July 12, 1938. R. PASH 2,123,254

STRAND HANDLING APPARATUS

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FIG. 1.

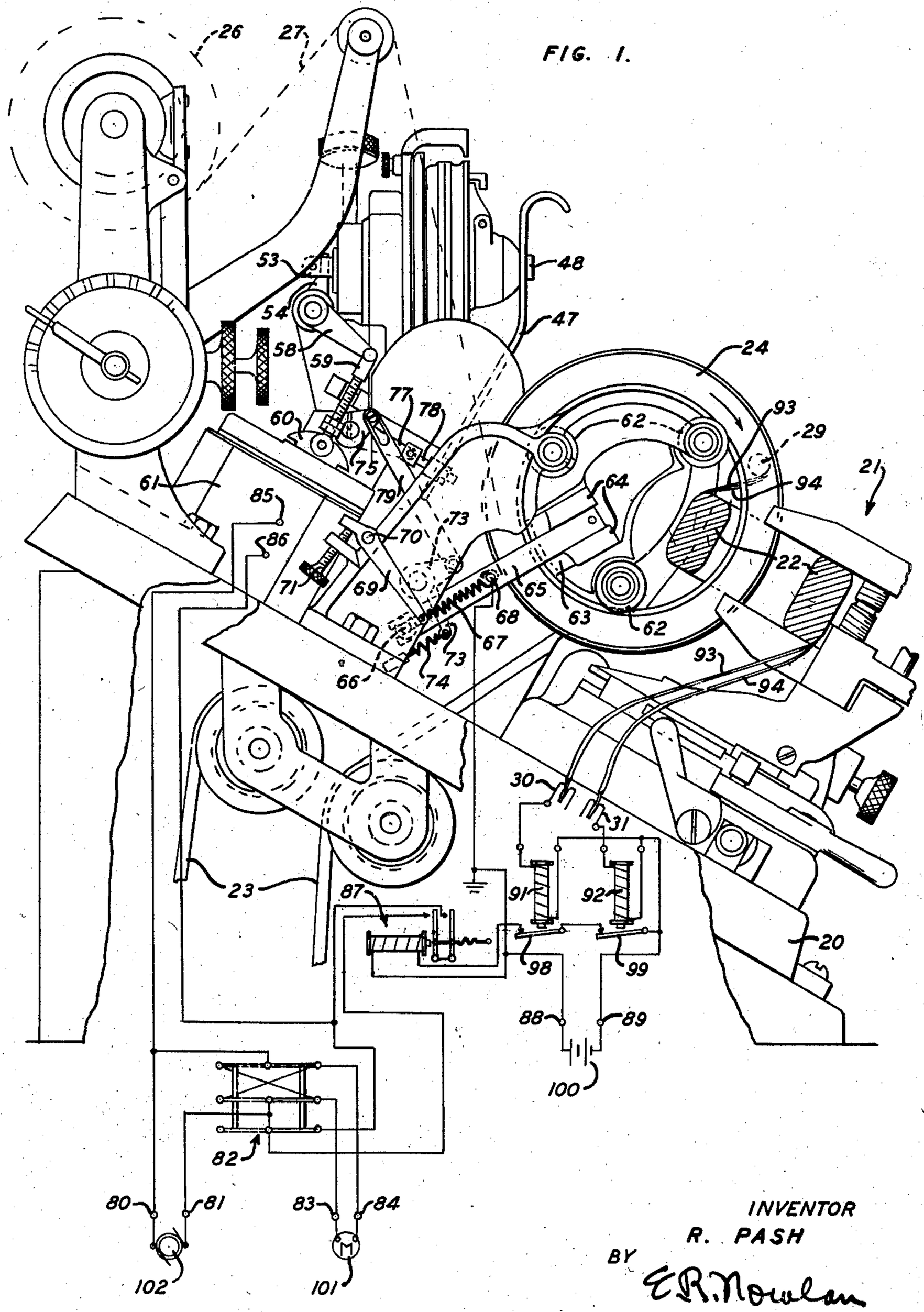

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FIG. 3.

