

July 30, 1935.

D. J. SCOTT

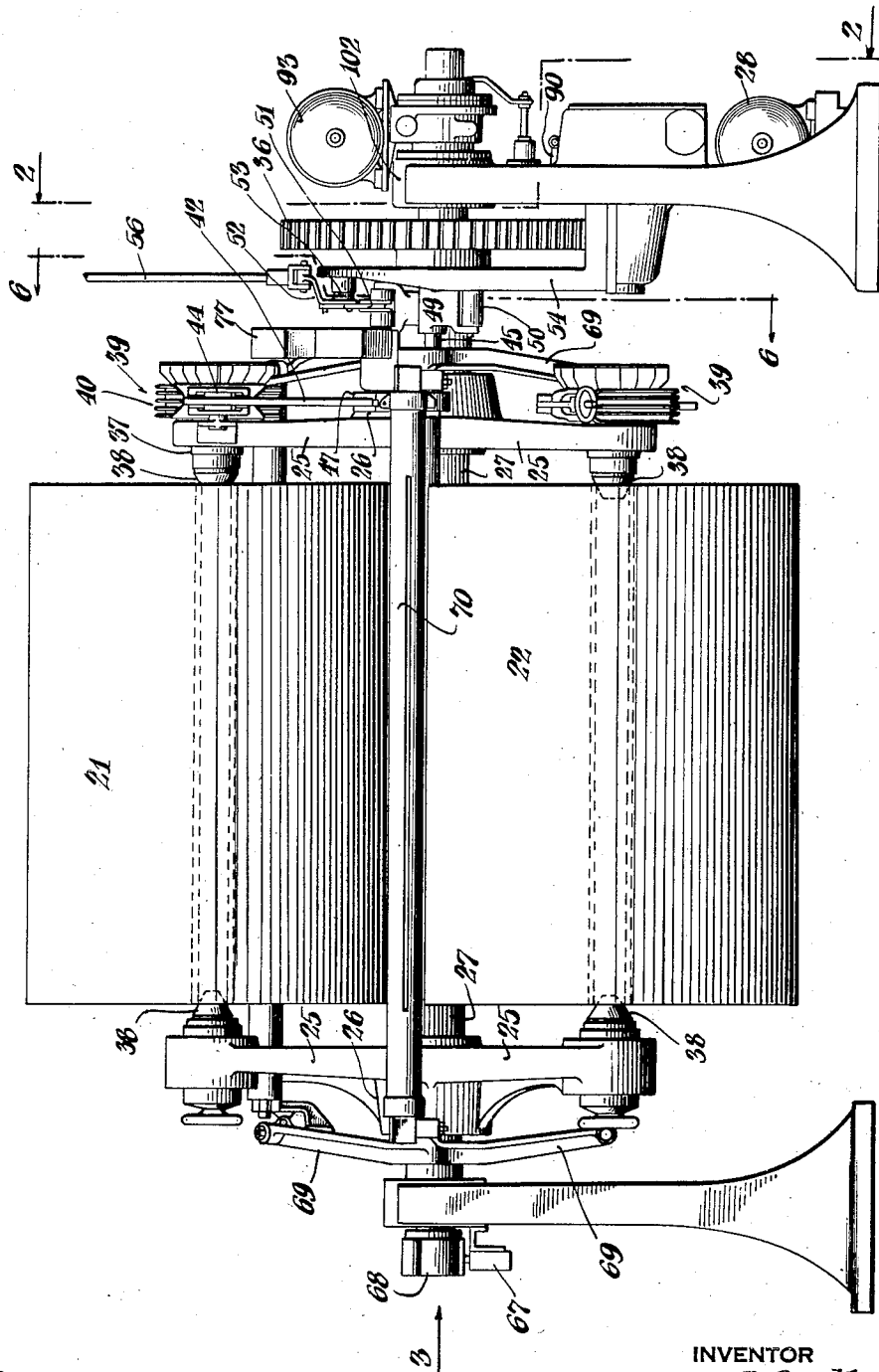
2,009,707

WEB SUPPLY MEANS

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8 Sheets-Sheet 1

