Feb. 4, 1969 J. A. HUBER ET AL 3,425,612

DUAL ROLL FEEDING APPARATUS

Filed May 25, 1967

Sheet 1 of 4

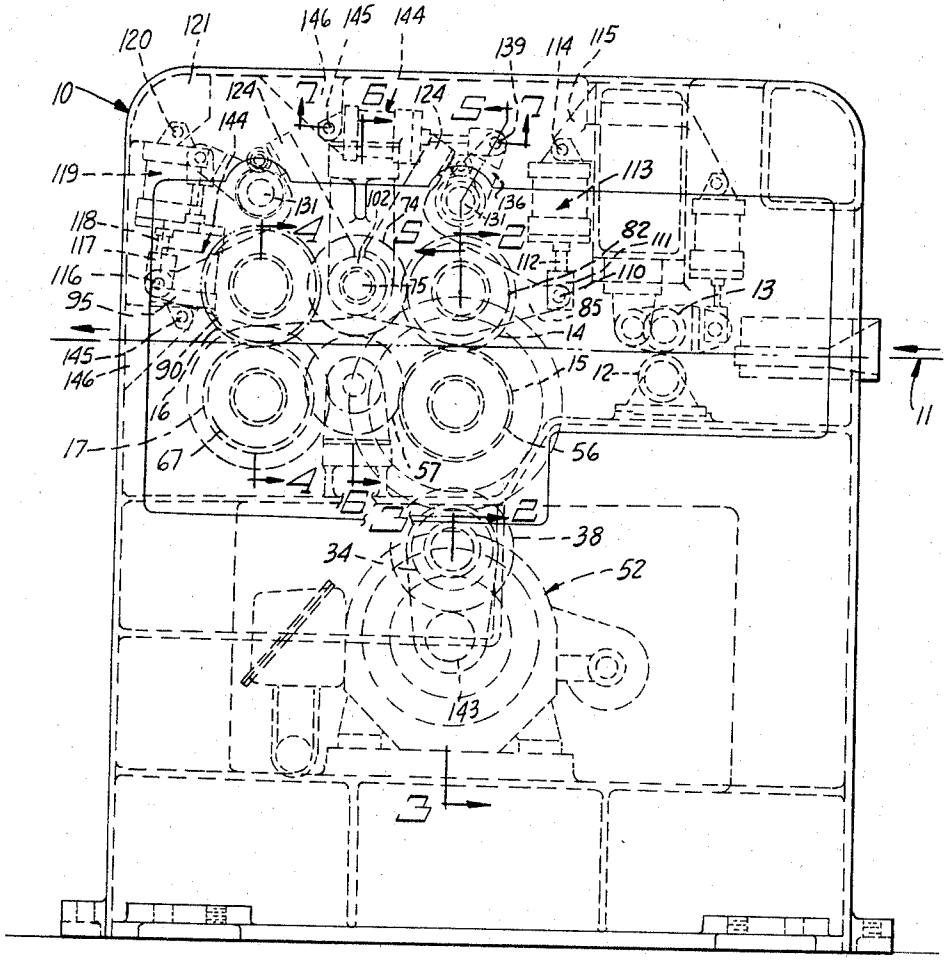


Fig. 1

INVENTORS.
BERLYN E. BARINGER
BY JOHN A. HUBER
Donnelly, Mentag & Harrington
ATTORNEYS

