Sept. 20, 1960 F. A. GARMAN ET AL 2,953,239

ROD BUNDLE UNLOADER

Filed July 23, 1957 6 Sheets-Sheet 1

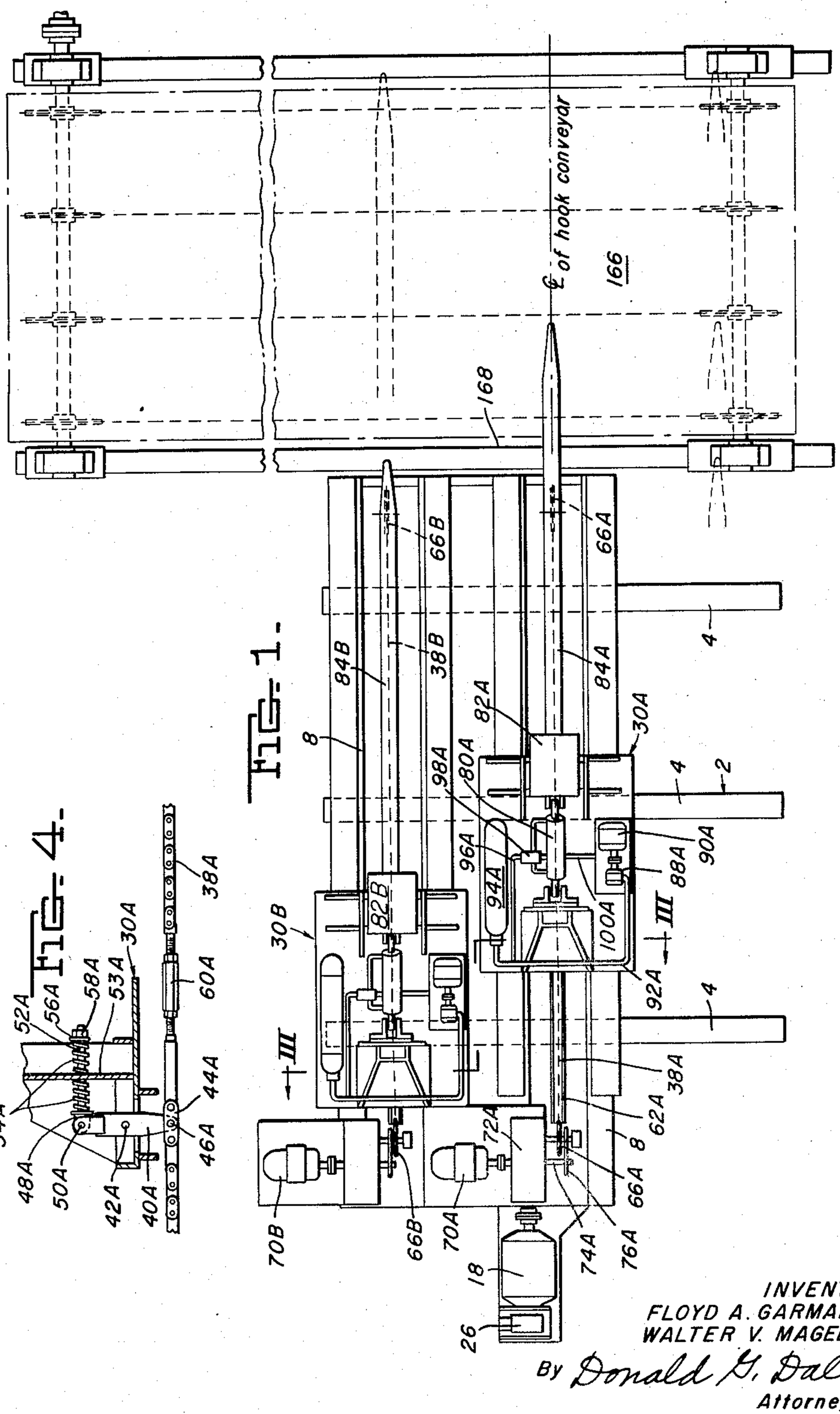

FIG. 1.

FIG. 4.

