein each of said mounts includes a threaded bushing having threaded engagement with said screw shafts, a boss on said side plates for receipt of said bushing, means mounting said bushing for relative axial movement with respect to said bushing but not relative rotation, a cap plate secured to

the end of said boss for retaining said bushing within said boss, and spring means interposed between said bushing and associated side plate for urging said side plate toward the other side plate of each pair.

6. The holder of claim 1 wherein said last-mentioned means provides for simultaneous adjustment of the spacing between both side plates of said plural pairs of side plates.

7. The holder of claim 6 wherein said means for simultaneously adjusting the spacing between both side plates of said plural pairs comprises a plurality of mounts on said side plates having threaded engagement with a plurality of screw shafts extending through said side plates, said screw shafts having threads of opposite hand threadedly engaging said mounts of each pair of side plates, whereby rotation of said screw shafts in opposite directions causes movement of said side plates of each pair toward and away from each other.

8. The holder of claim 1 wherein said means for simultaneously adjusting the position of at least one side plate of each pair comprises a plurality of elongated longitudinally adjustable bars having longitudinally spaced slots therein for removable receipt of the edges of a plurality of said one side plates in said slots in longitudinally spaced relation, and a plurality of screw shafts having threaded engagement with said bars, whereby rotation of said screw shafts causes said bars and thus said one side plates to move simultaneously.

9. The holder of claim 8 further comprising a plurality of relatively fixed bars having slots therein for removable receipt of the other side plates of each pair.

10. The holder of claim 9 further comprising means for providing limited longitudinal adjustment of said relatively fixed bars to permit limited adjustment of the vertical position of said other side plates of each pair.

11. The holder of claim 1 further comprising mans for independently adjusting the position of at least one side plate of each pair to permit variations in the spacing between each pair of side plates.

12. The holder of claim 11 wherein said means for independently adjusting the position of at least one side plate of each pair comprises a plurality of mounts on said one side plates including threaded bushings having threaded engagement with a plurality of screw shafts extending through said one side plates, bosses on said one side plates in which said bushings are rotatably received, sprockets attached to said bushings, a locking device comprising a toggle clamp having a lever arm mounted for pivotal movement, a sprocket segment carried by said lever arm for movement into and out of engagement with one of said sprockets for releasably locking said one sprocket against rotation, and a chain interconnecting said sprockets, whereby locking said one sprocket against rotation also locks said other sprockets against rotation.

13. The holder of claim 1 wherein said container is supported on rollers for movement along rails laterally of a stock processing line, and indexing means are provided for automatically indexing said holder to bring any one of the coils carried thereby into proper alignment with said stock processing line, said indexing means comprising a gear rack on said container, a gear motor adjacent said processing line having a drive shaft, a spur gear mounted on said drive shaft, and means mounting said gear motor for raising and lowering of said gear motor to bring said spur gear into and out of engagement with said gear rack.

14. The holder of claim 1 wherein said means for supporting such coils on said container comprises separate support rolls for each coil, and separate drive means on said container for rotating the respective separate support rolls for each of the coils.

15. The holder of claim 1 further comprising means for sensing the pay out of the stock material from said container, and means for automatically indexing the container after the stock from each coil is exhausted.

16. The holder of claim 1 further comprising means for automatically controlling the indexing and pay out of each coil carried by said container.

17. A holder for rotatably supporting a plurality of coils thereon for unwinding comprising a container, means for supporting such coils on said container, a plurality of pairs of side plates on said container for receipt of a coil between each pair of side plates, said container being supported on rollers for movement along rails laterally of a stock processing line, and indexing means for automatically indexing said holder to bring any one of the coils carried thereby into proper alignment with said stock processing line, said indexing means comprising a gear rack on said container, a gear motor adjacent said processing line having a drive shaft, a spur gear mounted on said drive shaft, and means mounting said gear motor for raising and lowering of said gear motor to bring said spur gear into and out of engagement with said gear rack, a plurality of limit switches adjacent said processing line for controlling the operation of said gear motor, and a plurality of adjustable stops carried by said container for selectively engaging said limit switches to interrupt the operation of said gear motor for locating the coils on said container with respect to said processing line.

18. A holder for rotatably supporting a plurality of coils thereon for unwinding comprising a container, means for supporting such coils on said container, a plurality of pairs of side plates on said container for receipt of a coil between each pair of side plates, and an automatic pressure compensating back-up roll for supporting the coils during payout to resist disengagement from said support means comprising a roll assembly, means mounting said roll assembly for movement toward and away from said holder for engaging the coils supported thereby, means for providing a variable amount of pressure urging said roll assembly into engagement with the coils and means for automatically decreasing such pressure as the size of the coils engaged by said roll assembly decreases during pay-out.

19. The holder of claim 18 wherein said last-mentioned means comprises a cylinder, and a variable pressure reducing valve for supplying pressure to said cylinder urging said roll assembly toward said coils, said roll assembly having a rack thereon engaging a gear on said valve which is rotated in a direction resulting in automatic reduction in pressure to said cylinder during movement of said roll assembly toward said coils.

20. The holder of claim 19 further comprising means for varying the angular position of said roll assembly.

21. A holder for rotatably supporting a plurality of coils thereon for unwinding comprising a container, support rolls for rotatably supporting such coils on said

container, a plurality of pairs of said plates on said container for receipt of a coil between each pair of side plates, said container being supported on rollers for movement along rails laterally of a stock processing line, and a common drive means adjacent said processing line for selective actuation of the respective support rolls for each of the coils, said drive means comprising a single drive motor, a spur gear driven by said drive motor, and means mounting said spur gear for movement into and out of engagement with a plurality of spur gears associated with said support rolls when brought into alignment therewith.

22. The holder of claim 21 wherein said process line includes pinch rolls for receipt of the stock during payout, said pinch rolls being operated by said single drive motor for synchronous operation of said rolls.

23. The holder of claim 21 further comprising means for adjusting the longitudinal position of said drive motor between said rails.

24. A holder for rotatably supporting a plurality of coils thereon for unwinding comprising a container, support rolls for rotatably supporting such coils on said container, a plurality of pairs of side plates on said container for receipt of a coil between each pair of side plates, said container being supported on rollers for movement along rails laterally of a stock processing line, drive means for rotating said coil support rolls for feeding material to said processing line, automatic loop control means adjacent said processing line for controlling the operation of said drive means to maintain the stock when pulled from the bottom of the coils in a loose condition for advancement by a feed device in said processing line, a feed chute for guiding the stock being paid out from the bottom of the coils, and means for varying the contour of said feed chute along the length thereof to suit the thickness and width of the coil stock being fed to the processing line.

25. The holder of claim 24 wherein said loop control means comprises a pivotally mounted lever arm, a roller on said lever arm about which the stock material is looped, spring means for urging said roller arm away from said holder, switch means actuated by said roller arm when moved a predetermined amount toward said holder to start said drive means, additional switch means actuated by said roller arm when moved a predetermined amount away from said holder to stop said drive means, and still additional switch means for stopping said drive means when said lever arm is moved a greater predetermined amount toward said holder, and spring means for resisting movement of said lever arm such greater predetermined amount.

26. The holder of claim 24 further comprising means for adjusting the position of said feed chute toward and away from said coil holder.

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