

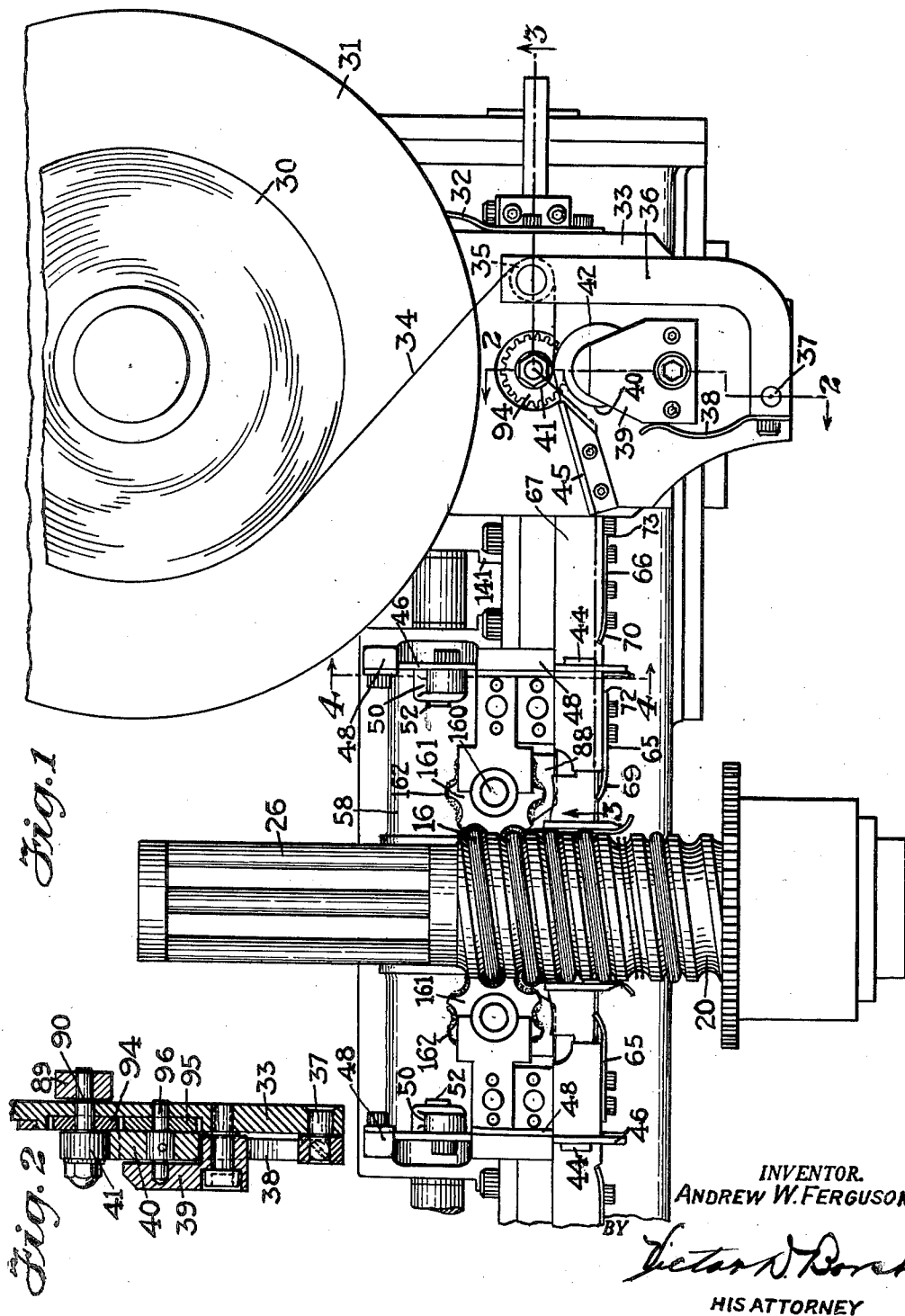
Nov. 1, 1949

A. W. FERGUSON
COIL BINDING MACHINE

2,486,832

Filed April 15, 1947

7 Sheets-Sheet 1



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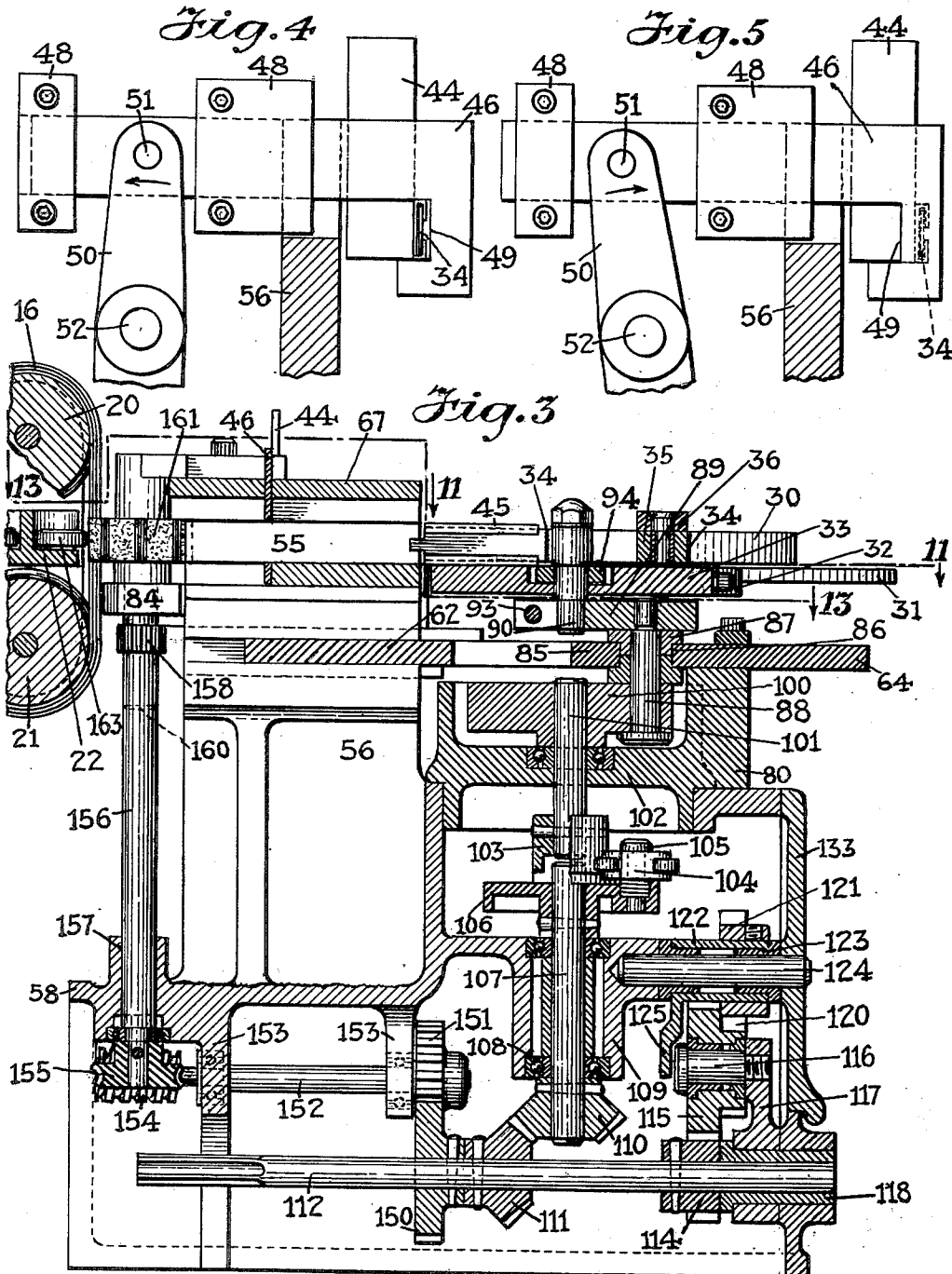
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7 Sheets-Sheet 2