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ROD BUNDLE UNLOADER

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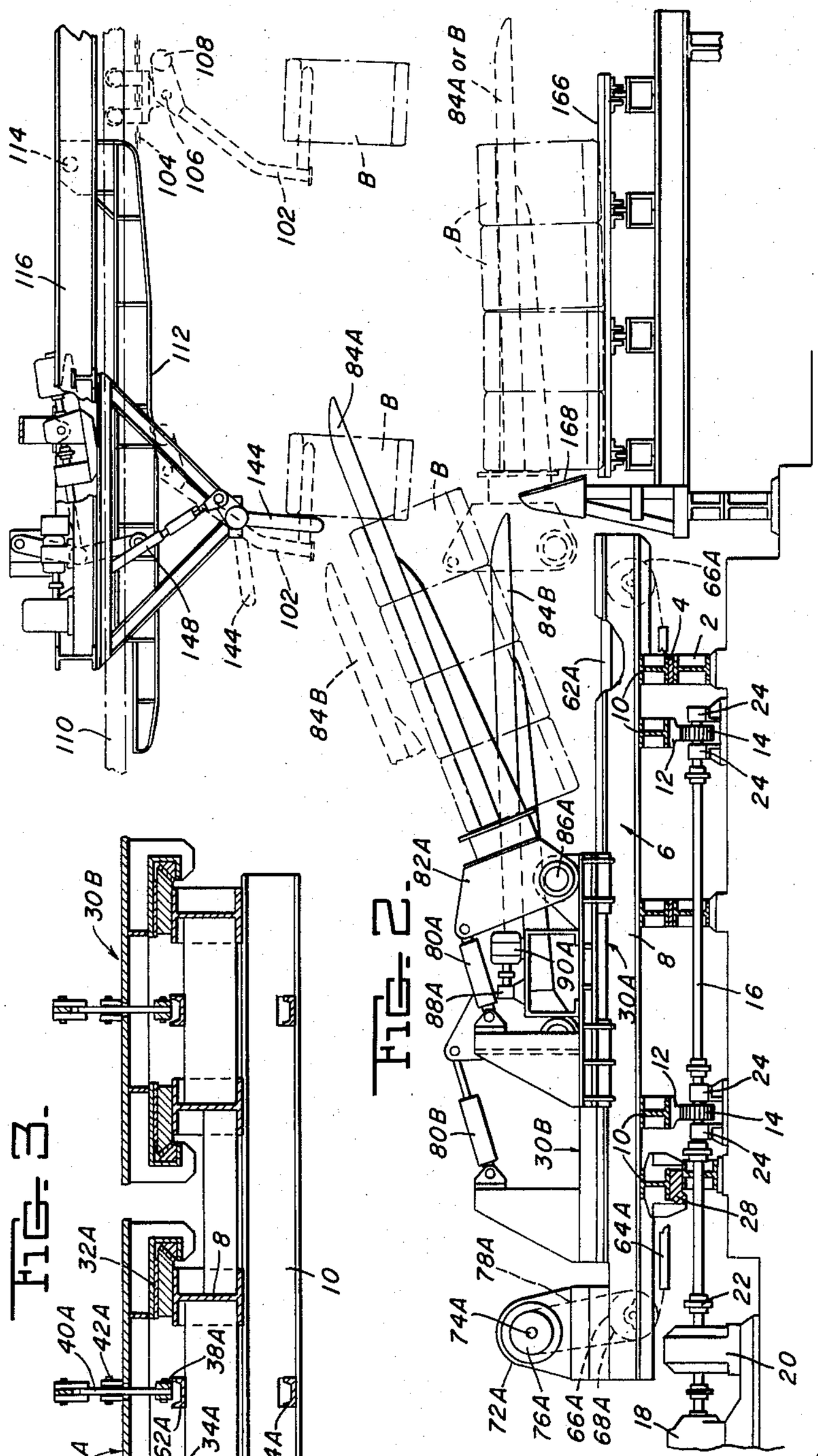

FIG. 3.

FIG. 2.

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FIG. 5.