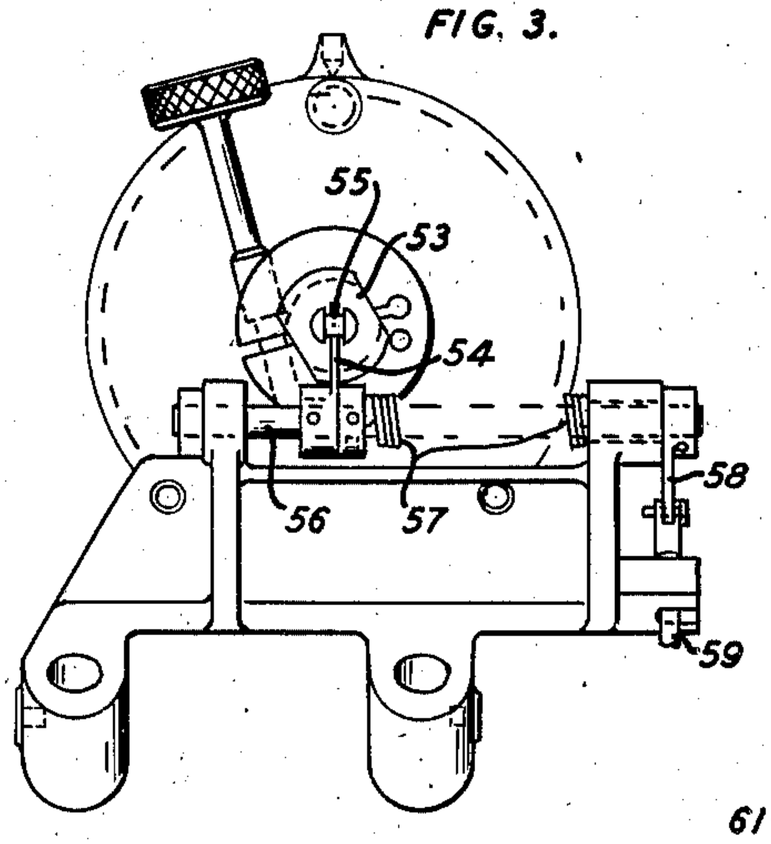

FIG. 2.

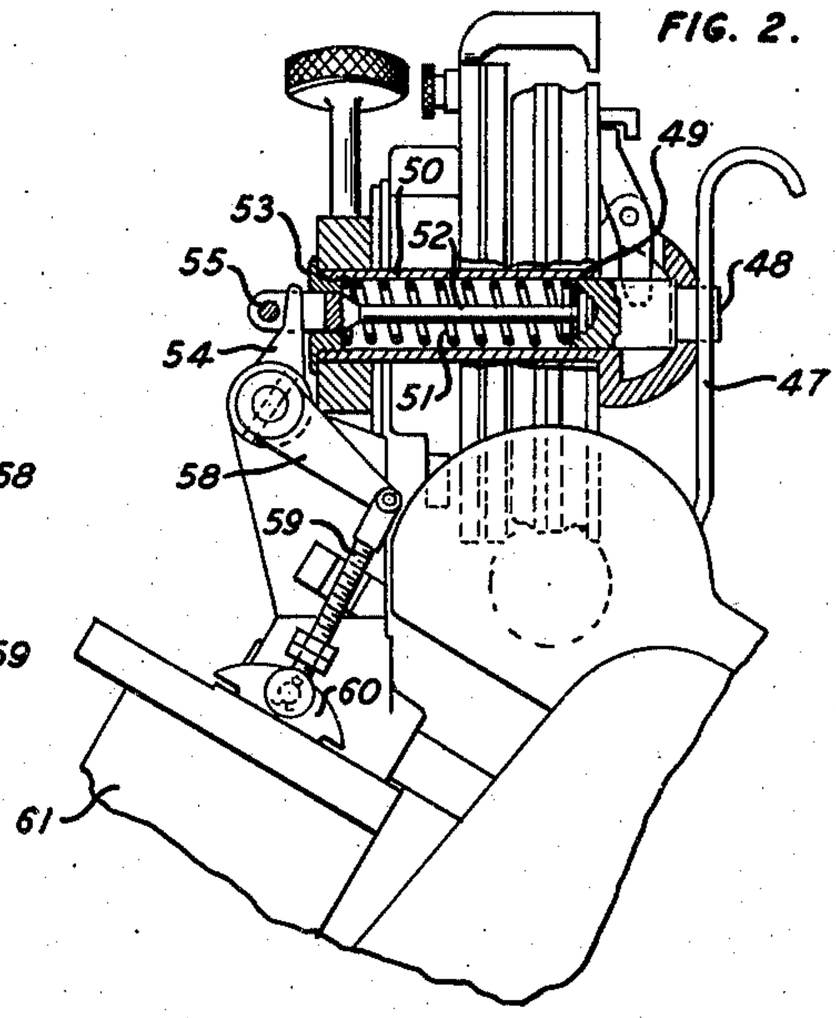

FIG. 4.