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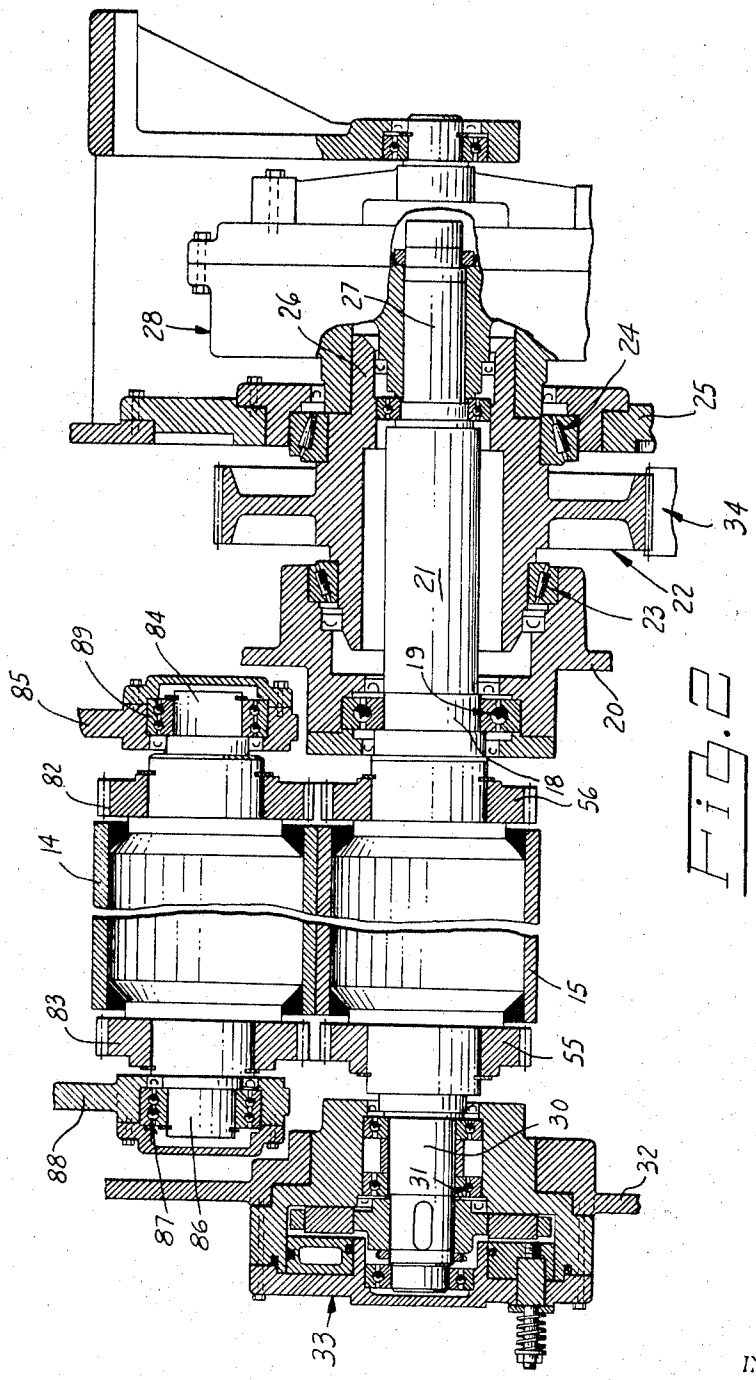


Fig. 2

INVENTORS.
BERLYN E. BARINGER
BY JOHN A. HUBER
Donnelly, Mentag & Harrington
ATTORNEYS

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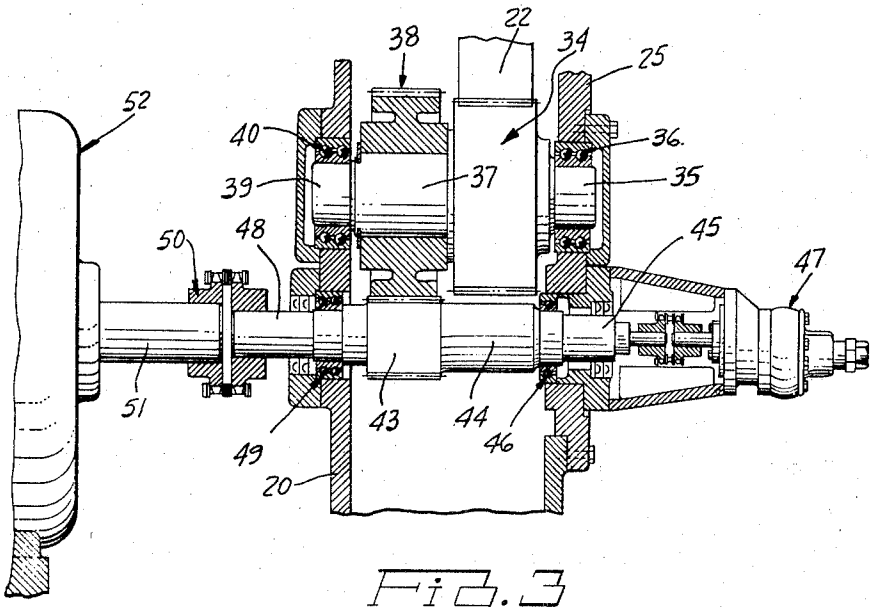