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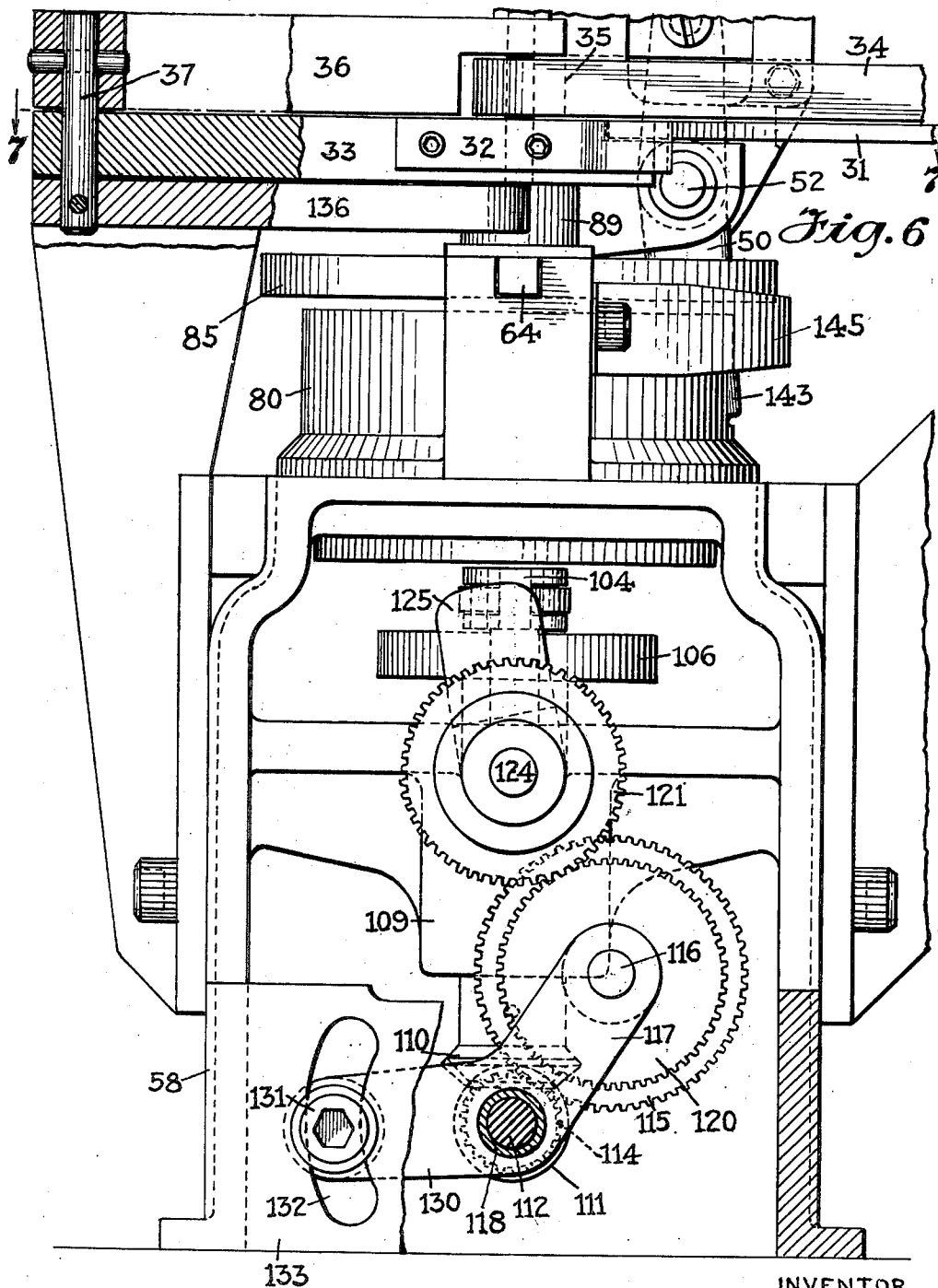
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Fig. 7