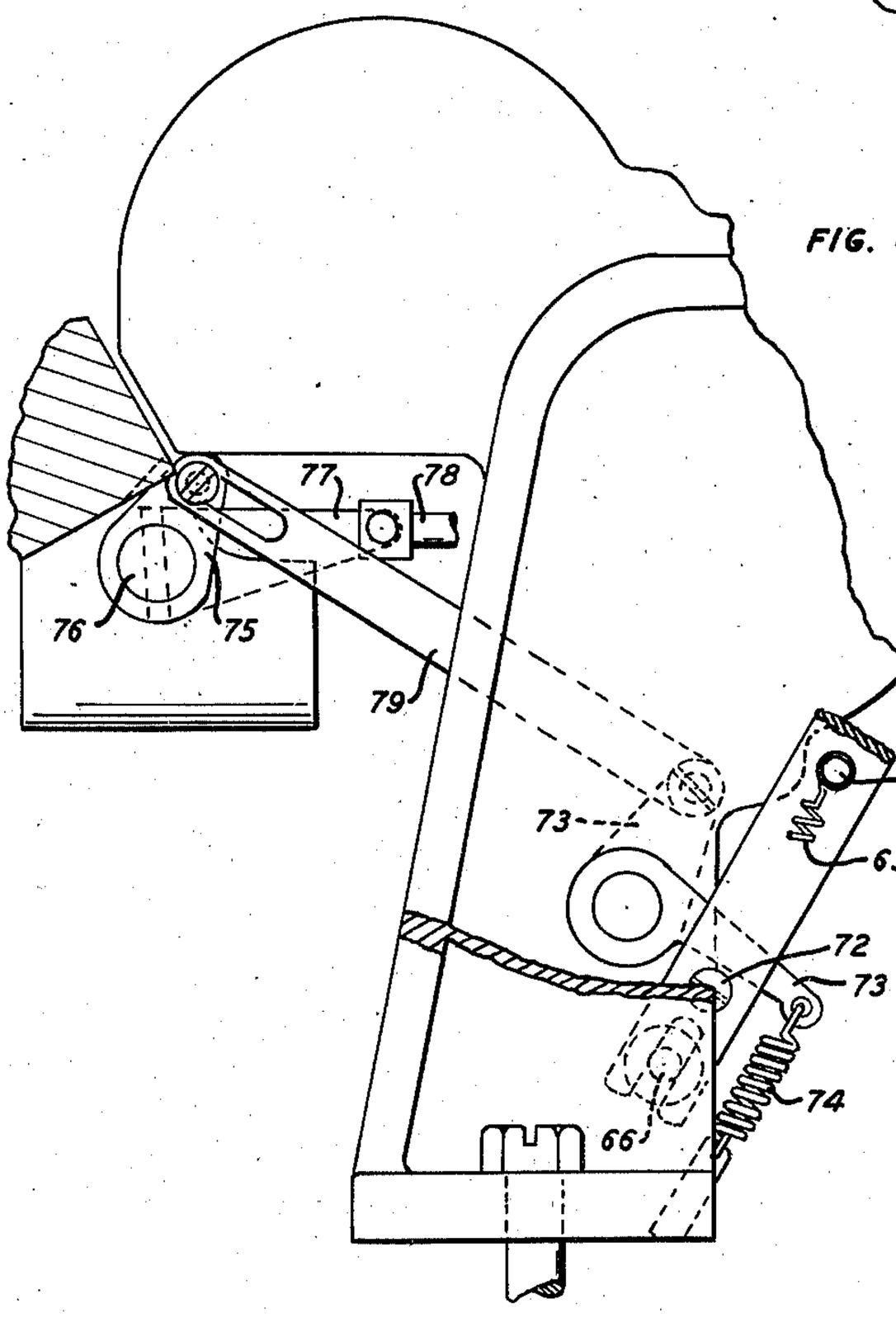

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FIG. 5