Fig. 1



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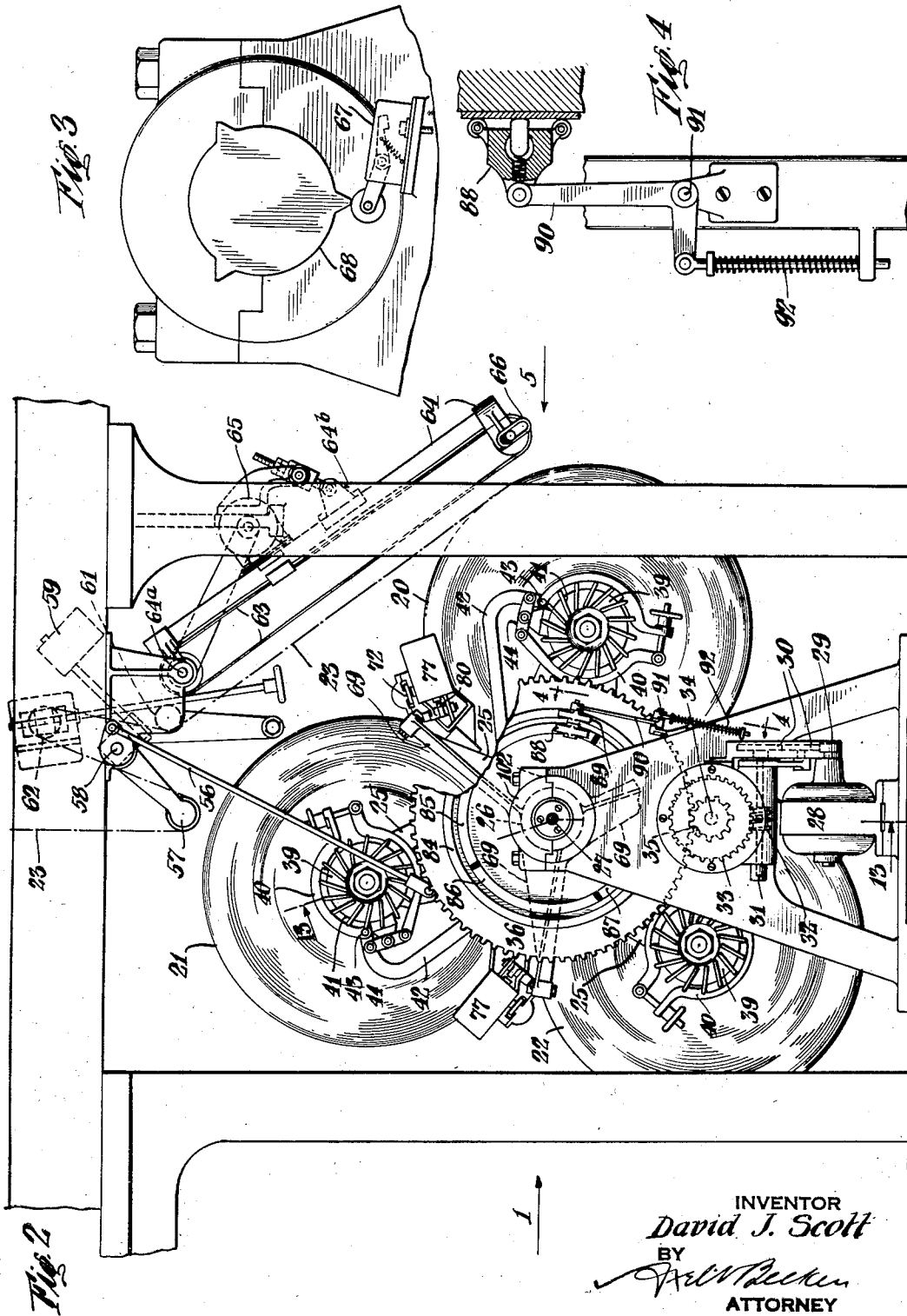
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WEB SUPPLY MEANS