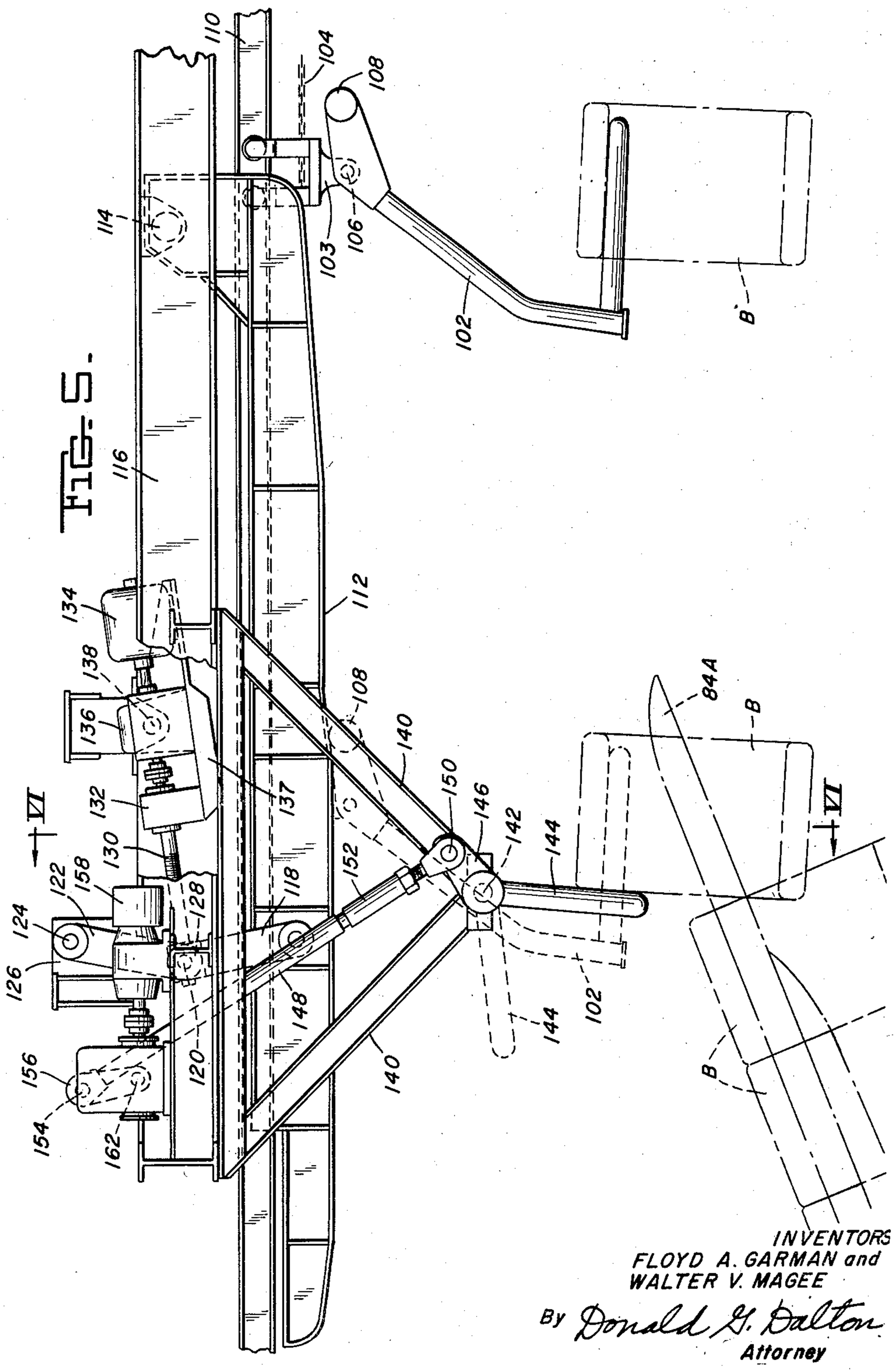

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FIG. 6.

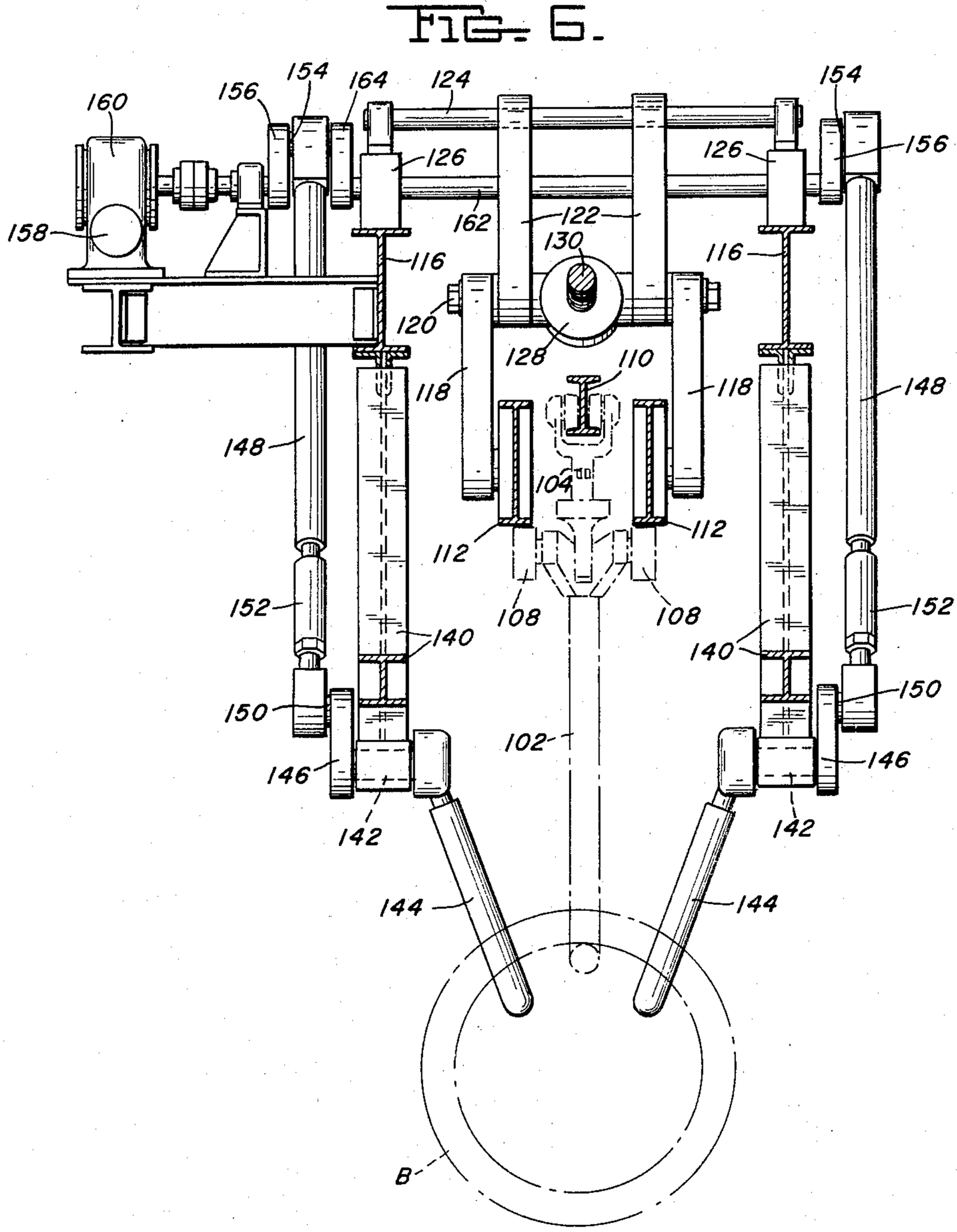

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FIG. 7.