Fig. 3

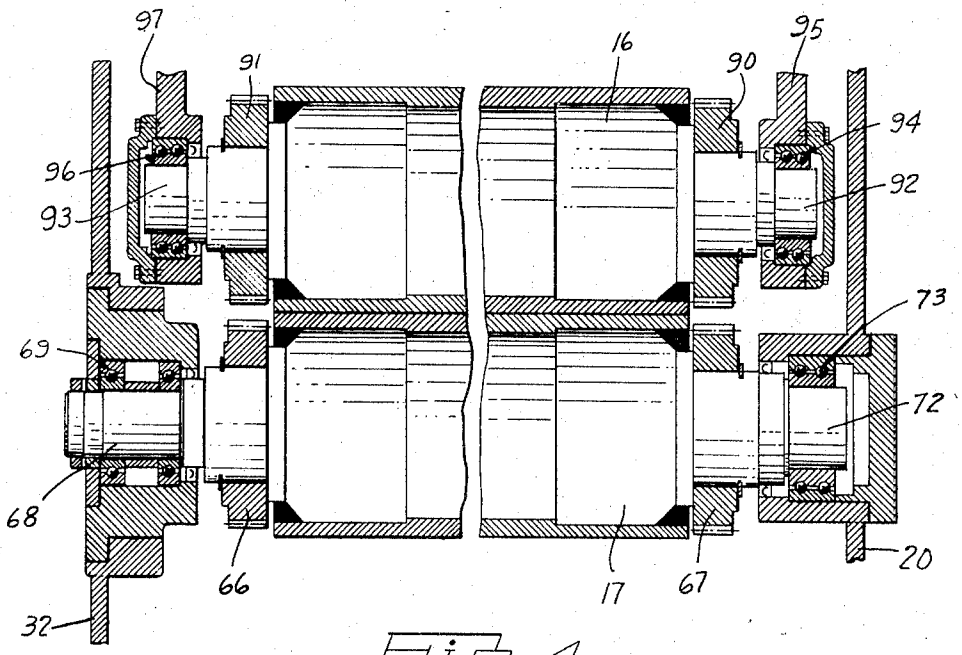


Fig. 4

INVENTORS.
BERLYN E. BARINGER
BY JOHN A. HUBER
Donnelly, Mentag & Harrington
ATTORNEYS

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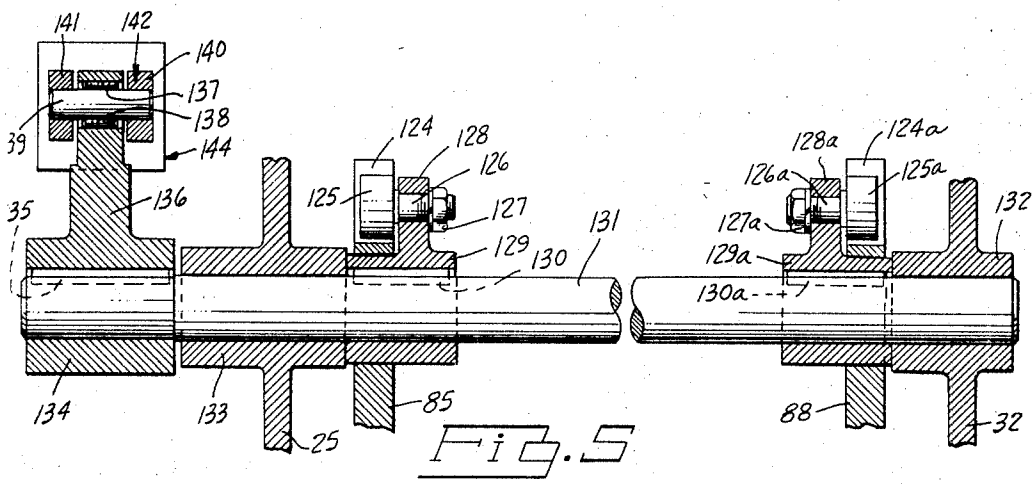