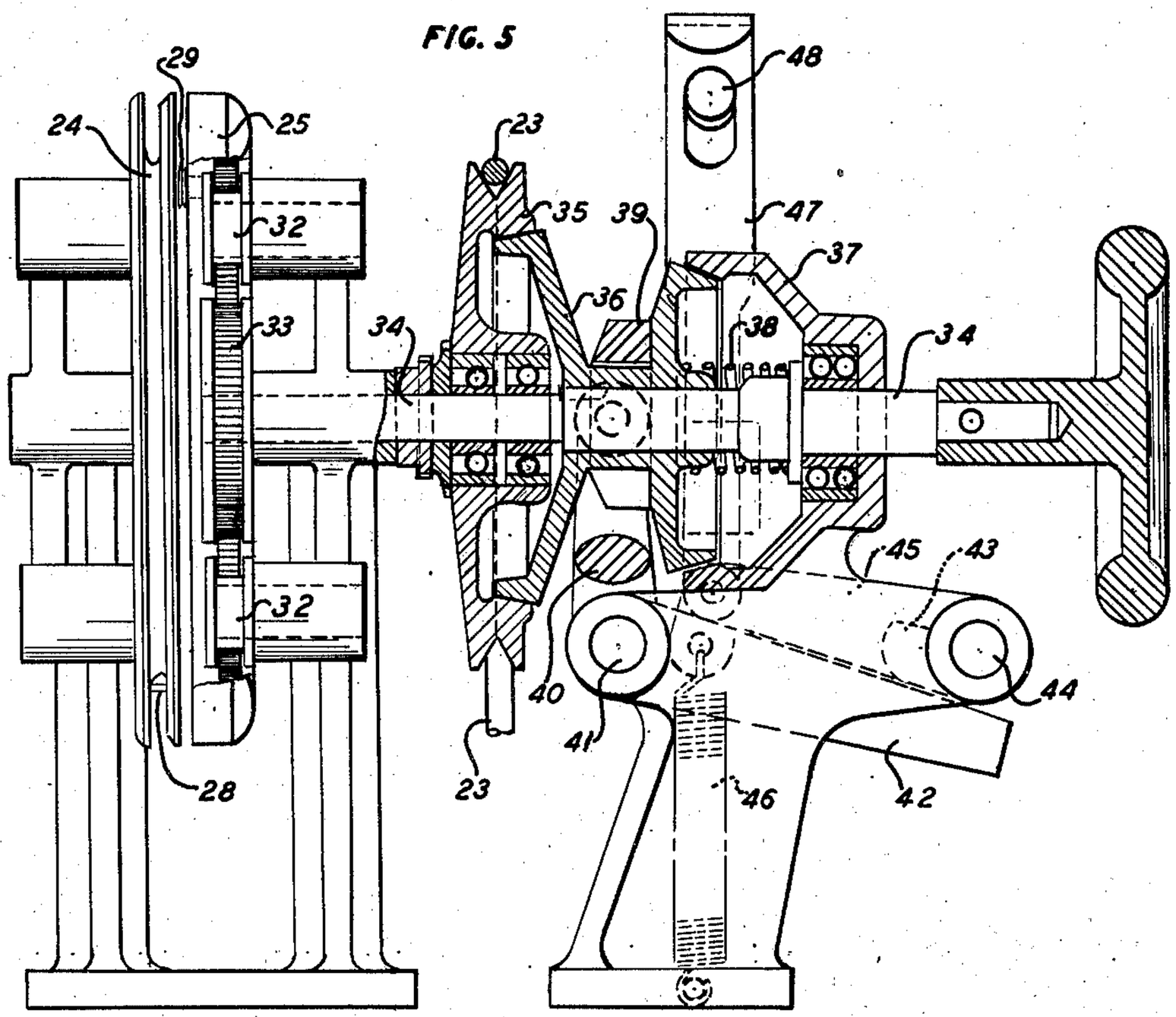
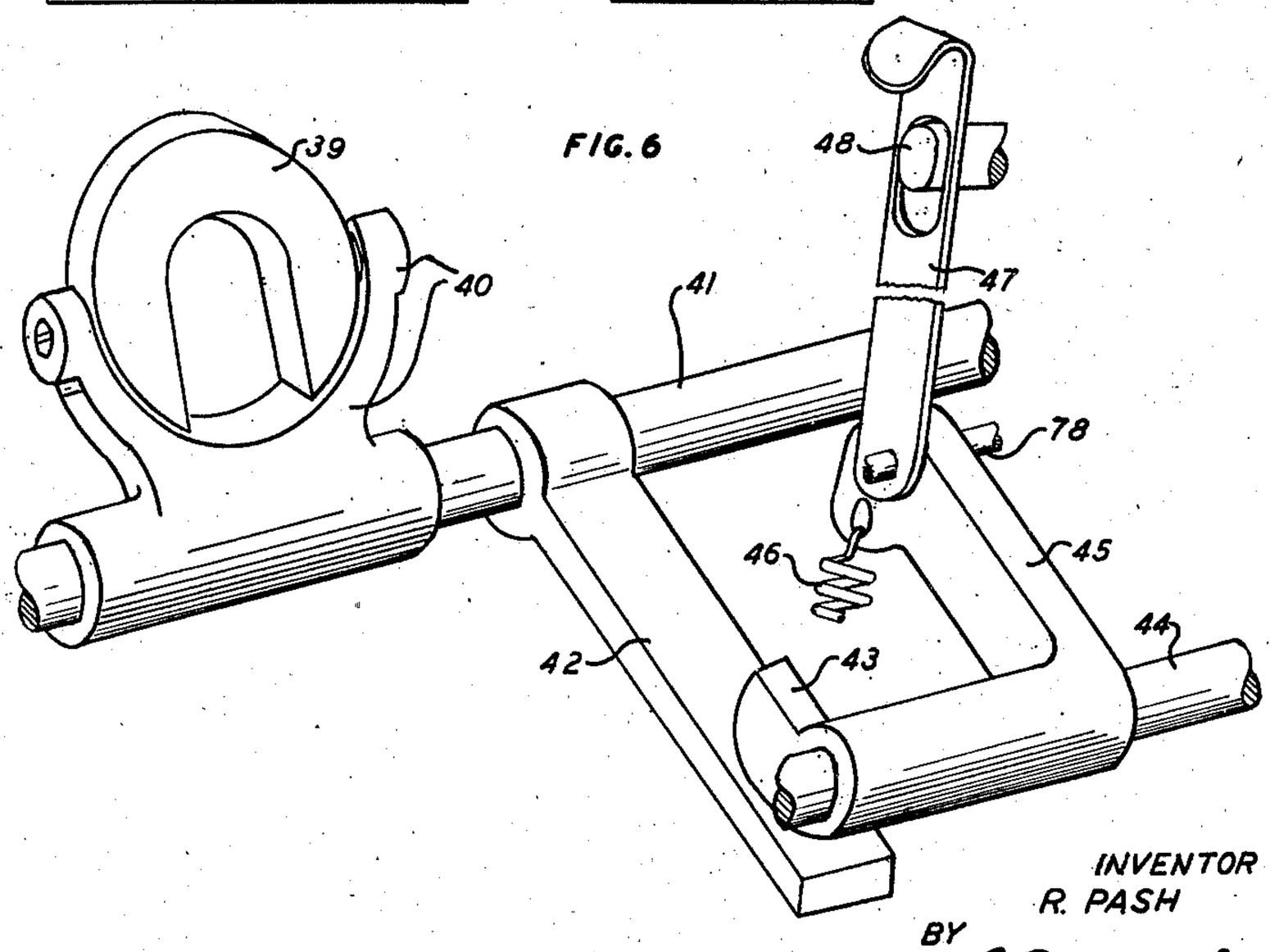