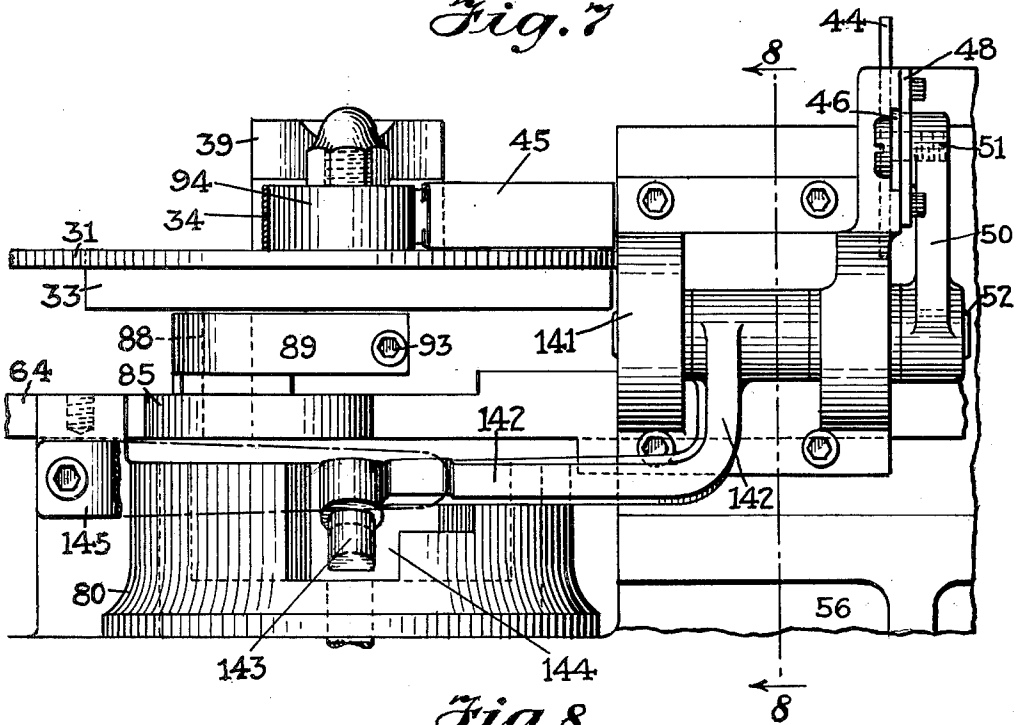
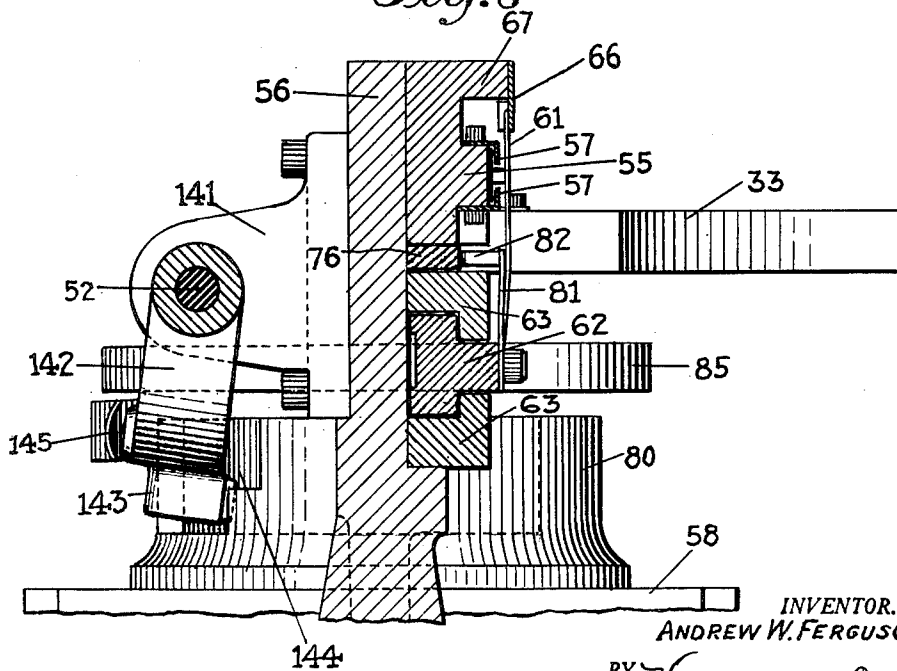


Fig. 8



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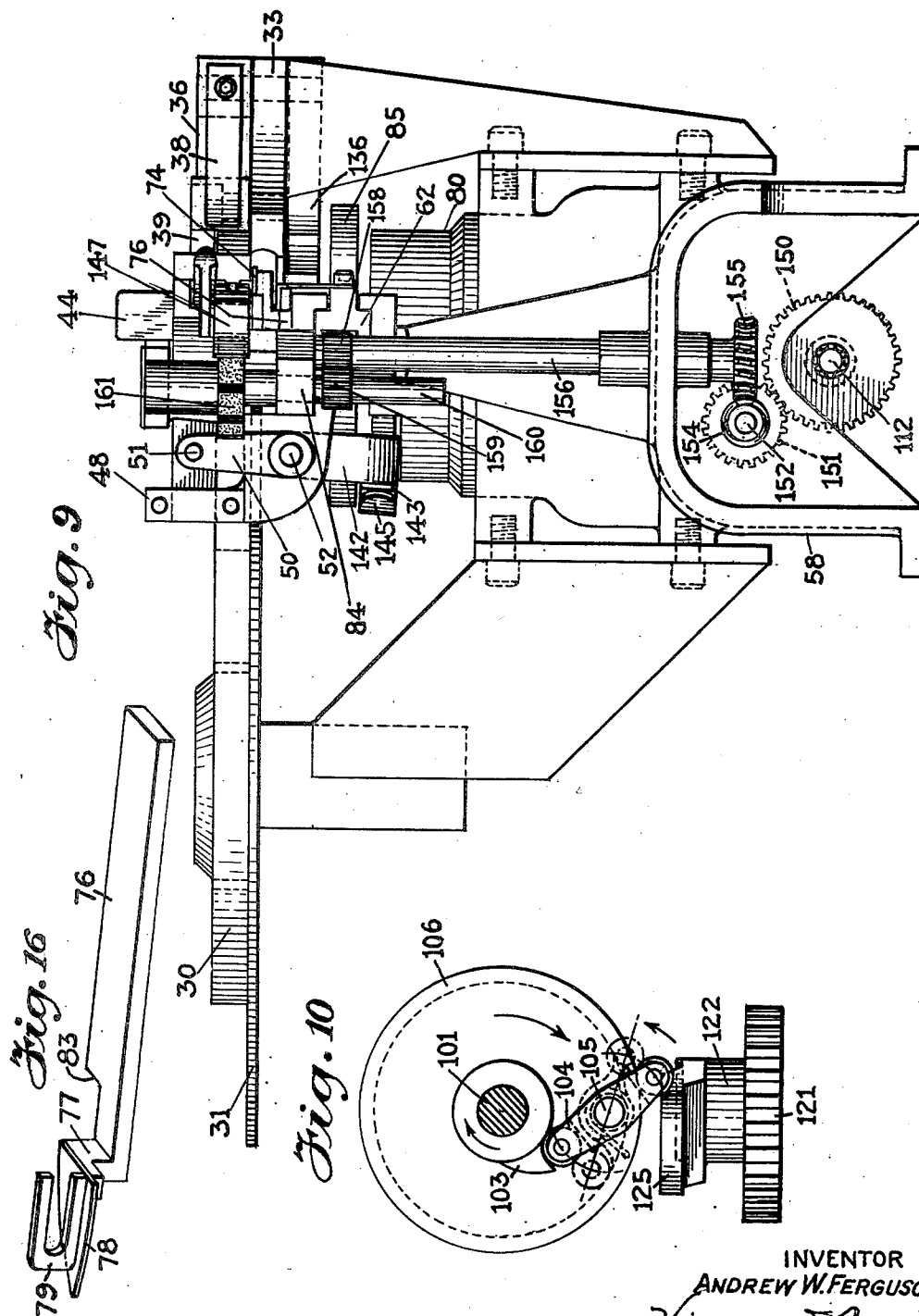
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7 Sheets-Sheet 5