Fig. 5

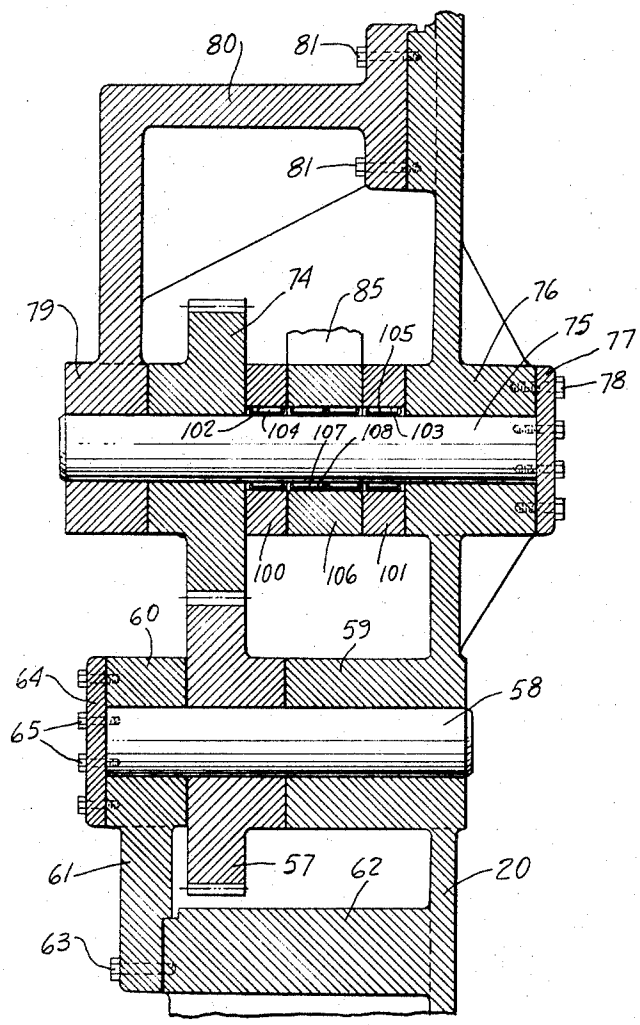


Fig. 6

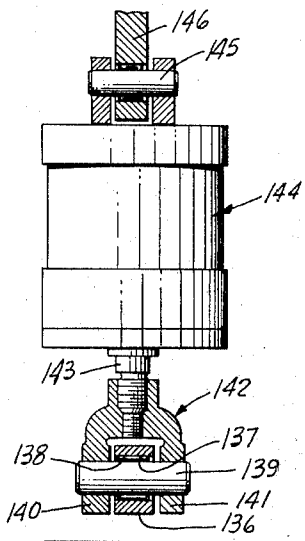


Fig. 7

INVENTORS.
BERLYN E. BARINGER
BY JOHN A. HUBER
Donnelly, Montag & Harrington
ATTORNEYS

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3,425,612

DUAL ROLL FEEDING APPARATUS

John A. Huber, Birmingham, and Berlyn E. Baringer, Southfield, Mich., assignors to U.S. Industries, Inc., Detroit, Mich., a corporation of Delaware

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U.S. Cl. 226—177 5 Claims
Int. Cl. B65h 17/20

ABSTRACT OF THE DISCLOSURE

A strip stock feeding machine having two sets of feed rolls that are positively driven by gears, with each set of feed rolls including one roll journalled on a pivotally mounted carrier that maintains the pivot point or pivot axis of the carrier at a constant distance from the center or rotational axis of the movable roll equal to the pitch diameter of the roll drive gears, so that the positive drive between the roll drive gears and the feed rolls is never lost as the movable feed roll in each set is pivoted to vary the opening between the rolls in each set to permit the feeding of various thicknesses of strip stock, and also to permit the use of only one of the sets of feed rolls alone or both sets together.

This invention relates generally to the strip stock feeding art, and more particularly to a novel and improved dual roll feeding apparatus for strip stock material.

Heretofore, some strip stock feeding machines have been provided with two sets of feed rolls with each set including a movable feed roll. However, a disadvantage of such prior art strip stock feeding machines is that the movable feed rolls were driven by universal joint connections between the power transmission system which connected the feed rolls to a power source. Such universal joint connection structure inherently causes vibrations in the movable feed rolls and a lack of positive drive for the movable feed rolls.

The present invention provides a strip stock feeding machine which includes a first set of feed rolls and a second set of feed rolls which are spaced apart from each other, and wherein one roll in each set of feed rolls can be moved a small distance, or a large distance, from its mating feed roll to permit the feeding of strip stock of various thicknesses and yet provide the movable feed roll in each set with a positive driving action free of vibrations.

The movable feed roll in each set of feed rolls is mounted on a carrier means that is pivoted about the axis of rotation of an idler gear which is meshed with gear means on the shaft carrying the movable feed roll, whereby the movable feed roll is continuously in mesh with the idler gear at all times, and the carrier means is adapted to be pivoted and yet maintain constant pitch diameter of said gears to provide a positive, vibrationless drive to the movable feed roll.