FIG. 6



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UNITED STATES PATENT OFFICE

2,123,254

STRAND HANDLING APPARATUS

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Application November 14, 1935, Serial No. 49,696

4 Claims. (Cl. 242—4)

This invention relates to strand handling apparatus and more particularly to a device for controlling the operation of strand winding apparatus especially such as is used for winding strands on toroidal cores.

In the winding of some coils it is desirable to provide means whereby if any strand breaks during the winding process, the machine will at once be automatically stopped.

One object of the present invention is to provide a device applicable to a coil winding machine for automatically stopping the machine when a break occurs in a strand being wound therein on a core, with special attention to simplicity of structure and reliability of operation in the device.

To this end, in one embodiment of the invention, there is contemplated a device applicable to toroidal core winding machines having a ring like shuttle, which device comprises brake means for the shuttle operated by electrical means in the main power circuit of the machine, together with an electrical control circuit having the shuttle and the strand being wound and the brake in circuit therein and arranged to open a branch of the main power circuit when the control circuit is interrupted, whereby the brake means will be actuated to stop the shuttle.

The above and other objects and features of the invention will appear from the following detailed description of one embodiment thereof taken in connection with the accompanying drawings in which the same reference numerals are applied to identical parts in the several figures and in which—

Fig. 1 is a partly diagrammatic view in left side elevation of a toroidal coil winding machine constructed in accordance with the invention;

Fig. 2 is a broken view in side elevation of one detail thereof;

Fig. 3 is a rear elevational view of the same detail with parts omitted;

Fig. 4 is an enlarged broken view in side elevation to show the shuttle brake actuating linkage;

Fig. 5 is an enlarged broken view in front elevation of the shuttle, guide ring and guide ring drive, and

Fig. 6 is an enlarged detached perspective view of the linkage which controls the normally operating brake of the machine.