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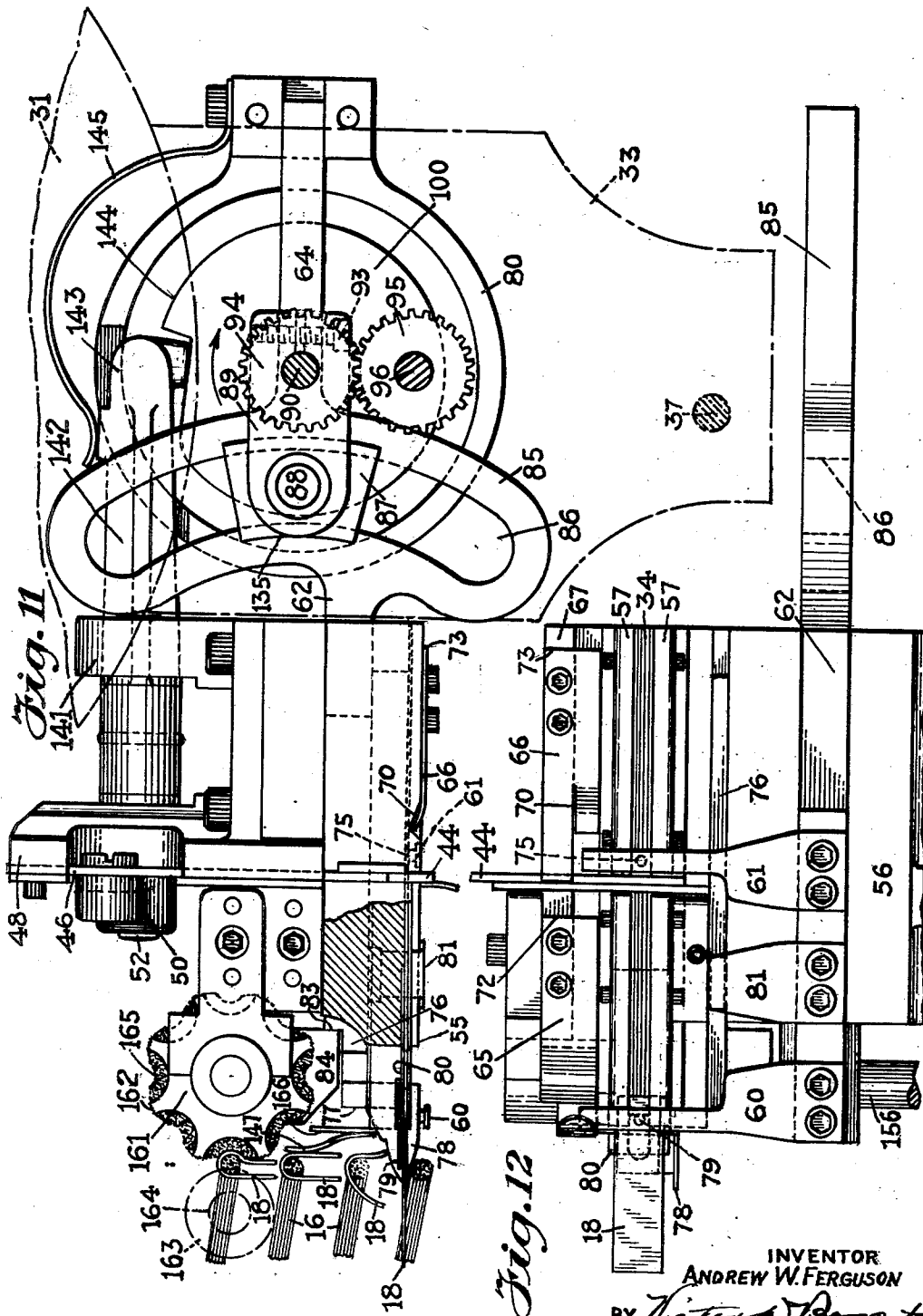
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COIL BINDING MACHINE

