United States Patent

Shumaker

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[54] **APPARATUS FOR FEEDING STRIP-LIKE MATERIAL TO A PROCESSING APPARATUS**

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[21] Appl. No.: **151,339**

[30] **Foreign Application Priority Data**

July 13, 1970 Great Britain.....33,842/70

[52] **U.S. Cl.** **228/5,** 226/109, 226/118, 228/4, 228/47, 270/52

[51] **Int. Cl.** **B23k 1/20**

[58] **Field of Search** 228/4, 5, 6.5, 44, 47; 270/52, 270/43, 44, 10, 11; 226/109, 118; 219/82; 242/58, 58.1, 58.4, 58.5

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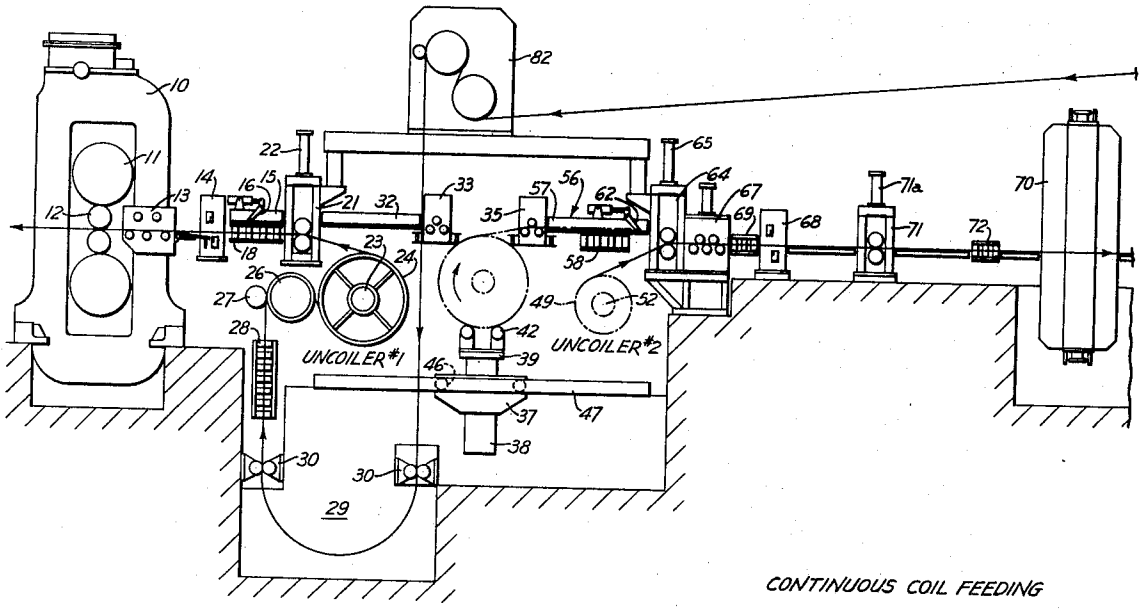
[57] **ABSTRACT**

This disclosure relates in one form to a method of and apparatus for feeding coils of metallic strip to a rolling mill or similar strip processing device in a manner that the device can be either operated continuously, e.g., it need not be stopped to receive succeeding coils to be processed, or intermittently, e.g., it requires interruption of the device to receive separate coils to be processed.

This combined operation is accomplished by providing two uncoilers, one of which feeds strip in a direction away from the mill to a strip accumulator. The second uncoiler is arranged to uncoil coils towards the mill when separate coils are to be rolled by the mill, but when the mill is to be operated to roll the coils continuously, the second uncoiler functions as part of a tension unit.