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8 Sheets-Sheet 2



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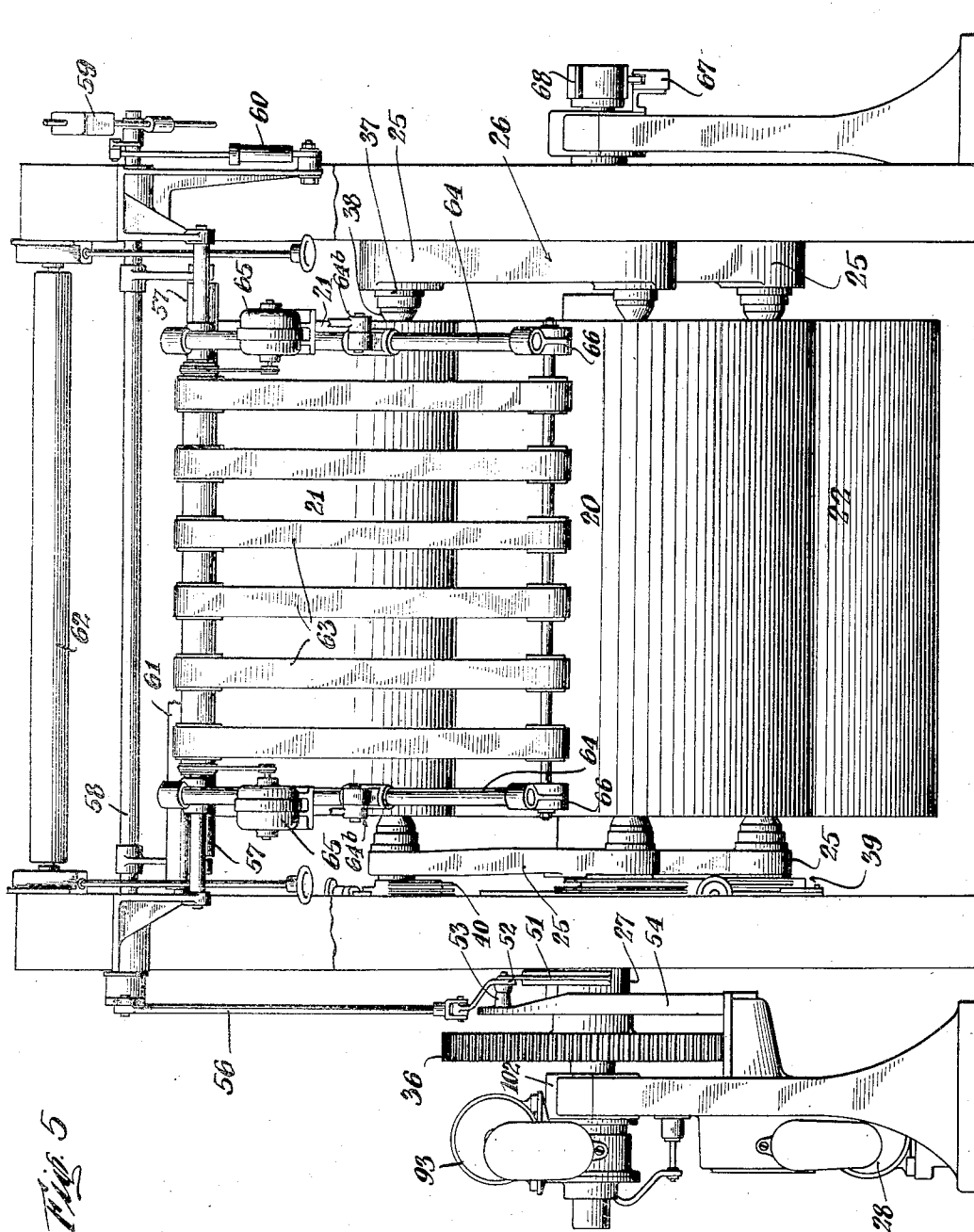
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WEB SUPPLY MEANS