Other features and advantages of this invention will be apparent from the following detailed description, appended claims, and the accompanying drawings:

In the drawings:

FIG. 1 is a side elevational view of a strip stock feeding machine made in accordance with the principles of the present invention;

FIG. 2 is a fragmentary, broken, enlarged elevational section view of one set of feed rolls employed in the invention, together with a portion of the drive train structure illustrated in FIG. 1, taken along the line 2—2 thereof, and looking in the direction of the arrows;

FIG. 3 is a fragmentary, enlarged, elevational section view of the drive train structure illustrated in FIG. 1,

taken along the line 3—3 thereof, and looking in the direction of the arrows;

FIG. 4 is a fragmentary, broken, enlarged elevational section view of the other set of feed rolls employed in the invention, taken along the line 4—4 of FIG. 1, and looking in the direction of the arrows;

FIG. 5 is a fragmentary, broken, enlarged elevational section view of the feed roll adjusting structure illustrated in FIG. 1, taken along the line 5—5 thereof, and looking in the direction of the arrows;

FIG. 6 is a fragmentary, enlarged, elevational section view of a portion of the drive train structure illustrated in FIG 1, taken along the line 6—6 thereof, and looking in the direction of the arrows; and,

FIG. 7 is a fragmentary, enlarged, elevational section view of the feed roll adjusting structure illustrated in FIG. 1, taken along the line 7—7 thereof, and looking in the direction of the arrows.

Referring now to the drawings and in particular to FIG. 1, the numeral **10** generally designates a dual roll feeding machine which is adapted to receive strip stock material indicated by the numeral **11** from a prior strip stock processing machine, such as straightening machine, and feed the strip stock material **11** into another processing machine, such as a punch press, a power operated shears and the like. As shown in FIG. 1, the strip stock material **11** enters the feeding machine **10** and advances through a pair of anti-back-up rolls **12** and **13**, and then between a first set of drive or feed rolls **14** and **15**. The strip stock material **11** next passes between the second set of feed rolls **16** and **17** and thence into the next aforementioned material processing machine. The present invention is directed to the two sets of feed or drive rolls **14** and **15**, and **16** and **17**, respectively, and accordingly, the details of the other parts of the feeding machine have not been shown.

As shown in FIG. 2, the feed roll **15** of the first set of feed rolls is rotatably supported by a first end shaft **18** in a suitable bearing means generally indicated by the numeral **19**. The bearing means **19** is operatively carried in a vertical inner wall **20** of the frame structure of the feeding machine **10**. The feed roll end shaft **18** is integral with the output drive shaft **21** of a gear type power transmission system which is in turn connected to a suitable power source, as more fully explained hereinafter.

The power transmission output shaft **21** is rotatably journalled on a pair of suitable bearing means, generally indicated by the numerals **23** and **24**, which are operatively mounted on the machine frame walls **20** and **25**, respectively. The power transmission system includes a clutch drive gear **22** which is provided with an axial hub extension **26** that is adapted to be selectively coupled to the reduced end **27** of the shaft **21** by a suitable clutch means, as generally indicated by the numeral **28**.

As shown in FIG 2, the feed roll **15** is provided with a second end shaft **30** which is rotatably supported in a suitable bearing means **31** that is operatively mounted in the outer frame wall **32** of the supporting frame for the feed machine **10**. A suitable brake means, generally indicated by the numeral **33**, is operatively connected to the outer end of the feed roll end shaft **30**.

As shown in FIG. 2, the clutch drive gear **22** is driven by a pinion gear **34**. As shown in FIG. 3, the pinion gear **34** is provided with an end shaft **35** which is journalled in a suitable bearing means generally indicated by the numeral **36**. The bearing means **36** is operatively mounted in the machine frame wall **25**. The pinion gear **34** is provided with a second end shaft **37** on which is mounted a pinion gear **39**, and it is journalled in a suitable bearing means **40** that is carried in the machine frame wall **20**.

As shown in FIG. 3, the pinion gear **38** is meshed with,

and driven by, a pinion gear **43** which is integrally formed on the drive shaft **44**. The drive shaft **44** is provided with a first reduced end **45** that is rotatably mounted in a suitable bearing means **46** that is supported in the machine frame wall **25**. The shaft end **45** is shown as being operatively connected to a hydraulic pump **47** for operating the same. The other reduced end **48** of the shaft **44** is rotatably mounted by a suitable bearing means **49** which is supported in the machine frame wall **20**. The outer end of the shaft **48** is connected to the output shaft **51** of an electric motor **52** by a suitable coupling generally indicated by the numeral **50**. The electric motor **52** comprises the power source of the power transmission system for driving the dual feed rolls of the feeding machine.

As shown in FIG. 2, the feed roll **15** is provided with a pair of gears **55** and **56** which are secured by any suitable means to the feed roll end shafts **30** and **18**, respectively, in positions at the ends of the feed roll **15**. The feed roll gears **55** and **56** function to transmit the drive power for the other feed rolls **14**, **16** and **17**, as described hereinafter.