7 Claims, 8 Drawing Figures



CONTINUOUS COIL FEEDING

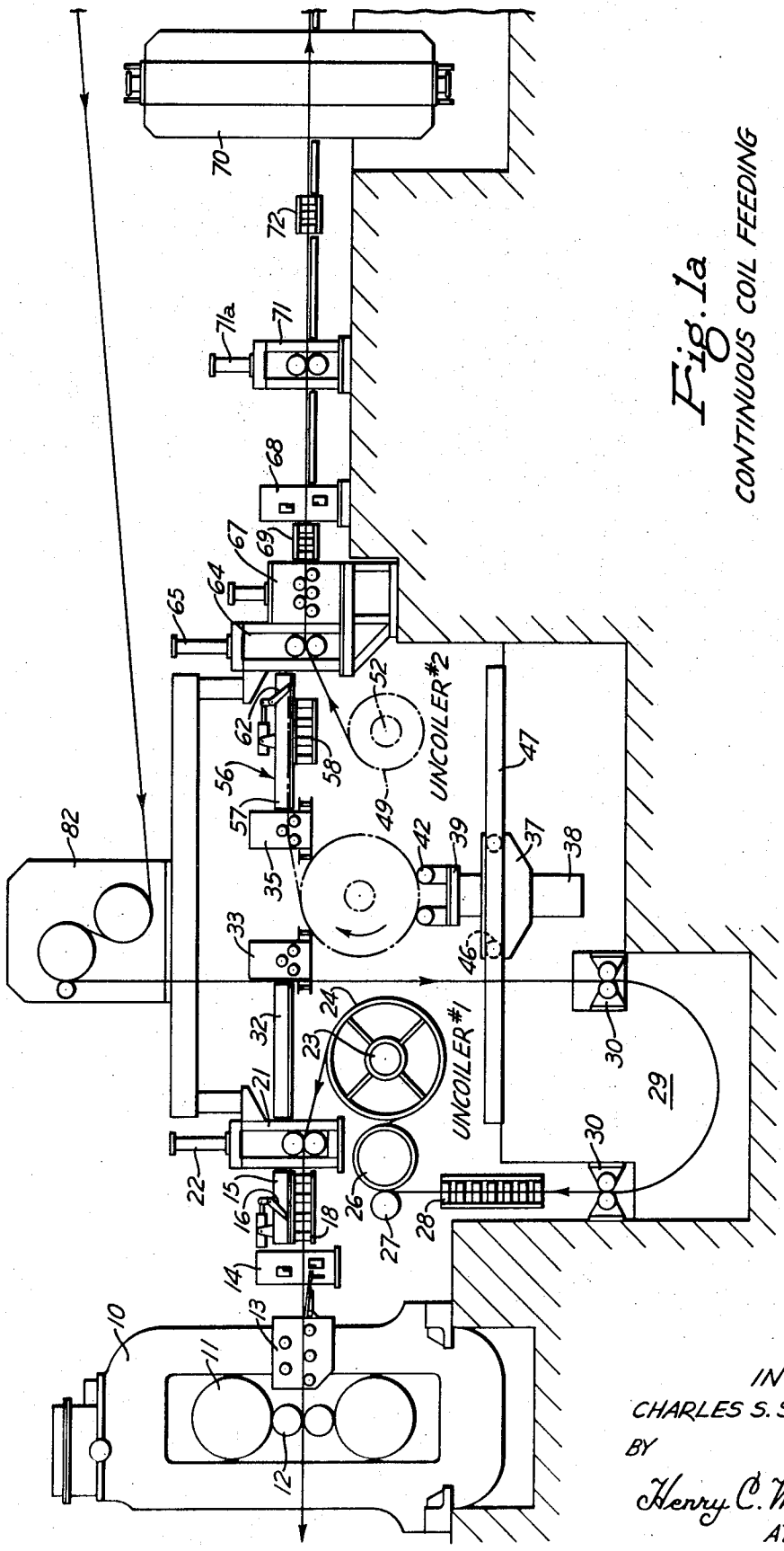


Fig. 1a
CONTINUOUS COIL FEEDING

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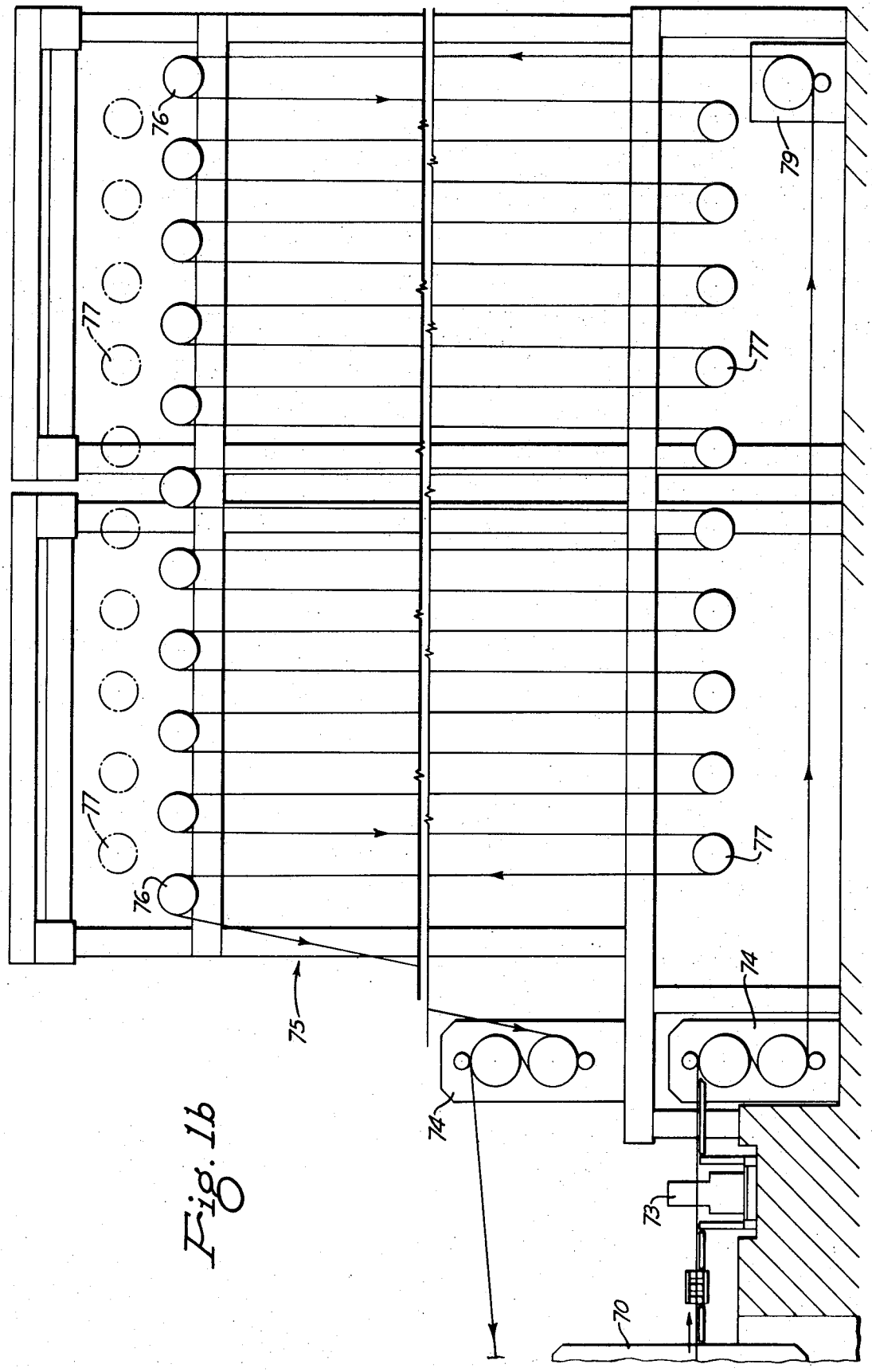