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7 Sheets-Sheet 6



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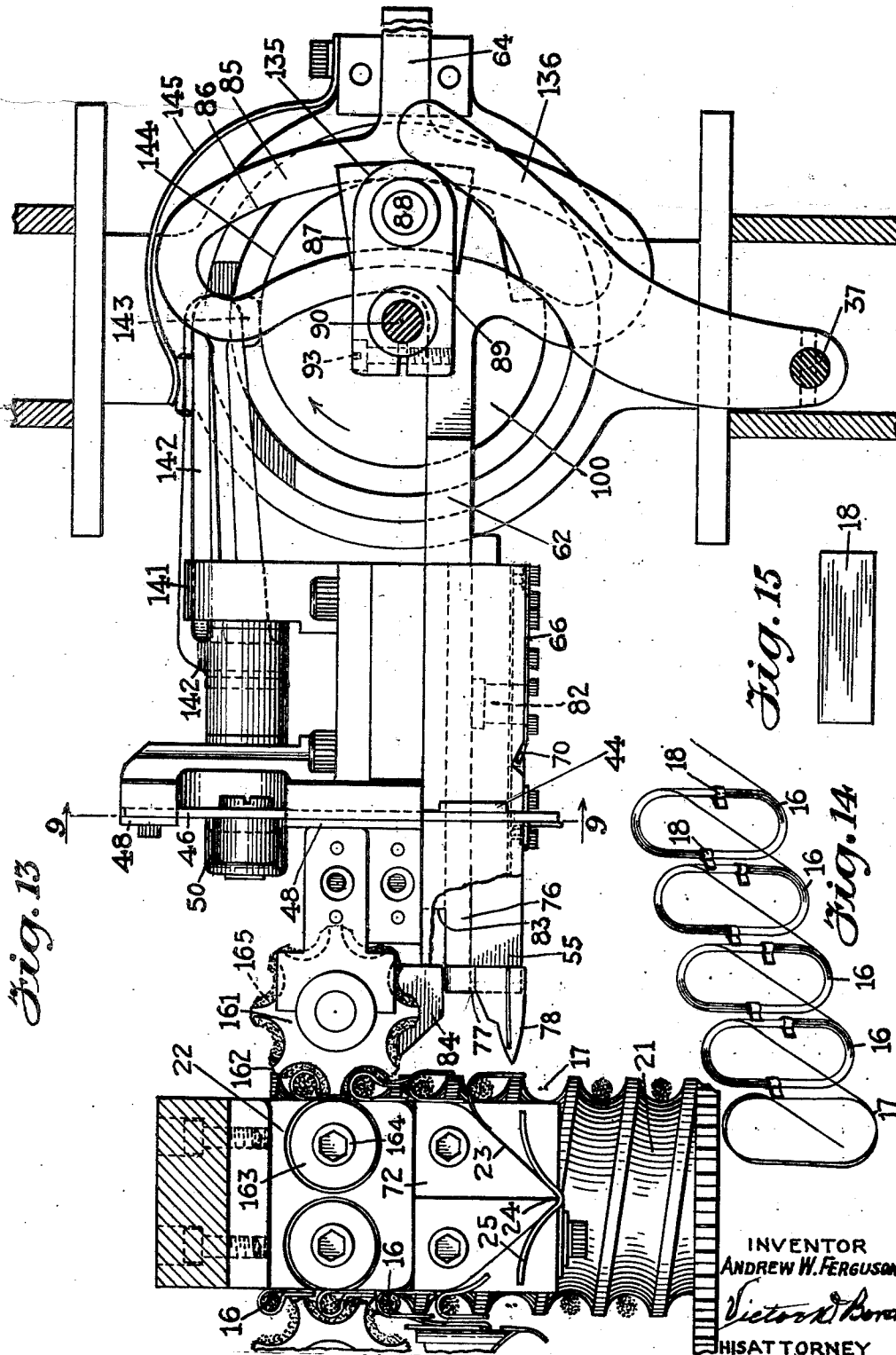
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UNITED STATES PATENT OFFICE

2,486,832

COIL BINDING MACHINE

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Application April 15, 1947, Serial No. 741,635

11 Claims. (Cl. 216—25)

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This invention relates to coil binding machines and more particularly to a machine for binding distributed field coils for electric motors or the like as they are wound and delivered from a winding machine of the type shown in my co-pending application, Serial No. 716,262, filed December 14, 1946, now Patent No. 2,445,109, granted July 13, 1948, for Coil winding machines.

The above mentioned application discloses a winding machine in which coil sections are successively wound and are advanced in spaced relationship to a discharge point. The machine provides for winding a required number of coil sections which are followed by a winding of one or more turns which may be severed to form the connecting leads, after which the next group of coil sections is wound and advanced in the same manner.

In accordance with the present invention the binding machine is adapted to apply a temporary binding to the various coil sections as they are advanced from the winding machine. Such binding, however, is omitted from the intermediate windings of one or more turns which separate the groups of coil sections.

An object of the invention is to provide a machine of the above type which automatically applies a temporary binding to the selected coil sections as they are wound and advanced from a winding machine so that the sections retain their form until they are applied to the armature or field as the case may be of an electric motor or the like.

Another object is to provide a mechanism of the above type which may be readily adjusted in accordance with the number of coil sections which are to be bound in each group.

Another object is to provide a mechanism of the above type which is adapted for operation in the commercial winding of electrical coils.

Various other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

Although the novel features which are believed to be characteristic of this invention are pointed out more particularly in the claims appended hereto, the nature of the invention will be better understood by referring to the following description, taken in connection with the accompanying drawings in which a specific embodiment thereof has been set forth for purposes of illustration.

In the drawings:

Fig. 1 is a top plan view of a binder for applying a temporary binding to a series of advancing coils, showing a portion of the paper roll support;

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Fig. 2 is a partial section taken on the line 2—2 of Fig. 1;

Fig. 3 is a longitudinal vertical section taken along the line 3—3 of Fig. 1;

Fig. 4 is a partial section on an enlarged scale taken on the line 4—4 of Fig. 1 showing the cutting knife extended;

Fig. 5 is a similar section showing the cutting knife retracted;

Fig. 6 is an end elevation of the machine, partly in section, and with a part of the end plate removed, looking from the right in Fig. 1.

Fig. 7 is a partial rear elevation showing the knife operating mechanism;

Fig. 8 is a section taken on the line 8—8 of Fig. 7;

Fig. 9 is an end elevation of the machine looking from the left in Fig. 1;

Fig. 10 is a detail view of the interrupter mechanism;

Fig. 11 is in part a top plan view and in part a horizontal section taken on the line 11—11 of Fig. 3 with the top plate omitted;

Fig. 12 is a detail view of the paper feed mechanism;

Fig. 13 is a horizontal section taken on the line 13—13 of Fig. 3;

Fig. 14 is a perspective view of a group of coil sections as bound by the present machine;

Fig. 15 is a detail view of a severed binding strip, and

Fig. 16 is a perspective view of the spreader.