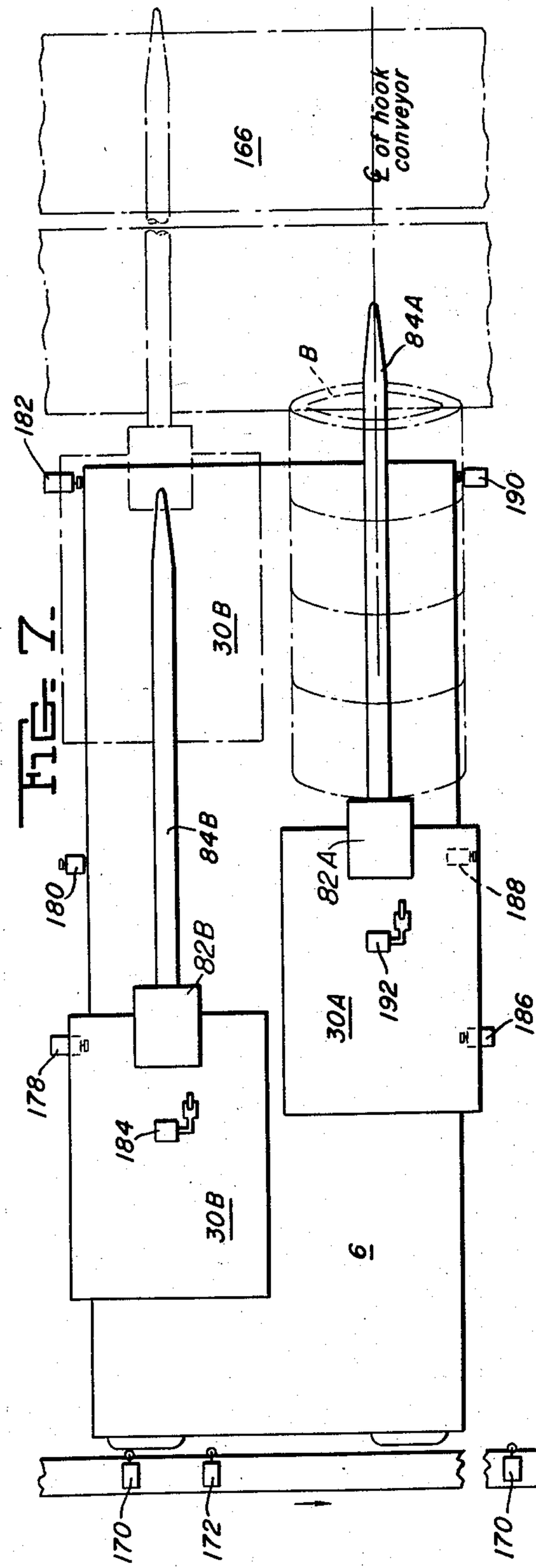

FIG. 8.