Fig. 1b

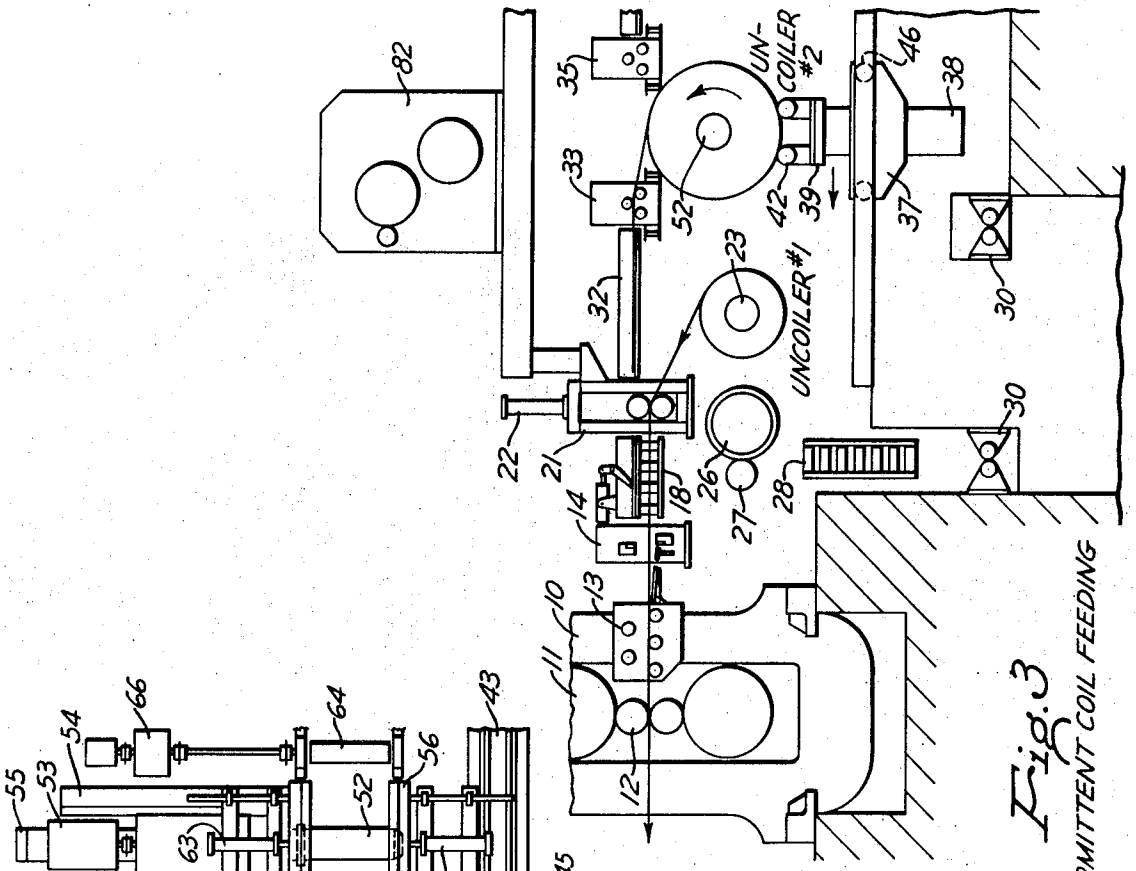

Fig. 3

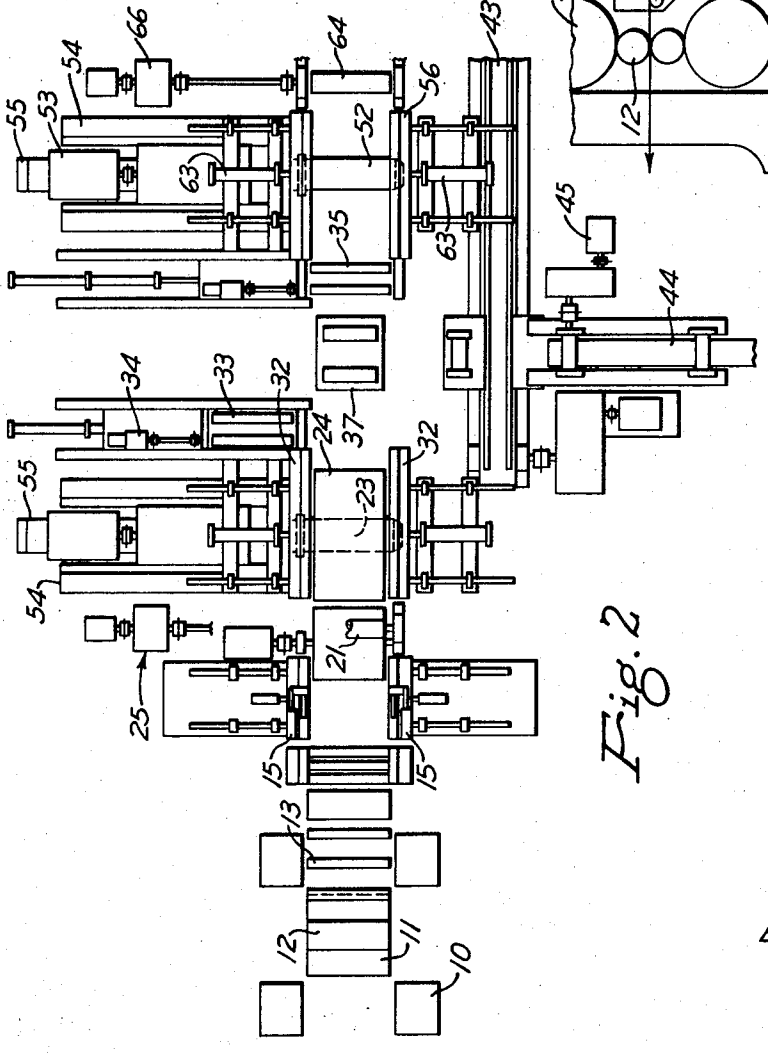

Fig. 2

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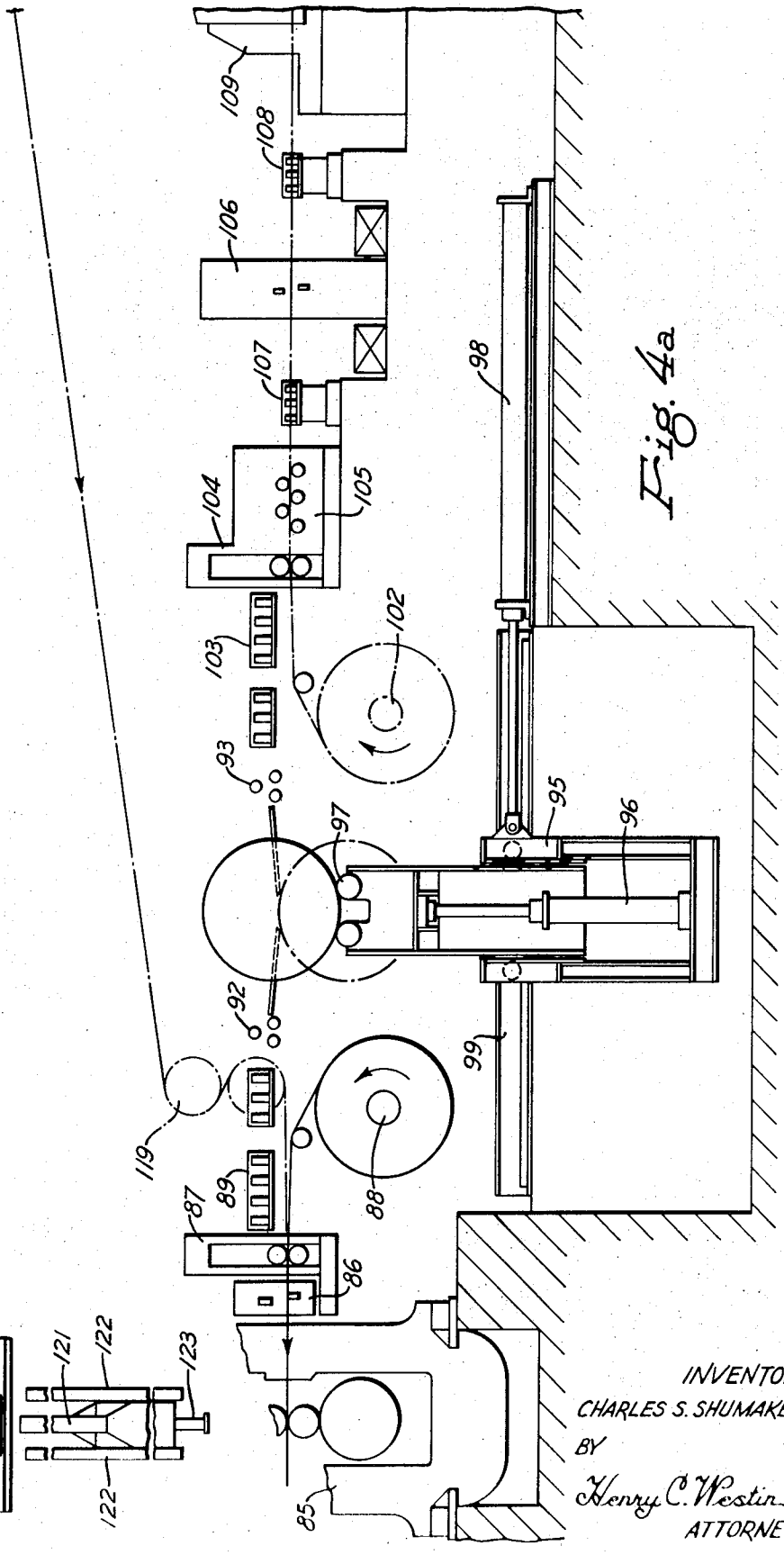