As shown in FIG. 1, the feed roll gear **56** is meshed with and drives the idler gear **57**. As shown in FIG. 6, the idler gear **57** is operatively mounted on an idler gear shaft **58** which has one end thereof operatively mounted in the journal member **59** which is formed integral on the machine frame wall **20**. The other end of the idler gear shaft **58** is operatively mounted in a detachable journal member **60** which is carried on the bracket arm **61**. The bracket arm **61** is secured to the machine frame arm **62** which extends from the machine frame wall **20**. The bracket arm **61** is secured to the frame arm **62** by any suitable means, as by screws **63**. A cap member **64** is secured by the screws **65** to the outer end of the journal member **60** to retain the shaft **58** in place.

It will be understood that the feed roll gear **55** also drives a second idler gear which is identical to the gear **57** and mounted in a spaced apart position from the gear **57**.

As shown in FIG. 4, the lower feed roll **17** of the second set of feed rolls is provided with a first end shaft **66** which is rotatably mounted on the machine frame wall **20** by a suitable bearing means **67**. The feed roll **17** is provided with a second end shaft **68** which is rotatably mounted on the machine frame wall **32** by a suitable bearing means **69**. The feed roll **17** is provided with a pair of gears **66** and **67** which are mounted on the feed roll end shafts **68** and **69**, respectively, by any suitable means, in positions at the ends of the feed roll **17**.

As shown in FIG. 1, the idler gear **57** is meshed with and drives the feed roll gear **67** to provide a drive means for the feed roll **17**. It will be understood that an idler gear identical to gear **57** is on the other side of the machine and drives the second feed roll gear **66** on the other end of the feed roll **17**.

The upper feed rolls **14** and **15** of the two sets of feed rolls are driven from the idler gear **57** in the following described manner. As shown in FIG. 1, the idler gear **57** is disposed below and meshed with a second idler gear **74** for driving this second idler gear **74**. As shown in FIG. 6, the idler gear **74** is journalled on an idler gear shaft **75** which has one end thereof operatively mounted in the journal member **76** which is carried by the machine wall **20**. The outer end of the journal member **76** is enclosed by the cap member **77** which is secured to the journal member **76** by the screws **78**. The other end of the idler gear shaft **75** is operatively mounted in the journal member **79** which is carried by the bracket **80** that is secured to the machine wall **20** by any suitable means, as by the screws **81**. It will be understood that the other side of the machine is provided with an idler gear similar to idler gear **74**.

As shown in FIG. 2, the feed roll **14** is provided with a pair of feed roll drive gears **82** and **83** which are mounted at the ends of the feed roll **14** on the end shafts **84** and **86**, respectively. As shown in FIG. 1, the feed roll gear **82** is meshed with and driven by the idler gear **74**. The idler gear on the other side of the machine which is identical to the idler gear **74** is meshed with and drives the feed roll gear **83**.

As shown in FIG. 2, the feed roll **14** is provided with a first end shaft **84** which is mounted in a suitable bearing means **89** which is supported on a pivotally mounted lever **85**. The feed roll **14** is provided with a second end shaft **86** which is mounted in a suitable bearing means **87** that is carried on a second pivotally mounted lever **88**. The levers **85** and **88** comprise a carrier means for the lower feed roll **14**, and the pivotal mounting means for these levers will be described in detail hereinafter.

As shown in FIG. 4, the feed roll **16** is provided with a pair of feed roll drive gears **90** and **91** which are mounted at the ends of the feed roll **16** on the end shafts **92** and **93**, respectively. As shown in FIG. 1, the idler gear **74** is meshed with and drives the feed roll gear **90**. The idler gear on the other side of the machine which is identical to the idler gear **74** is meshed with and drives the feed roll gear **91**.

As shown in FIG. 4, the one end shaft **92** for the feed roll **16** is rotatably mounted by a suitable bearing means **94** on the pivotally mounted lever **95**. The other end shaft **93** of the feed roll **16** is mounted in a suitable bearing means **96** which is carried by a second pivotally mounted lever **97**. The levers **95** and **97** comprise a carrier means for the upper feed roll **16**, and the pivotal mounting means for these levers will be described hereinafter.