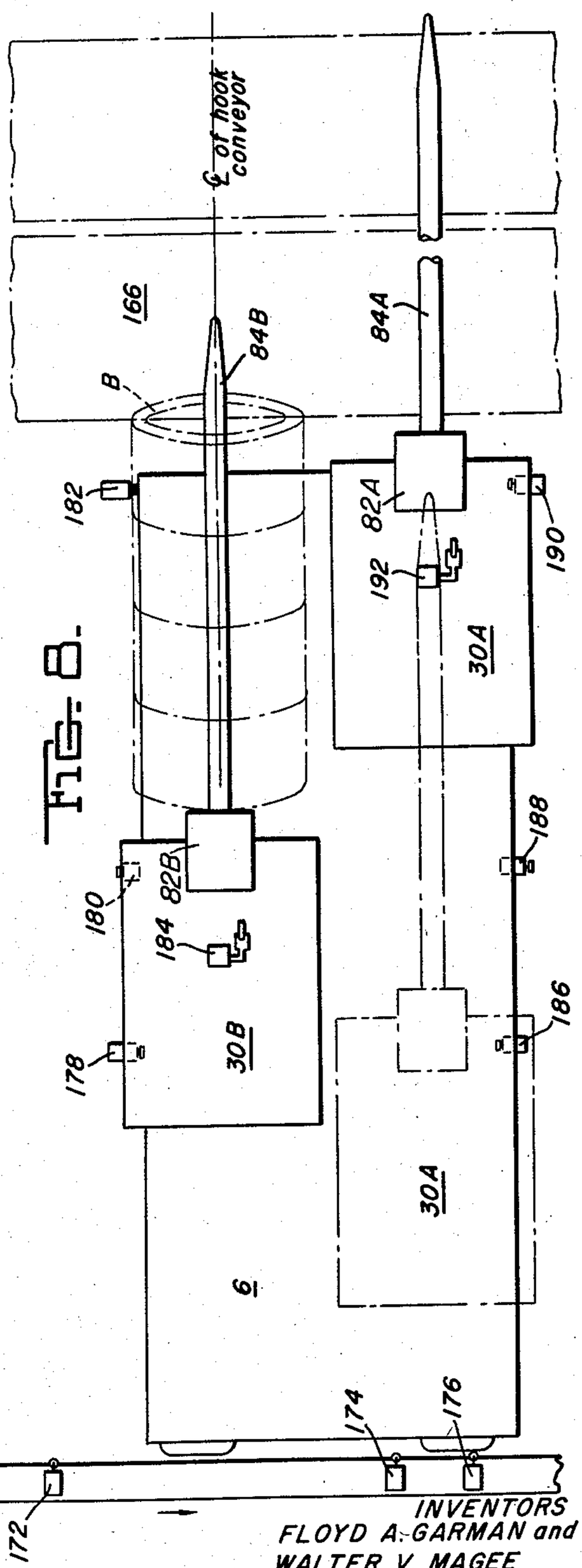

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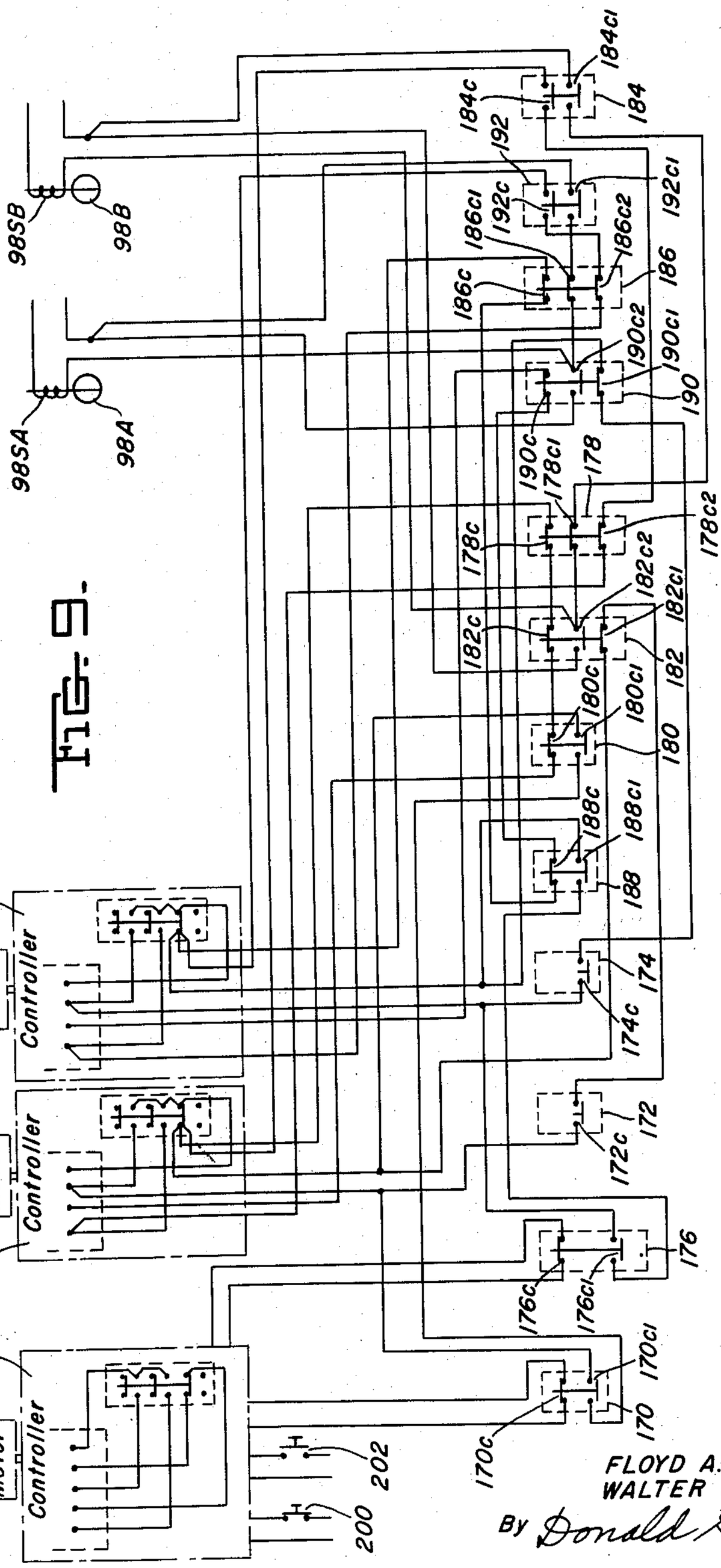
FIG. 9.



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ROD BUNDLE UNLOADER

Floyd A. Garman, Westlake, and Walter V. Magee, Lakewood, Ohio, assignors to United States Steel Corporation, a corporation of New Jersey

Filed July 23, 1957, Ser. No. 673,622

7 Claims. (Cl. 198—177)

This invention relates to a rod bundle unloader and more particularly to an apparatus for removing coils of wire, rod or strip from hooks on an overhead conveyor. In most rolling mills coils or bundles of wire rod or strip are conveyed from the mill to a storage or shipping area on hooks which are suspended from an overhead conveyor. It is desirable to remove these bundles from the conveyor without stopping the conveyor and if a bundle on the conveyor gets past the point of removal it is necessary to stop the conveyor and remove the bundle manually which is a difficult and dangerous operation. Furthermore, if the passage of the bundle past the point of removal is not observed damage to the equipment or bundle may occur.

It is therefore an object of our invention to provide apparatus for removing coils from an overhead conveyor without stopping the conveyor.

This and other objects will be more apparent after referring to the following specification and attached drawings, in which:

Figure 1 is a plan view of the apparatus of our invention;

Figure 2 is a side elevation of the apparatus of Figure 1;

Figure 3 is a view taken on the line III—III of Figure 1;

Figure 4 is an enlarged elevation of a detail;

Figure 5 is an enlarged view of a portion of Figure 2;

Figure 6 is a view taken on the line VI—VI of Figure 5;

Figure 7 is a schematic plan view showing switch locations;

Figure 8 is a view, similar to Figure 7, showing parts in different positions; and

Figure 9 is a schematic wiring diagram showing the electrical controls for our device.