Fig. 4a

Fig. 4c

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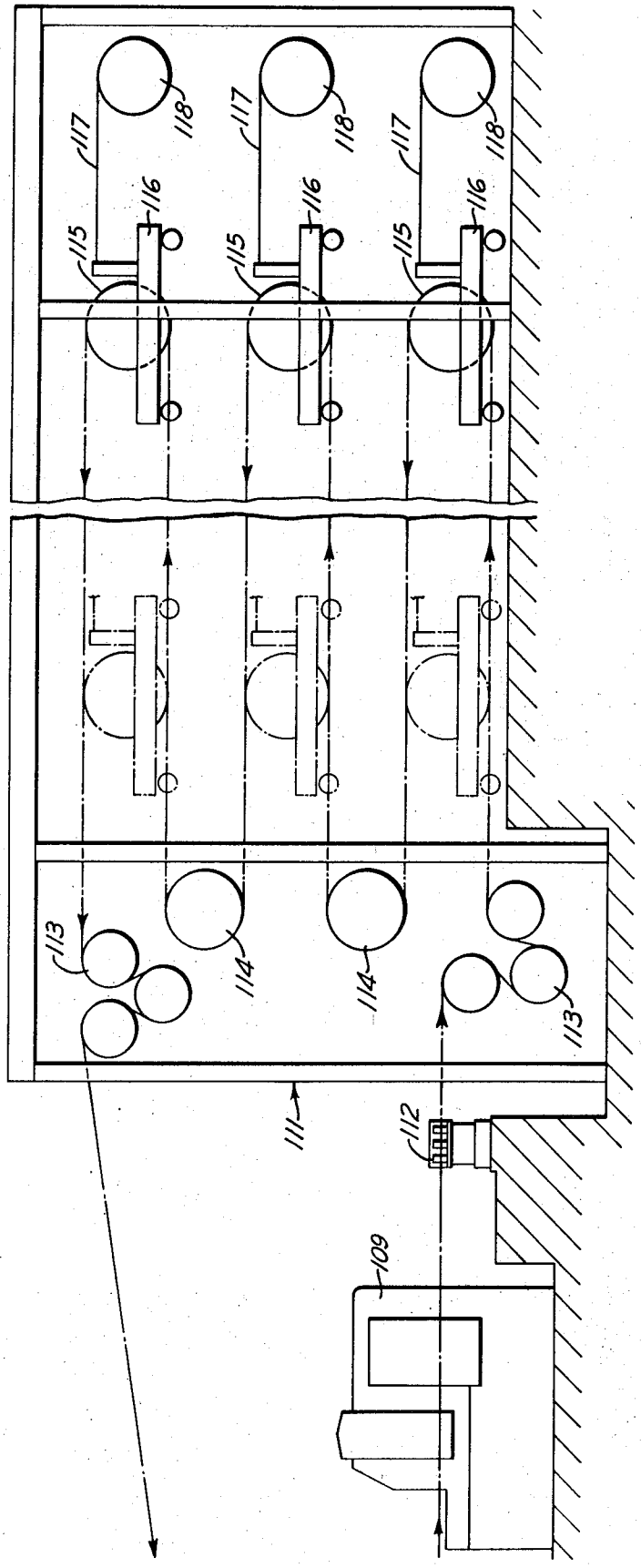