The device embodying the invention as herein disclosed is shown as applied to a toroidal coil winding machine whose general structure and mode of operation, except as hereinafter described in detail, are not pertinent to the present invention, and reference is made to U. S. Patent No. 802,359 issued on October 17, 1905 to C. F. Nickel and to U. S. Patent 1,827,186 issued on October 13, 1931 to S. E. Borgeson for a general description of the organization and operation of such machines.

For present purposes the machine comprises a base **20** on which is mounted a toroidal core or coil holding device generally indicated at **21** which serves to hold a core or partly wound coil **22** in position while being wound. A shuttle ring **24** and guide ring **25** are rotatably mounted in the machine passing through the center of the toroidal core, the one to carry a supply of double strand to be wound on the core, the other to guide the strand from the shuttle and lay it on the core.

When the shuttle is to be filled, a supply reel may be placed in the position indicated at **26** in dotted lines and the strands may be brought as shown at **27**, also in dotted lines, to the shuttle where the bare ends of the strands are hooked over a pin **28** mounted in the shuttle. The shuttle is then driven in reverse rotation to wind strand therein until filled. When full, the strands are cut, threaded over the guide pin **29**, and wrapped once or twice about the core. The bare ends are brought down and fastened in the clips **30** and **31**.

The machine is then set in motion to drive the guide pin **29** in clockwise rotation (Fig. 1) to wind the strand about the core. The guide ring **25** with the pin **29** mounted therein and having gear teeth inside is supported on rollers **32**, **32**, and is driven from a gear **33** mounted on a shaft **34** by means of a pinion behind the gear **33** in Fig. 5. A pulley **35** is freely rotatable on the shaft **34** and is driven through a belt **23** from an electric motor schematically indicated at **101**. A combination brake and clutch member **36** is keyed to the shaft to rotate therewith and be slidable thereon and is adapted at its left end (Fig. 5) to frictionally clutch the pulley **35** to be driven thereby and so to drive the shaft **34** and thereby the ring **25**. The right end of the member **36** is adapted to coact with a brake member **37** stationary on a suitable part of the machine frame. A compression spring **38** tends to drive the member **36** to the left to disengage it from the brake member **37** and engage it with the pulley **35**. The member **36** is shiftable by means of a U-shaped stirrup **39** held in a yoke **40** rigidly mounted on a shaft **41**.

A lever arm **42** is rigidly secured to the shaft **41** and is moved by a cam lug **43** pivotably supported on a shaft **44** and having an integral actuating arm **45**. A tension spring **46** hooked at one end into the arm **45** and at the other end into a

convenient part of the machine frame tends to force the member 36 to the right (Fig. 5) and thus to disengage the member 36 from the drive pulley 35 and to engage it with the brake member 37 thus stopping the guide ring 25. The several parts are so proportioned that the spring 46 will overpower the spring 38 unless restrained.

When the machine is to operate, a link 47, pivotably secured to the arm 45 by a long pin or short rod 78 is hooked over a stud 48, holding the arm 45 up against the spring 46 and allowing the spring 38 to engage the member 36 with the driving pulley 35.

The stud 48 is the outer end of a cylindrical member 49 slidably and rotatably housed in a hollow member 50 rotatably supported in the machine frame. A compression spring 51 presses the member 49 outwardly to the right (Fig. 2) into position to support the link 47. A pull rod 52 is connected to the member 49 at one end and extends through an aperture in the closure member 53 at the left end of the member 50. The left end of the pull rod is forked to receive an upstanding lever arm 54 and has a cross bar 55 mounted in the fork whereby the lever arm may draw the pull rod and therewith the member 49 to the left to withdraw the stud 48 from the link 47.

The lever arm 54 is rigidly mounted on a shaft 56 journalled in the machine frame and provided with a coaxial torsion spring 57 which tends to rotate the shaft and therewith the arm 54 counterclockwise (Fig. 2) to withdraw the stud 48 from the link 47. Another lever arm 58 is also rigidly secured on the shaft 56 and is connected at its outer end by a link 59 to the core 60 of a solenoid 61. Thus so long as the solenoid 61 is energized the spring 51 is free to keep the stud 48 out to support the link 47, but when the solenoid is de-energized the spring 57 is powerful enough to retract the stud from the link and so stop the guide ring.