The purpose of the present machine will be understood from Fig. 14 which shows a plurality of coil sections 16 which have been successively wound by suitable means, for example such as the machine shown in my co-pending application above referred to, and are followed by a winding 17 comprising a pair of turns which are adapted to constitute the connecting leads and may be severed to separate the group of sections 16 from the succeeding groups of sections. Each section 16 is shown as bound by strips 18 which are positioned about diametrically opposite legs of the coil sections. The strips 18 comprise a flexible ribbon such as paper having a pressure sensitive adhesive thereon and so constructed that the ends of the strips are adhesively joined together by the application of pressure. The strips 18 hold the coil sections formed until they are applied to the field or armature of the device on which they are to be wound. After the coil sections are finally assembled the strips 18 are removed.

The present machine is adapted to apply and

seal the strips 18 to the various coil sections as they successively advance from the winding machine.

Referring to Figs. 1, 3, 11 and 13, a plurality of coil sections 16 are shown as they are advanced in spaced relationship by upper and lower feed screws 20 and 21 which form a part of the discharge end of a coil winding machine which may be of the type shown in my co-pending application above referred to. The sections 16 advance on opposite sides of a guide 22 (Figs. 3 and 13) which is provided with front surfaces 23 terminating in a nose 24 carrying a spring guide member 25 which is adapted to position the coil sections to advance along the sides of the guide 22. Rods 26 (Fig. 1) are provided for supporting the coil sections after they are bound and discharged from the feed screws 20 and 21.

A binding machine is positioned on each side of the guide 22 to apply the binding strips 18 to the opposite legs of the coil sections 16 as they are advanced. The machine positioned to apply the binding to the right side of the advancing coil section is shown and described herein in detail. It is to be understood that a similar but reversed machine is mounted on the opposite side of the guide 22 to apply the binding to the left side of the advancing coil sections.

Referring to Fig. 1 a roll 30 of pressure sensitive tape from which the binding strips 18 are to be cut is shown as positioned on a supporting disc 31. A spring brake member 32 attached to a top plate 33 bears against the periphery of the disc 31 to restrain the rotation thereof as required. The tape 34 from the roll 30 is shown as feeding around a slack-providing pulley 35 mounted on a movable arm 36 which is pivoted at 37 and is provided with a spring 38 bearing against a stationary plate 39 to hold the arm 36 normally in retracted position.

From the slack-providing pulley 35 the tape 34 passes between a pair of feed pulleys 40 and 41 (Figs. 1 and 2). The feed pulley 40 is provided with a segmental surface 42 which holds the tape 34 against the pulley 41 for feeding the tape during the portion of each revolution which corresponds to the extent of the segmental surface 42. During the remainder of each revolution the tape 34 is released and remains stationary.

From the feed pulleys 40 and 41 the tape 34 is fed through a guide 45 to a movable cutting knife 46 (Figs. 1, 4, 5 and 7) which cooperates with a stationary knife 44 to sever the tape into the proper lengths of binding strip 18. The knife 46 is shown as comprising a blade which is slidably mounted in brackets 48 and is provided with a cutting edge 49. The blade 46 is reciprocated by means of a lever 50 which is pinned to the blade by a pin 51 and is attached to a shaft 52.

The tape 34 is fed from the guide 45 to a channel formed by a pair of guides 57 (Figs. 8 and 12) attached to a flange 55 (Figs. 3 and 8) secured to a plate 56 forming a part of the frame 58.

The tape is advanced in the guides 57 by means of a pair of fingers 60 and 61 (Figs. 8, 11 and 12) which are mounted on a reciprocating bar 62 slidable in a channel formed by guides 63 (Fig. 8) attached to the plate 56. The fingers 60 and 61 engage the tape on opposite sides of the cutting knife 46 for feeding the tape 34 to the knife and for advancing the severed strip 18 therefrom. A pair of stationary guide strips 65 and 66 are mounted on a flange 67 attached to the plate 56 and are provided with inturned front ends 69 and 70, respectively, which are positioned to engage

the fingers 60 and 61, respectively, on their return strokes and lift them from the tape. When the fingers 60 and 61 have been retracted past the rear edges 72 and 73, respectively, of the strips 65 and 66, they are free to snap against the tape and to feed the tape on their feed strokes during which the upper ends of the fingers 60 and 61 advance inside of the guide strips 65 and 66. The fingers 60 and 61 may be provided with suitable pins 74 and 75, respectively, to engage the tape between the guide strips 57. In the position shown in Fig. 12 a severed strip 18 has been advanced into the path of the oncoming coil section.

A spreader slide 76 (Figs. 11, 13 and 16) is mounted to slide on the upper guide 63 and carries a bracket 77 to which a horizontal plate 78 is attached. The plate 78 is shaped to extend between successive coil sections 16 to spread the same to receive the strip 18. The plate 78 also carries a vertical fin 79 which supports the projecting strip 18. A guide plate 80 is also attached to the flange 55 to support the severed strip 18.

The slide 76 is actuated by a spring finger 81 which is mounted on the bar 62 and carries a flange 82 which engages the slide 76. The slide 76 is provided with a shoulder 83 (Figs. 11, 13 and 16) which engages a stop plate 84 to limit the outward movement of the slide and the bracket 77 engages the flange 55 to limit the retraction of the slide. The spreader is thus advanced and retracted only at the beginning of the feed and return strokes of the bar 62. After the slide 76 engages its stop members, the spring member 82 slides thereover during the remainder of the stroke of the bar 62.

The bar 62 carries a head 85 having an arcuate slot 86 therein (Figs. 3, 11, 12 and 13) and terminates in a guide bar 64. A slide block 87 is adapted to slide in the slot 86 and is pivoted by a pin 88 to a disc 100 mounted on a drive shaft 101. The pin 88 also carries a crank 89 which is attached by a clamping screw 93 to a pin 90, concentric with the shaft 101. The pin 90 carries a gear 94 (Figs. 1, 2 and 3), meshing with a gear 95 (Fig. 2) on a shaft 96 to which the feed roller 40 is attached. The feed roller 41 is journaled for free rotation on the shaft 90.