Fig. 4b

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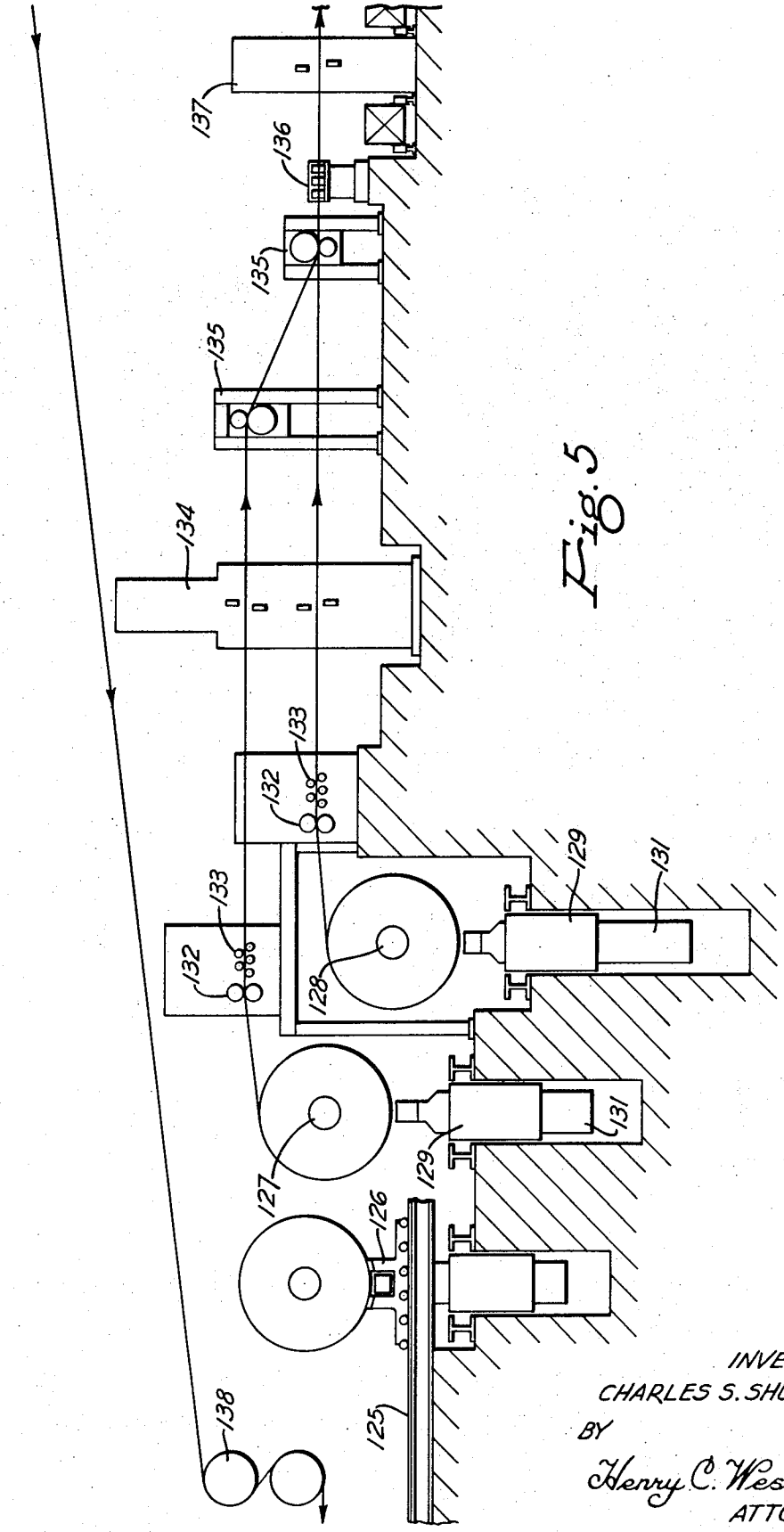

Fig. 5

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APPARATUS FOR FEEDING STRIP-LIKE MATERIAL TO A PROCESSING APPARATUS

In the operation of a rolling mill and, more particularly, a cold tandem mill for wide strip, the ultimate aim for many years from a production standpoint has been to find an acceptable procedure and arrangement that would permit strip to be fed continuously to the mill. This aim, in part, has not been realized because of the problems of perfecting a reliable strip joiner, such as a welder, to join the coils together. An equally difficult problem has been in devising a method and apparatus that would efficiently and economically handle the coils at the rate required for a high-speed cold mill and in a manner that would not require an inordinate amount of space, considering the fact that sufficient strip must be accumulated to permit the preparation and welding of each succeeding coil. This latter problem became even more difficult in view of the requirement that the equipment also accommodates the individual feeding of coils to the mill. This requirement is brought about by the fact that some mills are called upon to roll short coils of relatively thick strip which are best rolled individually.

The present invention relates to the second aforesaid problem and solves it by providing a method and apparatus for continually feeding coils of strip to a rolling mill or like device requiring a minimum amount of equipment and space and, while not so limited, in the circumstances where individual coils are to be fed to the mill, providing an arrangement where existing equipment may be used for this operation.

More particularly, the present invention provides a method of continuously feeding strip to a rolling mill comprising the steps of uncoiling a first coil in a direction away from the mill to a strip joiner arranged in line with the mill; uncoiling all but the trailing end portion of the first coil in a strip accumulator arranged on the side of the joiner furthest from the mill and in line with said mill; uncoiling a second coil in a direction away from the mill to the strip joiner; joining the leading end of said second coil to the trailing end of the first coil; passing the remaining portion of said first coil and all but the trailing end of said second coil to said strip accumulator; storing a minimum amount of strip in said accumulator to allow a succeeding coil to be uncoiled and joined to the second coil while strip is fed to said mill in an uninterrupted manner; and, lastly, feeding the leading end of said first coil to said mill for rolling.

The invention still further provides an apparatus for continually feeding strip to a rolling mill comprising a first uncoiler arranged in front of the mill and in line therewith for uncoiling separate coils in a direction towards the mill; a second uncoiler arranged in line with said mill for uncoiling coils in a direction away from said mill; a strip accumulator arranged on the side of said second uncoiler opposite said mill and in line with said mill; a strip joiner arranged between said accumulator and said second uncoiler for receiving strip uncoiled from said second uncoiler and welding the ends together, a tension roll removably mounted on said first uncoiler when strip is being fed to said mill from said accumulator; a second tension roller arranged to cooperate with said removable tension roller to impose tension on the strip being fed to said mill from said accumulator, said accumulator including

means for storing a minimum amount of strip to allow succeeding coils to be uncoiled and joined without interrupting the feeding of the strip to said mill.

The invention further provides a tension bridle uncoiler unit arranged in line with said mill between the mill and the first uncoiler; means for causing the strip to pass from a strip receiving means to said tension bridle uncoiler unit, said unit including means for rotatably supporting a first tension roller; means for rotatably supporting a second tension roller, said two tension rollers constructed and arranged to subject the strip to a back tension immediately prior to its passage to the mill; means for supporting said second tension roller including means for uncoiling a coil of strip to the mill in the direction of the mill; a coil carrying car; means for moving said car from a coil receiving station to each of said uncoilers for uncoiling thereby.

The invention still further provides an apparatus for continually feeding strip to a rolling mill comprising a first uncoiler arranged in front of the mill and in line with the mill for uncoiling a first coil in a direction away from said mill; a strip accumulator arranged on the side of said uncoiler opposite said mill and in line with said mill; a second strip uncoiler arranged in line with said mill between said first uncoiler and said accumulator; a strip joiner arranged between said second uncoiler and said strip accumulator for receiving strip uncoiled by said first and second uncoilers; means for receiving strip from said strip accumulator and feeding the strip to said mill in a continuous uninterrupted manner, said strip accumulator including means for storing a minimum amount of strip to allow succeeding coils to be uncoiled and joined without interrupting the feeding of the strip to said mill.

These features, along with other features and advantages of the invention, will be better appreciated when the following description is read along with the accompanying drawings, of which;

FIGS. **1***a* and **1***b* are composite elevational views of the equipment for carrying out one form of the present invention;

FIG. **2** is a plan view of a portion of the equipment illustrated in FIG. **1***a*;

FIG. **3** is an elevational view of a portion of the equipment illustrated in FIG. **1***a* illustrating the use of the equipment for feeding separate coils to the mill;

FIGS. **4***a* and **4***b* are composite elevational views of a second embodiment of the present invention;

FIG. **4***c* is a plan view of the conveyor arrangement for bringing coils to the uncoilers illustrated in FIG. **4***a*; and

FIG. **5** is a still further embodiment of the present invention illustrating in elevation only the uncoiling and strip preparation equipment.