The shuttle ring 24 is mounted on three rollers 62 and is freely rotatable on the rollers. In operation the shuttle ring is driven only by the pull of strands being withdrawn from it by the guide pin 29. To provide suitable tension on the strand and also braking means for the shuttle ring, a metallic brake shoe 63 rests against the inner periphery of the ring and is slidable radially of the ring in a guide 64 supported by the machine frame. The brake shoe 63 is secured to one end of a slide bar 65 also guided in the guide 64. The other end of the bar is forked and is slidable in a groove in a fixed stud 66 on the machine frame. Thus the bar 65 and with it the brake shoe 63 are limitedly slidable radially of the ring 24.

A tension spring 67 is hooked at one end over a stud 68 set into the bar 65, and at the other end is attached to one end of a lever 69 pivotally secured at 70 on the machine frame. The other end of the lever 69 is abutted against an adjustment screw 71 also mounted in the frame. Thus the shoe 63 is normally held against the ring 24 by the pull of the spring 67 which is adjustable by the screw 71.

The bar 65 is also provided with a laterally extending fixed stud 72 adapted to be pressed down by one arm of an offset bell crank lever 73 pivotably mounted on the machine frame. A tension spring 74 attached to the same arm of the lever and also to the machine frame tends to draw that arm down and therewith the stud 72 and the bar 65 to increase the pressure of the shoe 63 on the ring 24. The other arm of the bell crank 73 is connected by a link 79 to one arm 75 of another offset bell crank lever pivoted at 76 on the machine frame. The other arm 77 of the lever has pivotably connected to its outer end the long pin or shaft 78 by which the link 47 is attached to the lever arm 45.

The motor 101 which drives the machine through the belt 23 is fed with current from an outside source 102 through terminals 80 and 81 and a reversing switch generally indicated at 82 from which leads run to the terminals or binding posts 83, 84 of the motor. When the switch is in the position shown in dotted lines in Fig. 1, the motor runs ahead to drive the machine to wind strand on a core. When the switch is in the full line position, the motor runs in the reverse direction and can be coupled to the shuttle ring by means not here described to run it backwards for filling. The main power circuit from 80, 81 is also connected through the switch to the terminals 85, 86 of the solenoid 61, directly when the switch is in the full line position and through the contacts of a magnetic circuit breaker 87 when the switch is in the dotted or left hand position. The power supplied to this circuit may be of the customary relatively high tension, e. g. 220 volt A. C.

A source 100 of relatively low tension electrical current, e. g. 24 volt D. C., is connected to terminals 88, 89. The terminal 88 is connected through the winding of the circuit breaker 87 and thence in series through the armatures 98 and 99 of two relays to the terminal 89. The terminal 89 is also connected in parallel to one end each of the windings 91 and 92 of the relays whose armatures are respectively 98 and 99. The other ends of the windings 91 and 92 are connected respectively to the clips 30 and 31. The stud 68 or other convenient point of the bar 65 is connected both to ground on the machine and to the terminal 88.

The use of two distinct sources of electric current, 100 and 102, is dictated by considerations of safety and not by the construction or operation of the machine. In ordinary practice the current supplied by such a source as illustrated at 102 would be at one of the customary commercial potentials, e. g. 110, 220 or 440 volts. It is not impracticable but merely may be objectionable as a matter of safety to use power of such voltage in the circuit through the strands 93 and 94. It is preferable for both simplicity and safety to use high voltage A. C. at 80, 81 and low voltage D. C. at 88, 89 as described. However by connecting, say, 88 to 80 and 89 to 81 instead of to 100, and with A. C. relays at 87, 91 and 92 instead of D. C. devices, the machine also will function precisely as described herein.

In describing the operation of the automatic stop and brake which embodies the invention, it is assumed that the shuttle ring 24 is filled with two strands 93 and 94 of enamelled or otherwise insulated wire which are being withdrawn from the shuttle and laid on the core, side by side, by the guide pin 29. The bare outer ends of these two wires are connected to the clips 30 and 31 respectively, and the bare inner ends are connected to the metal pin 28 in the metal shuttle 24. There is then a pair of parallel continuous electrical paths from the terminal 89 through the windings 91 and 92, clips 30 and 31 and strands 93 and 94 to the shuttle 24. Thence a single continuous path leads via the metal brake shoe 63, and bar 65 to the terminal 88. In shunt across the above is a circuit from terminal 88 through the winding of the circuit breaker 87 and the

relay armatures 98 and 99 to the terminal 89. This shunt circuit remains closed energizing the circuit breaker 87 and holding it closed, so long and only so long as both windings 91 and 92 are energized and keep the armatures 98 and 99 in circuit closing position. If either strand 93 or 94 breaks, the corresponding winding 91 or 92 is de-energized and the corresponding armature 98 or 99 opens the circuit through the winding of the circuit breaker 87. The circuit breaker opens and cuts off current from the solenoid 61.