Referring more particularly to Figures 1 to 4 of the drawings, the reference numeral **2** indicates a stationary support having a plurality of parallel sliding surfaces **4** thereon. A slidable base **6** is mounted on the surfaces **4** for movement transversely of the base. The slidable base **6** is fabricated of structural members including longitudinal beams **8** and transverse beams **10**. A rack **12** is attached to the underside of each of two of the beams **10**. The racks **12** are in mesh with pinions **14** which are mounted on a shaft **16**. The shaft **16** is rotated from a motor **18** through a gear reducer **20** and couplings **22**. The shaft **16** is rotatably mounted in bearings **24**. The motor **18** is preferably provided with a solenoid brake **26**. Guides **28** are mounted on the support **2** and serve to maintain alignment of the base **6** in its sliding movement on the surfaces **4**. A pair of carriages **30A** and **30B** are mounted on the base **6** for movement longitudinally of the support **2**. The carriages **30A** and **30B** are of identical construction so that only one will be described in detail, the reference numerals used being provided with the suffix A and B for corresponding parts on the carriages. The carriage **30A** is provided with

sliding slippers **32A** which ride on fixed sliding surfaces **34A** and are held from lateral movement by guides **36A** carried by carriage **30A**. A chain **38A** is provided for moving the carriage **30A**. As best shown in Figure 4 a lever **40A** is pivotally mounted on a pin **42A** supported by the carriage **30A** and extends downwardly to a link **44A** on chain **38A**. The lever **40A** is attached to link **44A** by means of a pin **46A**. A clevis **48A** is attached to the upper part of lever **40A** by means of a pin **50A**. A threaded pin **52A** is attached to the clevis **48A** and passes through an opening in a plate **53A** on the carriage **30A** with a pair of springs **54A** being mounted on the pin **52A**, one on each side of the plate **51A**. A washer **56A** and nut **58A** which is threaded on the pin **52A** holds the compression springs **54A** in place. The springs **54A** function as a shock absorber between the chain and carriage. A turnbuckle **60A** forms part of the chain **38A** and maintains the chain in a tight condition. The upper run of the chain **38A** is supported in a trough **62A** and the lower run in a trough **64A**. The chain **38A** is supported by sprockets **66A**, one of which is mounted on a common shaft with a sprocket **68A**. Sprocket **68A** is driven from a motor **70A** through a speed reducer **72A**, shaft **74A**, sprocket **76A** and chain **78A**. A hydraulic cylinder **80A** is pivotally mounted on carriage **30A** with its forward end being pivotally connected to framework **82A** which carries a prong or ram **84A**. The framework **82A** is pivotally supported on the carriage **30A** by means of a pin **86A**. Fluid for operating the cylinder **80A** is obtained from hydraulic pump **88A** which is driven from a motor **90A**. The fluid is conveyed from the pump **88A** through a conduit **92A** to an accumulator **94A** and to cylinder **80A** by means of conduit **96A**. A spring loaded solenoid operated 3-way valve **98A** controls flow of fluid to the cylinder **80A**. Fluid is returned to pump **88A** through a conduit **100A**.

Conveyor hooks **102** are pivotally connected to hangers **103** of conveyor chain **104** by means of pins **106**. Each of the hooks carries a pair of rollers **108** for a purpose which will appear later. The chain **104** is suspended from conveyor rail **110** by means of hangers **103**. A pair of cam tracks **112** are pivotally mounted at one end on a pin **114** carried by a pair of beams **116**. The other end of each of the cam tracks **112** is connected to the lower end of an arm **118**. The upper ends of the arms **118** are carried by pin **120** which in turn is carried by a pair of arms **122**. The upper ends of the arms **122** are mounted on a pin **124** which is supported in framework **126** carried by beams **116**. A threaded nut **128** is also carried by the pin **120** and engages a threaded shaft **130**. The arms **118** and **122** form toggles. Shaft **130** is mounted for rotation in a bearing **132** which also prevents axial movement of the shaft **130**. The shaft **130** is rotated from a motor **134** through a gear reducer **136**. Bearing **132**, motor **134** and gear reducer **136** are carried on a bracket **137** and are pivotally mounted on a pin **138** carried by framework **126**. In the position shown, the cam tracks **112** are in engagement with the rollers **108**. When it is desired to have the rollers disengage the cam tracks **112**, the motor **134** is rotated so that the shaft **130** will turn in the nut **128** to move the nut to the right as seen in Figures 2 and 5 until the arms **118** and **122** are in retracted position. A pair of V-shaped brackets **140** are attached to and suspended from the beams **116**. A shaft **142** is rotatably mounted at the lower end of each of the brackets **140**. A sweep arm **144** is mounted on each of the shafts **142** for movement therewith. A lever arm **146** is mounted on each of the shafts **142** on the end opposite the sweep arms **144**. Each of the arms **146** is connected to a connecting rod **148** by means of a pin **150**. Each connecting rod **148** includes a turnbuckle **152** for

adjusting the length thereof. A pin 154 connects the upper end of each connecting rod 148 to a lever arm 156. The lever arm 156 shown at the left of Figure 6 is driven from a motor 158 through a gear reducer 160. The left hand arm 148 is connected to a shaft 162 through an arm 164 also mounted on pin 154. The arm 156 at the right of Figure 6 is connected to be rotated by shaft 162. Thus, rotation of motor 158 will cause connecting rods 148 to move downwardly and move the sweep arms 144 from the full line position shown in Figure 5 to the broken line position shown. Reverse movement of the motor 158 causes the connecting rods 148 to move upwardly and return the sweep arms 144 to the full line position.