As shown in FIG. 1, the inner ends of the levers **85** and **95** are pivotally mounted on the idler gear shaft **75**. The lever **95** is provided with a yoke or slotted end to form a pair of bifurcated mounting arms **100** and **101** which are provided with the bores **102** and **103**. Operatively mounted in the bores **102** and **103** are suitable bearing means **104** and **105**, respectively, which are mounted about the idler gear shaft **75**. The outer faces of the mounting yoke arms **100** and **101** are rounded, as shown in FIG. 1. The inner end of the lever **85** is indicated in FIG. 6 by the reference numeral **106**, and it is provided with the bore **107** in which is mounted the bearing means **108** for mounting the lever **85** on the idler gear shaft **75** in a position between the lever mounting yoke arms **100** and **101**. It will be understood, that the levers **88** and **97** are mounted in a similar manner on the other side of the machine on the other idler gear shaft which is identical to the idler gear shaft **75**.

As shown in FIG. 1, the outer end of the lever **85** is attached by a hinge pin **110** to a yoke **111** carried on the outer end of a cylinder rod **112**. The cylinder rod **112** is operatively mounted in a fluid cylinder generally indicated by the numeral **113**, which may be of any suitable type, as for example, an air cylinder. The upper end of the air cylinder **113** is attached by the hinge pin **114** to a mounting plate **114** which is fixed to the frame of the machine **10**. The cylinder **113** is a double-acting cylinder. It will be understood, that the lever **88** which carried the other end shaft **86** of the feed roll **14** is supported at its outer end by a double acting cylinder which is identical to the cylinder **113** and which acts in unison therewith.

It will be seen, that by means of the pair of double-acting cylinders, as **113**, the upper feed roll **14** may be lifted from the lower feed roll **15** to provide a large opening therebetween, for the purpose of moving the feed roll **14** to an inoperative position, or for the purpose of threading heavy strip stock material between the feed rolls **14** and **15**. The pair of double-acting cylinders, as **113**, also may be used to apply pressure to the sheet material being fed between the feed rolls **14** and **15**.

As shown in FIG. 1, the outer end of the lever **95** is attached by the hinge pin **116** to a yoke **117** that is carried by a cylinder rod **118**. The cylinder rod **118** is operatively mounted in a double-acting fluid cylinder **119**

which would be identical to the cylinder **113**. The cylinder **119** is attached by the hinge pin **120** to a mounting plate **121** which is fixed on the frame of the machine **10**. It will be understood, that the lever **97** is also provided with a double-acting cylinder identical to the cylinder **119** for pivoting the lever **97** in unison with the lever **95** to move the feed roll **16** to an open position spaced apart from the feed roll **17**, and also for exerting pressure on strip stock material being fed between the feed rolls **16** and **17**. The pair of cylinders, as **119**, would function in the same manner as the pair of cylinders operating the levers **85** and **88** carrying the other upper feed roll **14**.

As described hereinafter, each of the upper feed rolls **14** and **16** is provided with a power means for moving these feed rolls a small distance apart from their mating feed rolls **15** and **17**, respectively.

As shown in FIG. 1, the feed roll lever **85**, for the feed roll **14**, is provided on the upper side thereof with an upwardly extended arm **124** which functions as a cam follower. As shown in FIG. 5, the other lever **88** which supports the other end of the feed roll **14** is also provided with a similar cam follower arm **124***a*. The cam follower arms **124** and **124***a* are adapted to be swung through small angles of rotation, for lifting the feed roll **14** small distances apart from the lower feed roll **15** by means of the structure shown in FIGS. 5 and 7.

As shown in FIG. 5, the cam follower arm **124** is engaged by a cam roller **125** which is mounted on the shaft **126**. The shaft **126** is secured by the nut **127** in a suitable bore on the arm **128**. The arm **128** is carried on the hub **129** which is fixed by any suitable means as by the key **130** to the cam shaft **131**. The cam shaft **131** extends across the machine and also carries a second cam follower **125***a* which is mounted on the shaft **131** by a structure identical to that which carries the cam roller **125**, and the same reference numerals have been used for such structure, followed by the small letter "*a*." The weight of the feed roll **14** and its carrier means or levers biases the cam follower arms **124** and **124***a* into constant engagement with the cam rollers **125** and **125***a*.

As shown in FIG. 5, the cam shaft **131** is operatively mounted in the journals **132** and **133** which are carried by the machine frame walls **32** and **25**, respectively. One end of the cam shaft **131** is fixed by any suitable means as by the key **135** to the hub **134**. The hub **134** is formed on the lower end of a lever or arm **136**. The upper end of the lever **136** is provided with a bore **137** in which is mounted a suitable bearing means **138**. Mounted in the bearing means **138** is a hinge pin **139** that connects the lever **136** to the arms **140** and **141** of a yoke **142**.

As shown in FIG. 7, the yoke **142** is threadably mounted on the outer end of the cylinder rod of a double acting fluid cylinder generally indicated by the numeral **144**. The head end of the cylinder **144** is attached by the hinge pin **145** to the mounting plate **146** carried by the frame of the machine **10**, as shown in FIG. 1.