In referring to the embodiment of the present invention as illustrated in FIGS. **1***a*, **1***b* and **2**, the invention will be described starting from the rolling mill appearing in FIGS. **1***a* and **2** proceeding from the left to the right of the drawings. Those skilled in the art will recognize that the various components making up the arrangement of equipment are generally well known in the art and, for this reason, it is deemed unnecessary to describe, in many cases, the specific designs of the equipment. As one views the equipment in the figures, there is illustrated a four-high rolling mill **10** compris-

ing backup rolls **11** and cooperating work rolls **12**. The arrow in FIG. **1***a* indicates the direction of travel of the material through the mill so that on the entry side there is provided in the customary manner a roller leveller **13** that straightens the leading end of the strip entering the mill.

Proceeding away from the mill, as one views FIG. **1***a*, there is arranged next a snip shear **14** along with a pair of holding shelves **15** which include a piston cylinder operated hold-down arm **16**. As shown in FIG. **2**, the shelves are adapted to be retracted away from the edges of the strip so that the strip falls down to the pass line where it is guided by the vertical rollers **18** that form part of the shelf unit. On the entry side of the holding shelves there is arranged a pinch roll unit **21** which has a cylinder **22** to raise and lower the upper roll of the pinch roll unit.

Below the pinch roll unit **21** there is arranged a combination uncoiler-tension bridle unit illustrated best in FIG. **1***a* where its use as a tension bridle is shown, whereas, in FIG. **3** the unit is shown used in the conventional way as an uncoiler. The combined tension bridle and uncoiler comprise a cantilever-mounted rotatable collapsible reel **23** which is adapted to either support a coil, as shown in FIG. **3**, or an exchangeable wheel **24**, as shown in FIG. **1***a*. A coil or the wheel supported by the reel **23** is driven by a drive **25** shown in FIG. **2**. It will be noted that the wheel **24** actually forms the large roller of the tension bridle unit, the smaller roller **26** being mounted on the same horizontal axis and cooperating with a still smaller roller **27**. The smaller roller **26** is driven in relationship to the driven wheel **24** so as to subject the strip passing in a serpentine manner around the two rollers to a back tension which is required for both rolling and proper feeding of the continuous strip to the mill **10**. Directly below the roller **27**, there is provided a series of vertically arranged spaced-apart rollers **28** which receive the strip from a free-looping station **29**, the station including opposed nondriven guide rolls **30**.

Referring now to the equipment located above the reel **23** that makes up the first uncoiler station, there is provided a pair of retractable shelves **32** which allow the strip to be conveyed from a coil preparatory station to the shelves **15**, it being understood at this time that the upper pinch roll of the pinch roll unit **21** will have been raised by the cylinder **22**. On the entry side of the shelves **32** there is provided a transferable three-roll strip bender **33**, the driving means for these rolls being shown in FIG. **2** and identified as **34**. Directly across from the bender **33** there is a similar three-roll bender **35**, its drive also being shown in FIG. **2** and identified as **36**. In FIG. **2** the bender **33** is shown retracted, which is the position the bender assumes to allow a coil to be transferred to the reels, whereas the bender **35** is shown in the position the bender assumes during the preparation of the strip. As shown in FIG. **1***a*, a coil is adapted to be brought into the space between the benders **33** and **35** by a coil car **37** which includes a piston cylinder assembly **38** and a platform **39** including driven rolls **42** which support the coil.

Coils, as noted in comparing FIG. **1***a* with FIG. **3**, are adapted to be positioned on the coil car **37** so that their convolutions are either paid off in a direction away from the mill **10** or in a direction towards the mill. The coils may be brought to the coil car **37** in a number of different ways, in which connection FIG. **2** illustrates one preferred arrangement. In this regard, there is illustrated a conveyor **43** that runs parallel to the pass line of the mill **10** and which brings coils from a position towards the right to a position towards the left as one views FIG. **2**. Once they are positioned in front of the coil car **37**, they are lifted from the conveyor **43** by a ram **44** driven by a motor **45** which carries the coils from the conveyor to the car **37**. After this, the cylinder **38** of the car will be operated to lift the coil free from the ram **44** allowing the ram to be retracted by operating the motor **45**.

Referring again to FIG. **1***a*, it will be noted that the coil car **37** is provided with spaced-apart wheels **46** which are received in rails **47** and which allow the car to be moved between the first uncoiler, e.g., in a direction towards the left of the drawing, and to a second uncoiler, e.g., in a direction towards the right of the drawing. This second uncoiler **49** is mounted in the same horizontal plane with the first uncoiler **23** and consists of identical machines having a retractable collapsible payoff reel **52** which, as shown in FIG. **2**, includes a drive **53**. To mount the coils on the payoff reel **52**, as in the case of the reel **23**, the reel is allowed to retract transversely of the pass line of the mill and, for this reason, it is supported on a sliding base **54** and retracted over the base by piston cylinder assemblies **55**.

It may be well to indicate here some of the practical parameters of the carbon steel coils that are to be fed to the mill. With reference first to the coils that are fed continuously to the mill, the strip width may range between 28 and 80 inches having a thickness range of 0.060 to 0.100,and the coils will have a 72 -inch OD minimum and a 24 -inch ID. The coils that are fed directly to the mill will be made up of strip having a thickness range of 0.100 to 0.250 and an OD of 30 to 110 inches.

Directly above the second uncoiler, there is provided a retractable holding shelf assembly **56**, similar to the units **15** and **32**, which consists of a pair of holding shelves **57** arranged below a vertical guide roll assembly **58** and a cylinder-operated strip hold-down unit **62**. The shelves **57** are adapted to receive strip issuing from the three-roll straightener unit **35**. As in the case of the shelves **15** and **32**, the shelves **57** are also adapted to be retracted transversely by piston cylinder assemblies **63** so as to allow the strip to fall down into the guide unit **58** for feeding to the pinch roll unit **64** arranged at the delivery side of the shelves **56**. This pinch roll unit is similar to the pinch roll unit **21** and consists of a cylinder **65** for raising the top roll. FIG. **2** alone shows the drive **66** for the pinch roll unit.