A conveyor 166 provided with an abutment 168 is preferably provided adjacent the end of the rams 84A and 84B for receiving the bundles of rod B. Limit switches 170, 172, 174 and 176 are arranged along the path of travel of the movable base 6 and are adapted to be contacted therewith. Limit switches 178, 180 and 182 are located on the base 6 and are adapted to be actuated by the carriage 30B. Limit switch 184 is located on the carriage 30B and is adapted to be actuated by the framework 82B when the ram 84B is in its lower position. Limit switches 186, 188 and 190 are located on the base 6 and are adapted to be contacted by the carriage 30A. Limit switch 192 is located on the carriage 30A and is adapted to be contacted by the framework 82A when the ram 84A is in its lower position. Switch 170 has a normally closed contact 170C and a normally open contact 170C1. Switch 172 has a normally open contact 172C. Switch 174 has a normally open contact 174C. Switch 176 has a normally closed contact 176C and a normally open contact 176C1. Switch 178 has three normally closed contacts 178C, 178C1 and 178C2. Switch 180 has a normally closed contact 180C and a normally open contact 180C1. Switch 182 has normally closed contacts 182C and 182C1 and a normally open contact 182C2. Switch 184 has two normally open contacts 184C and 184C1. Switch 186 has three normally closed contacts 186C, 186C1 and 186C2. Switch 188 has a normally open contact 188C and a normally closed contact 188C1. Switch 190 has two normally closed contacts 190C and 190C1 and a normally open contact 190C2. Switch 192 has two normally open contacts 192C and 192C1. Normally closed contact 170C is connected in circuit to controller 194 which controls the operation of motor 18. Contact 170C1 is connected through contact 180C1 to controller 196 which controls the operation of motor 70B. Contact 176C is connected in circuit with the controller 194 and contact 176C1 is connected in circuit to controller 198 which controls the operation of motor 70A. Contact 176C1 is connected in series with contact 188C1. Contact 172C is connected in circuit with controller 196 through contact 182C1. Contact 174C is connected to controller 198 through contact 190C1. Contact 188C is connected to controller 198 through contacts 186C and 190C. Contact 180C is connected to controller 196 through contacts 182C and 178C. Contact 182C2 is connected to solenoid 98SB for operating solenoid valve 98B, both directly and through a parallel circuit including contacts 178C1 and 184C1. Contact 178C2 is connected to controller 196 through contact 184C. Contact 190C2 is connected in circuit with solenoid 98SA for operating valve 98A both directly and through a parallel circuit including contacts 186C1 and 192C1. Contact 186C2 is connected to controller 198 through contact 192C.

The operation of our device is as follows:

Motor 134 is operated to lower the cam tracks 112 to their operative position and motor 158 is operated to position the arms 144 in their lower position. Assuming that the parts are as shown in full lines in Figure 7 with ram 84A in its loading position, the bundles of wire B will be removed from the hooks 102 as they strike the

sweep arms 144, the hooks 102 rotating in a clockwise direction as shown in Figure 2 as the rollers 108 roll along the cam track 112. After the ram 84A has received the correct number of bundles, a switch 200 leading to controller 194 is closed by the operator, thus starting motor 18 to move the base 6 in the direction indicated by the arrow in Figure 7. As the base 6 moves in this direction it contacts switch 172, thus closing its contact 172C to complete a circuit to controller 196 which operates motor 70B to start the carriage 30B moving forwardly toward the conveyor 166. Carriage 30B continues its movement until it operates switch 180. Operation of switch 180 opens contact 180C to stop movement of the carriage 30B in its loading position as shown in Figure 8. The base 6 continues its movement until it operates switch 176, thus opening contact 176C which through controller 194 stops operation of carriage motor 18. Operation of switch 176 also closes contact 176C1 which through controller 198 operates motor 70A to move carriage 30A forward over conveyor 166. When the carriage 30A reaches its full line position shown in Figure 8 it contacts switch 190. This opens contact 190C which through controller 198 stops motor 70A. Operation of switch 190 also closes contact 190C2 which completes the circuit to solenoid 98SA, thus operating valve 98A to actuate hydraulic motor 80A to lower the ram 84A. When the ram 84A reaches its horizontal or lower position it operates switch 192 closing its contacts 192C and 192C1. Closing of contact 192C completes the circuit to controller 198 to reverse motor 70A, thus retracting carriage 30A and stripping the bundles B off ram 84A against abutment 168. Closing of contact 192C1 completes the holding circuit to solenoid 96SA. When the carriage 30A reaches its broken line position shown in Figure 8 it actuates switch 186. Actuation of switch 186 opens contact 186C which through controller 198 stops motor 70A. Contact 186C1 also opens, thus deenergizing solenoid 98SA allowing spring loaded valve 98A to operate to raise the ram 84A to its loading position. After ram 84B is loaded as shown in Figure 8, push button 202 is pushed by the operator and through controller 194 causes motor 18 to rotate in the opposite direction and moves the base 6 in the direction opposite the arrow. When the base 6 actuates switch 174 it closes contact 174C which through controller 198 operates motor 70A to move carriage 30A forwardly to its loading position shown in Figure 7 where it strikes switch 188. This opens contact 188C which through controller 198 stops movement of carriage 30A. The base 6 continues to move until it contacts switch 170. When this occurs contact 170C opens completing a circuit to controller 194 which stops motor 18. The ram 84A is then in position at the center line of the hook conveyor to receive bundles of rod B from the hook conveyor as shown in Figure 7. Contact 170C1 is also closed at this time, thus completing a circuit to controller 196 causing motor 70B to move the carriage 30B forwardly to the position over the conveyor 166 shown in broken lines in Figure 7. In this position carriage 30B strikes switch 182 to open contact 182C1 which through controller 196 stops motor 70B. At the same time contact 182C2 closes, completing the circuit to solenoid 98SB which causes valve 98B to move to a position where fluid will flow to hydraulic motor 80B, thus causing framework 82B to rotate about pin 86B and lower ram 84B until it actuates switch 184. This closes contact 184C1 to set up a holding circuit to solenoid 98SB and also closes contact 184C which through controller 196 causes motor 70B to reverse, thus moving carriage 30B rearwardly with the bundles B being stripped from the ram 84B by means of the abutment 168. Movement of carriage 30B continues to the full line position shown in Figure 7 where it contacts switch 178. Contact with switch 178 opens contact 178C to complete a circuit to controller 196 to stop operation of motor 70B with the carriage