When the solenoid 61 is thus de-energized, the spring 57 turns the arm 54 counterclockwise (Figs. 1 and 2) to retract the stud 48 from the link 47. The link 47 is thus released and allows the bell crank 77, 75 to drop, and the spring 74 pulls the bell crank 73 down thus pulling the brake shoe 63 against the free running shuttle 24 to bring it to a halt. At the same time, the spring 46 has thrown the clutch member 36 out of engagement with the drive pulley 35 and into engagement with the brake member 37. The relatively light shuttle and guide are disconnected from the relatively massive driving elements and can be braked to a stop in much less time than the latter.

The embodiment of the invention herein disclosed is illustrative only and may be modified and departed from in many ways without departing from the scope and spirit of the invention as pointed out in and limited only by the appended claims.

What is claimed is:

1. In a toroidal coil winding machine, a driven annular rotatable strand guide member, an annular freely rotatable metallic strand supply shuttle, a metallic brake member, spring pressed means to press the brake member against the shuttle to stop the same, a latch to hold the spring pressed means out of action, a solenoid to trip the latch and put the spring pressed means into action when deenergized, the winding of the solenoid being in shunt to the motor across the supply circuit thereof, a relay whose armature is in the supply circuit to the solenoid and acting when energized to open the supply circuit to the solenoid, means in the shuttle to connect the inner end of a conductive insulated strand wound thereon electrically to the shuttle, means to connect the brake member electrically to one end of the winding of the said relay and to one side of a source of current, means to connect the other end of the said winding to the armature of a second relay, means to connect the second relay armature to the other side of the source and to one end of the winding of the second relay, means to connect the other end of the second relay winding to the outer end of the strand wound on the shuttle, and a combination clutch and brake actuable by the solenoid when deenergized to disconnect the guide member from the motor and to stop the guide, all whereby when a break occurs in the strand on the shuttle the guide member will be disconnected from the motor and stopped, and the shuttle will be stopped.

2. In a strand handling apparatus, brake means for the apparatus generally and normally operative, free running strand supply means driven only by withdrawal of strand therefrom and not affected by said brake means, independent brake means for the supply means and normally operative, common means to maintain both brake means inoperative including a solenoid connected in a power supply circuit of the apparatus, and means to render the said common means ineffective including a circuit breaker having its contacts in the power supply circuit and having its winding connected through a strand on the strand supply means with a source of current, the several parts being so constructed and arranged that opening the power supply circuit will deenergize the solenoid and thereby cause the two brake means to operate and that breakage of the strand will actuate the circuit breaker to deenergize the solenoid.

3. In a strand handling apparatus, brake means for the apparatus generally and normally operative, free running strand supply means driven only by withdrawal of strand therefrom and not affected by said brake means, independent brake means for the supply means and normally operative, common means to maintain both brake means inoperative including a solenoid connected in a power supply circuit of the apparatus, means to deenergize the solenoid and thereby to render the said common means ineffective and the said two brake means operative comprising a circuit breaker having its contacts in the power supply circuit, and a relay having its armature connected in series with the winding of the circuit breaker and a source of current and its winding connected in series with a strand on the strand supply means to the source of current, the several parts being so constructed and arranged that opening the power supply circuit will deenergize the solenoid and thereby cause the two brake means to operate and that breakage of the strand will actuate the circuit breaker to deenergize the solenoid.

4. In a strand handling apparatus, brake means for the apparatus generally and normally operative, free running strand supply means driven only by withdrawal of strand therefrom and not affected by said brake means and having a plurality of parallel strands thereon, independent brake means for the supply means and normally operative, common means to maintain both brake means inoperative, and means to deenergize the solenoid and thereby to render the said common means ineffective and the said two brake means operative comprising a circuit breaker having its contacts in a power supply circuit of the apparatus, and a plurality of relays having their several armatures connected in series with each other and with the winding of the circuit breaker and with a source of current, the winding of each relay being connected in series with one of the parallel strands on the strand supply means to the source of current, the several parts being so constructed and arranged that opening the power supply circuit will deenergize the solenoid and thereby cause the two brake means to operate and that breakage of any one of the parallel strands will actuate the circuit breaker to deenergize the solenoid.

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