Immediately following the pinch roll unit **64**, there is a leveller unit **67**. Between the leveller unit **67** and an up-cut shear **68**, there is a vertical guide roll assembly **69**. The unit **67** and the shear **68** are employed to prepare the front end of the coils for a welder **70**. It will be noted, however, that between the welder **70** and shear **68** there is provided a pinch roll unit **71** having a piston cylinder assembly **71***a* for raising its top roll to bring it into contact with the strip for driving the strip towards the welder **70**. Between the pinch roll unit **71** there is a second vertical guide roll assembly **72** im-

mediately adjacent the welder **70**. While there are various forms of welders that can be employed, one of the preferred forms is a flash welder which would include a draw-type flash trimmer and a corner notcher, which are well known in the industry, a good illustration being found in U.S. Pat. No. 3,249,732 which issued to J. H. Cooper et al. on May 3, 1966.

Leaving now FIG. **1***a* and FIG. **2** and looking at FIG. **1***b*, which is a continuation of FIG. **1***a*, it will be noted that following the welder **70** is the aforesaid notcher **73** which, as noted in the Cooper patent, has the function of removing any sharp corners between the two welded strips that may be present after welding. The strip, upon leaving the notcher **73** is delivered to the first of two similar tension units **74** that form part of the strip accumulator **75**. In FIG. **1***b*, there is shown what is referred to in the industry as a vertical tower-type strip accumulator. It will be appreciated, however, as indicated in FIG. **4***b*, that other types of accumulators may be employed. U.S. Pat. No. 3,386,638 which issued to W. A. Turner on June 4, 1968 is another illustration of a well-known type of vertical looping strip accumulator. As shown in FIG. **1***b*, the accumulator essentially consists of an upper row of rollers **76** that are nondriven and which consist of a number of similar rollers mounted in the same place over which the strip to be accumulated is caused to partly encircle and cooperate with a similar set of rollers **77** that are movable in a vertical direction from the lower full line position to the phantom line position, which is the feeding position of the rollers **77**. In the figure it will be seen that the rollers **77** are shown in their lowered position, which is the position they will assume in storing the maximum amount of strip.

The size of the accumulator, of course, is a function of the time necessary to prepare the succeeding coils and weld them without requiring the mill to slow down or stop. Accordingly, it may vary depending on the speed and other factors of a given mill and the technique and type and arrangement of equipment. The accumulator illustrated in FIG. **1***a* is adapted to store up to 3,000 feet of strip which, at a mill speed of 5,000 feet per minute and an entry speed of 1,000 feet per minute, will give approximately 3 minutes of time for joining succeeding strips and refilling the accumulator without causing interruption, but with normal acceleration and deceleration of the mill.

Returning now to FIG. **1***b*, after the first tension unit **74**, the strip is advanced to a pair of guide rollers **79** and, from there, to the first stationary rollers **76** from which point it takes a serpentine path around the respective rollers **76** and **77** until it issues from the accumulator **75** and is received by the second tension unit **74**. The rolls of the units **74** are differentially driven so as to provide a controlled tension on the strip while passing through the accumulator. Returning now to FIG. **1***a*, the strip is shown issuing from the accumulator **75** where it is received by a third tension bridle unit **82** and delivered to the first of the two guide rolls **30** of the free-looping station **29**.

In briefly explaining the operation of the equipment discussed in FIGS. **1***a* and **1***b* and FIG. **2**, which is the equipment employed when feeding strip to the mill in a continuous uninterrupted manner, coils are brought from the conveyor **43** to the coil car **37** in a direction so that, upon rotation by the rolls **42** of the car **37**, the strip is paid off by the rolls **42** in a direction towards the welder and opposite that of the mill. Let it be assumed at this point that a coil is in the process of being uncoiled from the second uncoiler **52** so that a second coil carried by the car **37** is fed through the straightener unit **35** and to the holding shelf **56**, after which the unit **35** is retracted. As soon as the first coil has been paid off the reel **52** and stored in the accumulator **75**, its trailing end is held in the welder **70** while the leading end of the second coil carried by the car **37** is allowed to drop down into the guide unit **58**, and the car is advanced in the direction of the uncoiler **52** to bring the coil into a position so that, when the reel **52** is caused to move transversely by the cylinder **55**, it will engage the center of the coil, thereby allowing the coil to be lifted from the car **37** on operation of the cylinder **38** of the car. After this happens, the reel **52** is rotated to advance the strip through the pinch roll **64**, the straightener unit **67** and into the snip shear **68** where its front end is cropped off. The leading end of the second coil is then brought to the welder **70** and welded to the trailing end of the previous coil.

Let it also be assumed that, in view of the length of the coils, the first coil has not been fed to the mill. In this event, upon welding the second coil, the payoff reel **52** is operated at its maximum speed to feed all but the trailing end of strip to the accumulator **75**. When sufficient strip is stored in the accumulator to allow the mill **10** to be operated in a continuous uninterrupted way, the strip will be fed out of the accumulator **75** to the mill and succeeding coils will be joined to each other in the manner just described. As the strip issues from the tension bridle **82**, it passes around the tension wheel **24** rotatably driven and supported by the reel **23**, as previously described.

As noted previously, there is some coil stock that it is desirable to roll as individual coils, in which regard the arrangement shown in FIG. **3** is employed. As shown, the wheel **24** has been removed from the reel **23** and the strip has been brought to the coil car **37** with its convolutions extending so that, when rotated by the rolls **42** of the coil car, it is spent off in a direction towards the mill. Assuming that the mill now has received a coil which is being unwound by the reel **23**, the leading end of the second coil is passed into the straightening unit **33** and onto the shelves **32** and held there for the complete unwinding of the first coil, during which time the unit **33** is retracted. Once this happens, the shelves **32** are retracted to allow the strip to drop down into the guide unit **18** and the pinch roll **22** is brought into place to urge the strip into the mill **10**. Should the next order of coils involve coils of the type that are advantageous to roll continuously, all that needs to be done is to place the wheel **24** back on the payoff reel **23**, and the equipment is made ready for the continuous operation.

Referring now to the second embodiment of the present invention as illustrated in FIGS. **4***a*, **4***b*, and **4***c*, this embodiment differs from the previous one only in the manner in which the coil is stored, the manner in which the coils are brought to the coil car and, lastly, in that the first uncoiler is used strictly as an uncoiler and a separate tension bridle is employed to impose a back tension on the strip immediately prior to its entry into

the mill. It will be noted that, aside from these differences, the equipment is similar to what was discussed with respect to the earlier embodiment. For this reason, various operations will not be given a second time.