30B in its full line position. Contact 178C1 also opens thus deenergizing solenoid 98SB and permitting spring loaded valve 98B to move to a position where the ram 84B will be raised to its loading position. This completes the cycle.

While one embodiment of our invention has been shown and described it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

We claim:

1. Apparatus for removing bundles having their axes substantially horizontal from a hook conveyor comprising a base below said conveyor movable transversely thereof, a carriage mounted on said base for movement longitudinally of said conveyor, a prong pivotally mounted on said carriage for movement in a vertical plane, means for raising said prong about its pivot mounting so that its outer end will receive bundles from said conveyor when said base has been moved to a position with said prong beneath said hook conveyor and said carriage has been moved to its bundle receiving position, means for tilting said hooks to enable ready removal of bundles therefrom, and means for stripping said bundles from said hooks onto said prong.

2. Apparatus for removing bundles having their axes substantially horizontal from a hook conveyor comprising a base below said conveyor movable transversely thereof, a pair of prongs mounted on said base for movement longitudinally of the conveyor, means for selectively moving said prongs to a position where the outer ends thereof will receive bundles from said conveyor when said base has been moved to a position where the selected prong is beneath said hook conveyor, means for tilting said hooks to enable ready removal of bundles therefrom, and means for stripping said bundles from said hooks onto said prongs.

3. Apparatus for removing bundles having their axes substantially horizontal from a hook conveyor comprising a base below said conveyor movable transversely thereof, a pair of carriages mounted on said base for movement longitudinally of the conveyor, a prong pivotally mounted on each of said carriages for movement in a vertical plane, and means for selectively moving said prongs in their said vertical plane so that the outer end of the selected prong will receive bundles from said conveyor when said base has been moved to a position with the selected prong beneath said hook conveyor and the carriage of the selected prong has been moved to its bundle receiving position.

4. Apparatus for removing bundles having their axes substantially horizontal from a hook conveyor comprising a base below said conveyor movable transversely thereof, a pair of carriages mounted on said base for movement longitudinally of the conveyor, a prong pivotally mounted on each of said carriages for movement in a vertical plane, means for selectively moving said prongs in their said vertical plane so that the outer end of the selected prong will receive bundles from said conveyor when said base has been moved to a position with the selected prong beneath said hook conveyor and the carriage of the selected prong has been moved to its bundle receiving position, and means for tilting said hooks to enable ready removal of bundles therefrom.

5. Apparatus for removing bundles having their axes substantially horizontal from a hook conveyor coprising a base below said conveyor movable transversely thereof, a pair of carriages mounted on said base for movement longitudinally of the conveyor, a prong pivotally mounted on each of said carriages for movement in a vertical plane, means for selectively moving said prongs in their said vertical plane so that the outer end of the selected prong will receive bundles from said conveyor when said base has been moved to a position with the selected prong beneath said hook conveyor and the carriage of the selected prong has been moved to its bundle receiving position, means for tilting said hooks to enable ready removal of bundles therefrom, and means for stripping said bundles from said hooks onto said prongs.

6. Apparatus for removing bundles having their axes substantially horizontal from a hook conveyor comprising a base below said conveyor movable transversely thereof, a pair of carriages mounted on said base for movement longitudinally of the conveyor, a prong pivotally mounted on each of said carriages for movement in a vertical plane, means for selectively moving said prongs in their said vertical plane so that the outer end of the selected prong will receive bundles from said conveyor when said base has been moved to a position with the selected prong beneath said hook conveyor and the carriage of the selected prong has been moved to its bundle receiving position, means for tilting said hooks to enable ready removal of bundles therefrom, means for stripping said bundles from said hooks onto said prongs, and means for removing bundles from said prongs.

7. Apparatus for removing bundles having their axes substantially horizontal from a hook conveyor comprising a base below said conveyor movable transversely thereof, a carriage mounted on said base for movement longitudinally of said conveyor, a prong pivotally mounted on said carriage for movement in a vertical plane, means for raising said prong about its pivot mounting so that its outer end will receive bundles from said conveyor when said base has been moved to a position with said prong beneath said hook conveyor and said carriage has been moved to its bundle receiving position, and means for stripping said bundles from said hooks onto said prong.

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