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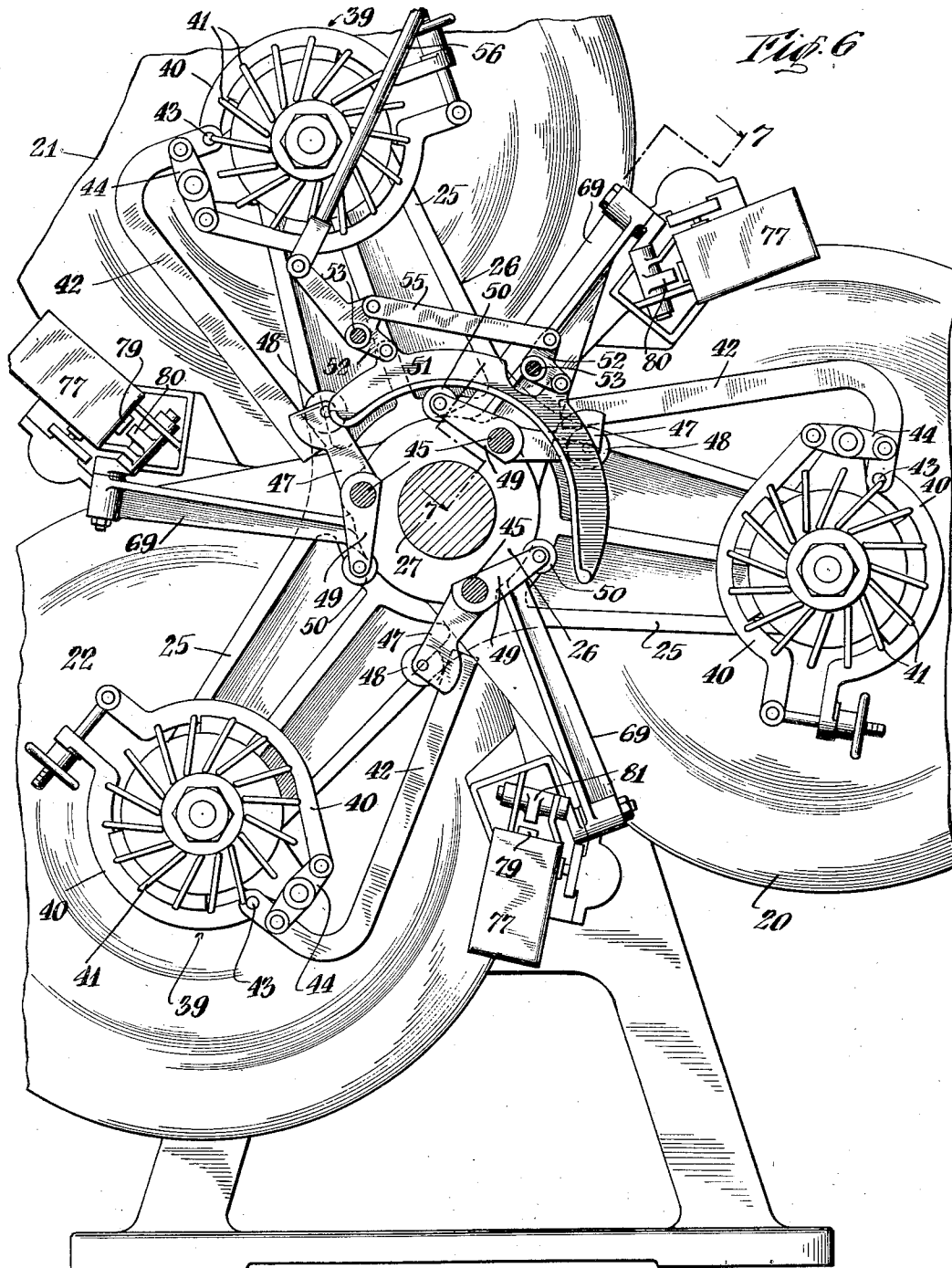
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WEB SUPPLY MEANS