It will be seen that when the double-acting cylinder **144** is operated, the cam shaft **131** will be rotated to move the cam roller **125** in the desired rotational direction. The movement of the cam rollers **125** and **125***a* will rotate the arms **124** and **124***a* to raise or lower the feed roll **14** in the desired controlled manner.

As shown in FIG. 1, the lever arm **95**, for the feed roll **16**, is provided with a cam follower arm **124** which is identical to the cam follower arm **124** on the lever **85**. The other lever **97**, for the feed roll **16**, shown in FIG. 4, would also be provided with a lever arm **124***a* in the same manner as the feed roll lever **88** in the first set of feed rolls. The second set of feed rolls **16** and **17** would be provided with an identical cam operated power means for moving the levers **124** and **124***a* on the levers **95** and **97**, respectively. As shown in FIG. 1, the same reference numerals for the last mentioned cam operated power means have been used in FIG. 1 to indicate the same.

It will be seen, that the gear drive for the two sets of feed rolls operates the feed rolls in a positive manner as compared to the prior art universal joint type of connection means which is employed for connecting the prior art power drive means to a pair of feed rolls. It will also be seen, that the mounting of the upper feed rolls **14** and **16** on their respective carrier means provides a structure wherein the feed rolls **14** and **16** are always disposed with their rotational axis at a constant distance from the axis of rotation of the upper idler gears **74**, whereby the feed roll gears for the feed rolls **14** and **16** are always running on a true pitch diameter. The positive gear drive for the feed rolls **14**, **15**, **16** and **17** provides a smooth operation to the machine, yet permits flexibility of use of the two sets of feed rolls because of the novel mounting structure of the feed rolls. The positive continuous contact of the drive gears for the movable feed rolls **14** and **16** eliminates the possibility of vibrations in these feed rolls, regardless of the position these feed rolls are in, or the thickness of the strip material being rolled. It will be understood, that the aforementioned fluid cylinders for pivoting the feed roll carrier means may be operated in any desired sequence. The two sets of feed rolls may have to be provided with different roll surfaces. For example, one set as rolls **14** and **15**, could have smooth surfaces for feeding, and the other set as **16** and **17**, could have a surface adapted to coat the strip material as it passes therebetween.

While it will be apparent that the preferred embodiment of the invention herein disclosed is well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modifications, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. A strip stock feeding apparatus having a first set of feed rolls and a second set of feed rolls spaced laterally apart from said first set of feed rolls for receiving strip stock fed from said first set of feed rolls, wherein the improvement comprises:

(a) one roll in each of said first and second sets of feed rolls being rotatably mounted on a fixed axis of rotation;

(b) the other roll in each of said first and second sets of feed rolls being rotatably mounted on a pivotally mounted carrier means, and on an axis of rotation parallel to said first named axis of rotation;

(c) gear means on each of said one feed rolls for rotating the same;

(d) shaft means on said apparatus disposed in a longitudinal position parallel to the first two named axis of rotation;

(e) the carrier means for each of said one feed rolls having one end pivotally mounted on said shaft means;

(f) gear means on said shaft means and meshed with said gear means on each of said one feed rolls for driving the last named gear means;

(g) a power source;

(h) a power transmission system connecting said source of power to the gear means on said shaft means and to the other roll in each of said first and second sets of feed rolls for driving the feed rolls; and,

(i) power means engaged with each of said carrier means for selective pivoting of each of said carrier means about said shaft means for selectively moving said one roll in each of said first and second sets of feed rolls relative to said other roll in each of said sets of feed rolls.

2. A strip stock feeding apparatus as defined in claim **1**, wherein:

(a) said power transmission system comprising a gear train.

3. A strip stock feeding apparatus as defined in claim 1, wherein:

(a) said power means for pivoting each of the carrier means includes fluid cylinder means connected to the other end of each carrier means.

4. A strip stock feeding apparatus as defined in claim 3, wherein:

(a) said power means for pivoting each of said carrier means further includes:

(1) a rotatable cam means; and,

(2) fluid cylinder means connected to said cam means for operating the cam means to pivot each carrier means.

5. A strip stock feeding apparatus as defined in claim 1, wherein:

(a) each of said carrier means comprises a pair of

spaced apart levers which each have one end pivotally mounted on said shaft means, and each of said one feed rolls is rotatably mounted between a pair of said levers.

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ALLEN N. KNOWLES, *Primary Examiner.*

U.S. Cl. X.R.

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