The shaft 101 is supported in a plate 102 (Fig. 3) forming a part of the frame 80. The shaft 101 carries a toothed member 103 (Figs. 3 and 10) which is normally engaged by pawl 104 pivotally mounted on a pin 105 attached to a disc 106. The disc 106 is mounted on a shaft 107 which is supported in bearings 108 in a boss 109 forming a part of the frame 58. The lower end of the shaft 107 carries a bevel gear 110 meshing with a bevel gear 111 mounted on a horizontal shaft 112 to which power is supplied by suitable means not shown.

The shaft 112 carries a spur gear 114 (Figs. 3 and 6) meshing with a gear 115 mounted on a pin 116 carried in an arm 117 which is journaled by a bushing 118 to swing about the shaft 112. The gear 115 carries a pinion 120 meshing with a gear 121 (Figs. 3, 6 and 10) attached to a sleeve 122 journaled on bearings 123 about a horizontal pin 124. The sleeve 122 carries an arm 125 which is adapted to engage the pawl 104 for holding the same out of engagement with the member 103. The arm 117 is provided with an extension 130 (Fig. 6) carrying a locking screw 131 extending through an arcuate slot 132 in the end plate 133 of the machine, for permitting the extension 130 and arm 117 to be adjusted in ac-

cordance with the size of the gears 120 and 121. These gears are changeable and are selected with the desired ratio for causing the arm 125 to engage the pawl 104 for releasing the member 103 after a predetermined number of actuations of the bar 62. The purpose of the coupling member 103 and the release mechanism above described is to prevent the binding strip 18 from being applied to the connecting loop 17 between the coil sections 16.

The crank 89 is provided with a cam surface 135 (Figs. 6, 11 and 13) which engages a finger 136 mounted on the shaft 37 which actuates the take-up arm 36.

The knife actuating shaft 52 is journaled in brackets 48 and 141 (Figs. 7, 8, 11 and 13). The shaft 52 carries an arm 142 having a head 143 which bears against the cam surface 144 of the disc 100 and is held against the surface 144 by a spring 145.

The drive shaft 112 also carries a spur gear 150 (Figs. 3 and 9) meshing with a gear 151 carried on a shaft 152 which is journaled in brackets 153 attached to the frame 58 and carries a worm 154 meshing with a worm gear 155 carried by a vertical shaft 156 journaled in bore 157 on the frame 58. The shaft 156 at its upper end carries a spur gear 158 meshing with a gear 159 on a shaft 160 carrying a rotating presser wheel 161 (Figs. 1, 3, 9, 11 and 13) having fingers 162 to press the strip 18 for sealing against a rotatable anvil 163 (Fig. 13) which is journaled on a pin 164 attached to the guide 22. The wheel 161 has recesses 165 lined by a soft material to receive the coil sections 16 as they advance past the anvil 163. A guide spring 147 is attached to a flange 166 carried by the lower guide strip 57 to guide the coil sections 16 to the wheel 161.

In the operation of this device the drive shaft 112 is driven in synchronism with the feed rollers 20 and 21 which feed the coil section 16 from the winding machine. The rate of drive is such that the bar 62 is reciprocated by the crank 89 once for each coil section 16 that advances past the guide 22. When the bar 62 has reached a predetermined point the knife 46 is actuated by the cam surface 144 of the disc 100 to sever the strip 18. When the bar 62 advances the fingers 60 and 61 advance both the severed strip 18 and a new length of the unsevered tape 34 along the guide 57 and cause the severed strip 18 to project between two adjacent coil sections 16. At the same time the spreader 78 advances into the space between two adjacent coil sections to space the same to receive the strip 18. The severed strip is then carried along by the advancing coil section 16 as indicated in Figs. 11 and 13 to form a loop with the two ends trailing. When this loop reaches the pressure wheel 161, the fingers 162 thereof engage the two trailing ends of the strip and press the same against the anvil 163 thereby effecting a pressure seal.

By changing the gearing and timing the strips 18 may be increased in length and so fed that a projecting end of each strip will contact and adhere to the binding strip on the following coil, thus holding the coils in a group.

At each rotation the arm 125 engages the pawl 104 to disengage the same from the tooth 103 and interrupt the drive of the shaft 101 and thereby stop the operation of the arm 62, the knife 46 and the feed of the tape. The gears 115 and 120 are so selected that this occurs when a connecting loop 17 is in the sealing position

and prevents a binding strip from being attached to this loop.

In the embodiment shown in Fig. 14 the connecting loop 17 appears after each group of four sections 16. Hence the gear ratio is so selected that the arm 125 makes one revolution for each five revolutions of the shaft 107 and disconnects the pawl 104 during each fifth revolution of the shaft 107. However, various other gear ratios may be readily obtained by changing the gears 115 and 120 and adjusting the position of the arm 130 accordingly.

The arm 36 tends to maintain a uniform rotation of the roll 30 and disc 31 and feeds out the slack in the tape 34 during the intervals between feed strokes of the fingers 60 and 61 and the feed roller 40.

It is to be understood that a similar mechanism applies the binding strips to the lefthand portion of the coil section 16 so that the coil sections are finally discharged onto the supporting rods 26 in bound condition as shown in Fig. 14.

Although a specific embodiment of the invention has been shown, it is to be understood that various changes and modifications may be made therein as will be readily apparent to a person skilled in the art, and that the invention is only to be restricted in accordance with the scope of the following claims.

What is claimed is:

1. A machine for applying a binding tape to one side of a wound annular coil or the like, comprising a support carrying a roll of binding tape having pressure sealing characteristics, feed mechanism connected to advance such tape from said roll, a cutting knife, actuating means for said knife timed to sever successive lengths of said tape for binding, means for advancing said annular coil axially, feed means advancing the severed length of tape into the path of the advancing coil, guide means guiding said coil to pick up said severed length and to carry the same along as a loop with trailing ends, and presser means to apply pressure to said trailing ends for sealing said loop.