Starting with the mill **85**, there is provided a snip shear **86** followed by a pinch roll **87** which receives strip from a first uncoiler in the form of a payoff reel **88**. Above the payoff reel **88**, there is provided a vertical strip guide unit **89** which is followed by two retractable three-roll benders **92** and **93** being separated by a distance to allow the positioning of a coil therebetween, as illustrated in FIG. **4***a*. Between the three-roll benders **92** and **93**, there is arranged a coil car **95** having a cylinder **96** which allows two driven rollers **97** to support and raise a coil vertically. The car is advanced to the left and right by a piston cylinder assembly **98** over rails **99**. In this manner, the coil may be brought to the payoff reel **88** arranged closest to the mill, or to a second payoff reel **102** arranged away from the mill and adapted to uncoil strip in a direction away from the mill. Above the payoff reel **102**, there is provided a vertical strip entry guide unit **103** which receives strip from a three-roll bender **93**. Following the unit **103** there is a pinch roll **104** followed by a leveller unit **105** which delivers strip to a shear **106**. On either side of the shear **106** there are vertical strip guiding units **107** and **108**. Following the unit **108** is a welder **109** from which continuous strip is delivered to a horizontal type accumulator **111** after it passes through a guide unit **112** arranged between the accumulator **111** and the welder **109**.

The accumulator **111** includes the first of two tension bridles **113** above the first of which there are arranged a number of in-line vertically disposed rolls **114** around which strip is adapted to be wound and accumulated within the accumulator **111**. A second series of rolls **115** of the accumulator are carried on movable cars **116**, the car being connected to cables **117** which, in turn, are connected to winches **118**, the winches being provided with a control torque in the customary manner. It is noted that the cars **116** are adapted to move in a horizontal direction towards the rolls **114** and, through this movement, a minimum to maximum amount of strip is stored in the accumulator **111**. At the exit side of the accumulator **111**, there is provided the second tension unit **113**, the drives of the two units **113** being controlled so as to control the tension on the strip in the accumulator. The strip is delivered to a tension unit **119** arranged adjacent the mill **85** shown in FIG. **4***a*, after which the strip is entered into the mill.

Turning now to FIG. **4***c* which illustrates the conveyor system for bringing the coils to the car **95**, in this regard a conveyor **120** is arranged at the drive side of the mill **85** and advances the coils in the direction of the coil car **95**, the coils being arranged on the conveyor so that, when received by the car, their convolutions will be in the proper relationship with respect to the direction in which they are supposed to be unwound. That is to say, if they are to be unwound as individual coils, the convolutions will run in a counterclockwise direction, and, if they are to be unwound as continuous coils, they will be unwound in a clockwise direction. The coils are removed from the conveyor **120** by a traveling horn **121** mounted on the operating side of the mill and moved over parallel tracks **122** by a piston cylinder assembly **123**. Once the horn **121** has brought a coil to a position over the coil car, the cylinder **96** of the car is operated to lift the coil, thus allowing the horn **121** to be retracted.

Coming now to the last embodiment of the present invention, which is illustrated in FIG. **5**, this arrangement is designed to feed continuous coils to the mill and makes no provision for feeding the coils separately. In this regard, the rolling mill has not been shown, nor the welder or accumulator, these elements being arranged in the same positions illustrated in the previous two embodiments. As shown in FIG. **5**, there is provided a conveyor **125** which brings coils on a platform **126** to the uncoiling station which consists of two retractable payoff reels **127** and **128**. Each reel is serviced by an elevator **129** which includes a piston cylinder assembly **131** by which the coils are taken from the conveyor **125** and placed in a proper axial position for reception by the payoff reels, which, as noted previously, are movable in a transverse direction. The coils, as shown in FIG. **5**, are uncoiled in a direction away from the mill and for each reel **127** and **128** there is provided a pinch roll unit **132** followed by a leveller **133**, after which there is a shear **134** followed by individual pinch roll units **135**.

The two strips assume a common pass line and are fed through a guide **136** to the second shear **137**. FIG. **5** also illustrates the tension bridle **138** similar to the bridle **119** shown in FIG. **4***a*. The operation of the arrangement of FIG. **5** and the various steps of its method are similar to what has been previously described with respect to the earlier embodiments as to coils being fed continuously to the mill.

In accordance with the provisions of the patent statutes, I have explained the principle and operation of my invention and have illustrated and described what I consider to represent the best embodiment thereof.

I claim:

1. In an apparatus for continuously feeding strip to a rolling mill, comprising:

a first uncoiler arranged at the entry side of said mill and in line with said mill,

a second uncoiler arranged at the entry side of said mill in line with said mill at a distance further away from said mill than said first uncoiler,

a strip accumulator arranged on the side of said second uncoiler opposite said mill and in line with said mill,

a strip joiner arranged between said second uncoiler and said strip accumulator for receiving strip from said first and second uncoilers,

said accumulator including means for storing a predetermined amount of strip before the strip is paid out to said mill sufficient to permit the mill to be operated in a continuous manner while succeeding coils are uncoiled and joined together, and

means for feeding the strip from said accumulator to said mill.

2. In an apparatus according to claim **1**, including a combination tension bridle and third uncoiler arranged in line with the mill between the mill and said first uncoiler,

means for causing the strip to be directed from said strip feeding means to said combined tension bridle and third uncoiler,

said combined tension bridle and third uncoiler including means for selectively rotatably supporting a first tension roller and a coil,

means for driving said supporting means in which, when used as a tension bridle, the first tension roller operates to subject the strip to a back tension and, when operated to uncoil a coil, the coil is unwound in the direction of the mill,

said first uncoiler comprising a coil carrying car, and

means for moving said car from a coil receiving position to each of said second and third uncoilers.

3. In an apparatus according to claim 2 wherein said second and third uncoilers include payoff reels and separate means for retracting said reels away from said in-line relationship with said mill,

means for moving said car to a position in front of said reels when said reels are retracted so that said reels can be caused to support coils.

4. In an apparatus according to claim 2 including conveyor means arranged on the drive side of said mill for bringing coils to said car and means for transferring coils from said conveyor means to said car.

5. In an apparatus according to claim 2 wherein said strip directing means is constructed and arranged to cause said strip to pass to said third uncoiler in a noninterfering manner with reference to said coil receiving position of said car, and

means for allowing a free loop to be formed in said strip passing from said strip directing means to said third uncoiler when employed as a tension means and wherein said loop is formed directly beneath said third uncoiler.

6. In an apparatus according to claim 2 including:

separate coil preparing means, one arranged to receive strip from a coil uncoiled by said car, when in said coil receiving position, in the direction of said mill, and the other arranged to receive strip from a coil uncoiled by said car, when in said coil receiving position, in the direction of said accumulator.

7. In an apparatus according to claim 6 including:

separate means for retracting said coil preparing means to permit partially uncoiled coils to be transferred by said car to said second and third uncoilers.

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