2. A machine for applying a binding tape to one side of a wound annular coil or the like, comprising a support carrying a roll of binding tape having pressure sealing characteristics, feed mechanism connected to advance said tape intermittently from said roll, a cutting knife, actuating means for said knife synchronized with said feed mechanism to sever successive lengths of said tape for binding, means for advancing said annular coil axially, reciprocating feed means advancing said severed length into the path of the advancing coil, guide means guiding said coil to pick up said severed length and to carry the same along as a loop with trailing ends, and presser means synchronized with the advance in said coil to apply pressure to said trailing ends for sealing said loop.

3. A machine for applying a binding tape to one side of a wound annular coil or the like, comprising a support carrying a roll of binding tape having pressure sealing characteristics, feed mechanism connected to advance said tape intermittently from said roll, a cutting knife, actuating means for said knife synchronized with said feed mechanism to sever successive lengths of said tape for binding, means for advancing said annular coil axially, reciprocating feed fingers advancing said severed length of tape into the path of the advancing coil, guide means to guide said coil to pick up said severed length

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and to carry the same along as a loop with trailing ends, and rotating presser wheels on opposite sides of said coil arranged to apply pressure to said trailing ends for sealing said loop.

4. A machine for applying a binding tape to one side of a wound annular coil or the like, comprising a support carrying a roll of binding tape having pressure sealing characteristics, feed means connected to advance said tape from said roll, a cutting knife, actuating means for said knife timed to sever successive lengths of said tape for binding, means for advancing said annular coil axially, feed means advancing said severed length of tape into the path of the advancing coil, guide means guiding said coil to pick up said severed length of tape to carry the same along as a loop with trailing ends, presser means to apply pressure to said trailing ends for sealing said loop, driving mechanism for said feed means and said knife actuating means, and timed means to interrupt said driving mechanism after a predetermined number of successive sealing operations.

5. A machine for applying a binding tape to one side of a wound annular coil or the like, comprising a support carrying a roll of binding tape having pressure sealing characteristics, feed means connected to advance said tape from said roll, a cutting knife, actuating means for said knife timed to sever successive lengths of said tape for binding, means for advancing said annular coil axially, feed means advancing said severed length of tape into the path of the advancing coil, guide means guiding said coil to pick up said severed length of tape to carry the same along as a loop with trailing ends, presser means to apply pressure to said trailing ends for sealing said loop, driving means for said feed means and said knife actuating means including a releasable clutch, and timed means driven by said drive means to release said clutch periodically after each predetermined number of successive sealing operations.

6. A machine for applying a binding tape to one side of a wound annular coil or the like, comprising a support carrying a roll of binding tape having pressure sealing characteristics, feed means connected to advance said tape from said roll, a cutting knife, actuating means for said knife timed to sever successive lengths of said tape for binding, means for advancing said annular coil axially, feed means advancing said severed length of tape into the path of the advancing coil, guide means guiding said coil to pick up said severed length of tape to carry the same along as a loop with trailing ends, presser means to apply pressure to said trailing ends for sealing said loop, driving means for said feed means and said knife actuating means including a releasable pawl, a rotating member adapted to engage said pawl at a selected point during each revolution for releasing said driving means, and means driving said rotating member at a selected ratio to the actuation of said feed means for releasing said pawl after selected numbers of actuations of said feed means.

7. In a machine for cutting and feeding strip material, a guide for said strip material, a pair of spaced feed fingers engaging the material in said guide, means causing said fingers to reciprocate, a spring guide positioned to engage said fingers during the return stroke thereof and to hold said fingers out of contact with said material whereby said fingers feed said material along said guide intermittently, a cutting knife dis-

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posed between said fingers and means synchronized with the movement of said fingers for actuating said knife during the return stroke of said fingers.

8. A machine for applying binding tape to a succession of advancing wound annular coils or the like, comprising a support carrying a roll of binding tape having pressure sealing characteristics, feed means connected to feed said tape intermittently from said roll, a cutting knife, actuating means for said knife synchronized with said feed means to sever successive lengths of said tape for binding, conveyor means advancing a succession of said annular coils in parallel spaced relationship, reciprocating feed fingers synchronized with the movement of said conveyor means to advance said severed lengths into the path of each advancing coil, spreader means synchronized with said feed fingers to space successive coils to receive said length of binding tape therebetween, guide means guiding said coils to pick up said severed lengths and to carry the same along in a loop with trailing ends, and presser means engaging said trailing ends to apply pressure thereto for sealing said loops.

9. A machine for applying binding tape to a progression of wound annular coils, comprising a pair of spaced feed rollers having means to advance a succession of coils in spaced parallel relationship, a strip of pressure-sensitive sealing tape, feed means to intermittently advance said tape, a cutting knife synchronizing said feed means to sever said tape into sealing lengths, means advancing said severed lengths into the space between successive coil sections, guide means cooperating with said coil sections to cause the same to pick up said tape in a loop and advance same with trailing ends, presser means synchronized with the advance in said coils and arranged to enter the space between successive coils to apply pressure to said trailing ends for effecting a seal, and means interrupting the operation of said feed means after each predetermined number of successive operations thereof.

10. A machine for applying a binding tape to one side of wound annular coils or the like, comprising a rotatable disc carrying a roll of binding tape having pressure sealing characteristics, a tape guide, rotating feed rollers connected to advance said tape from said roll to said guide, a cutting knife positioned to sever successive lengths of said tape in said guide for binding, conveyor means advancing said annular coils linearly, reciprocating feed fingers advancing the severed lengths of tape along said guide into the path of the advancing coils, guide means guiding said coils to pick up said severed lengths of tape and to carry the same along in a loop with trailing ends, and presser means synchronized with the advance of said coil to apply pressure to said trailing ends for sealing said loops.

11. In a machine for applying a binding tape to one side of wound annular coils or the like, comprising a support carrying a roll of binding tape having pressure sealing characteristics, feed mechanism connected to advance said tape intermittently from said roll, a cutting knife, actuating means for said knife synchronized with said feed mechanism to sever successive lengths of said tape for binding, conveyor means advancing said annular coil linearly, a tape guide, reciprocating feed means advancing said severed lengths of tape along said guide into the path of the advancing coils, a movable tape support, means

reciprocating said support with said feed means to support the advanced severed length of tape, guide means guiding said coil to pick up said severed lengths and to carry the same along in a loop with trailing ends, and presser means syn-
 5 chronized with the advance in said coils to apply pressure to said trailing ends for sealing said loops.

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