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8 Sheets-Sheet 4



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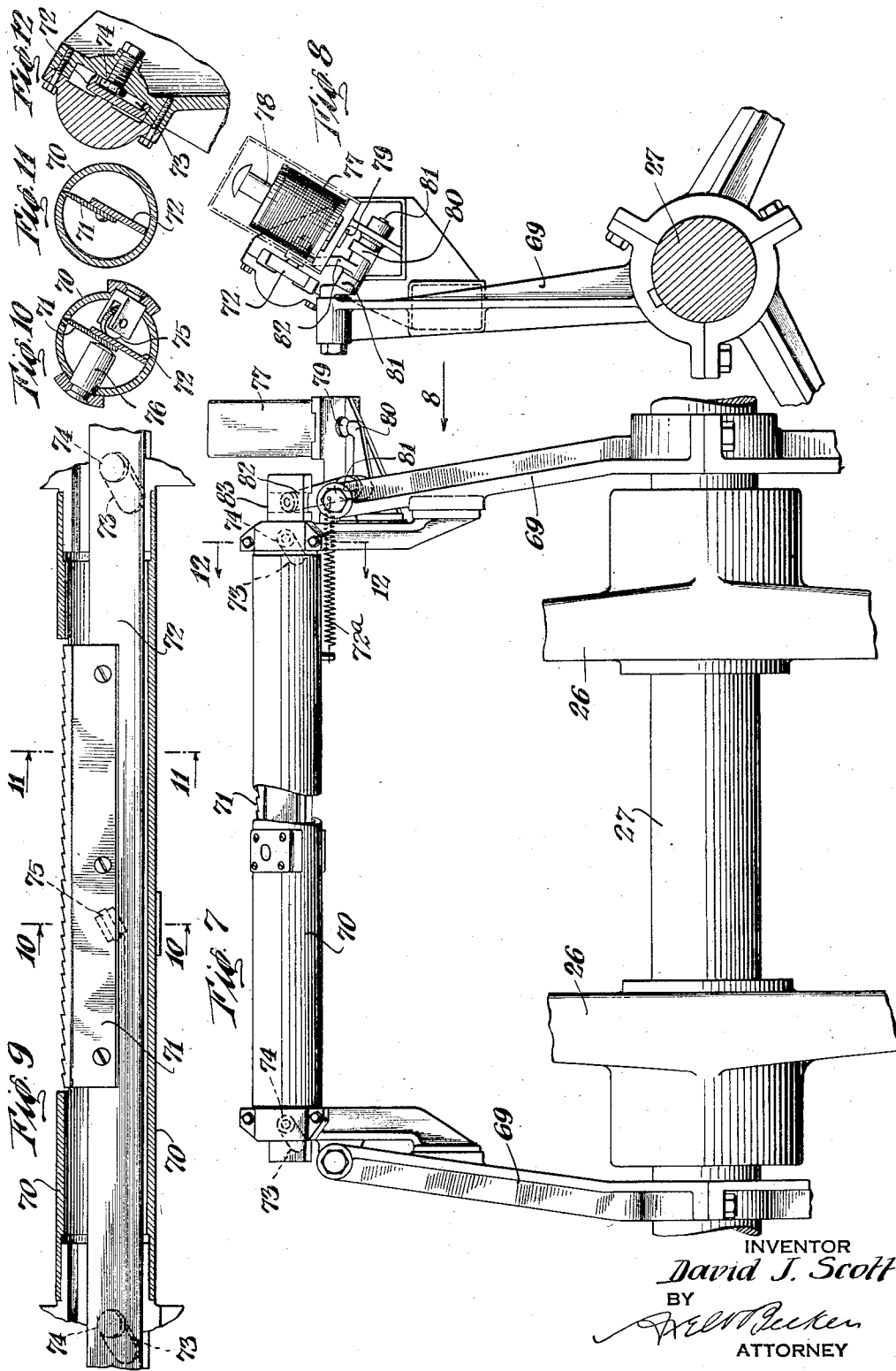
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WEB SUPPLY MEANS

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8 Sheets-Sheet 5



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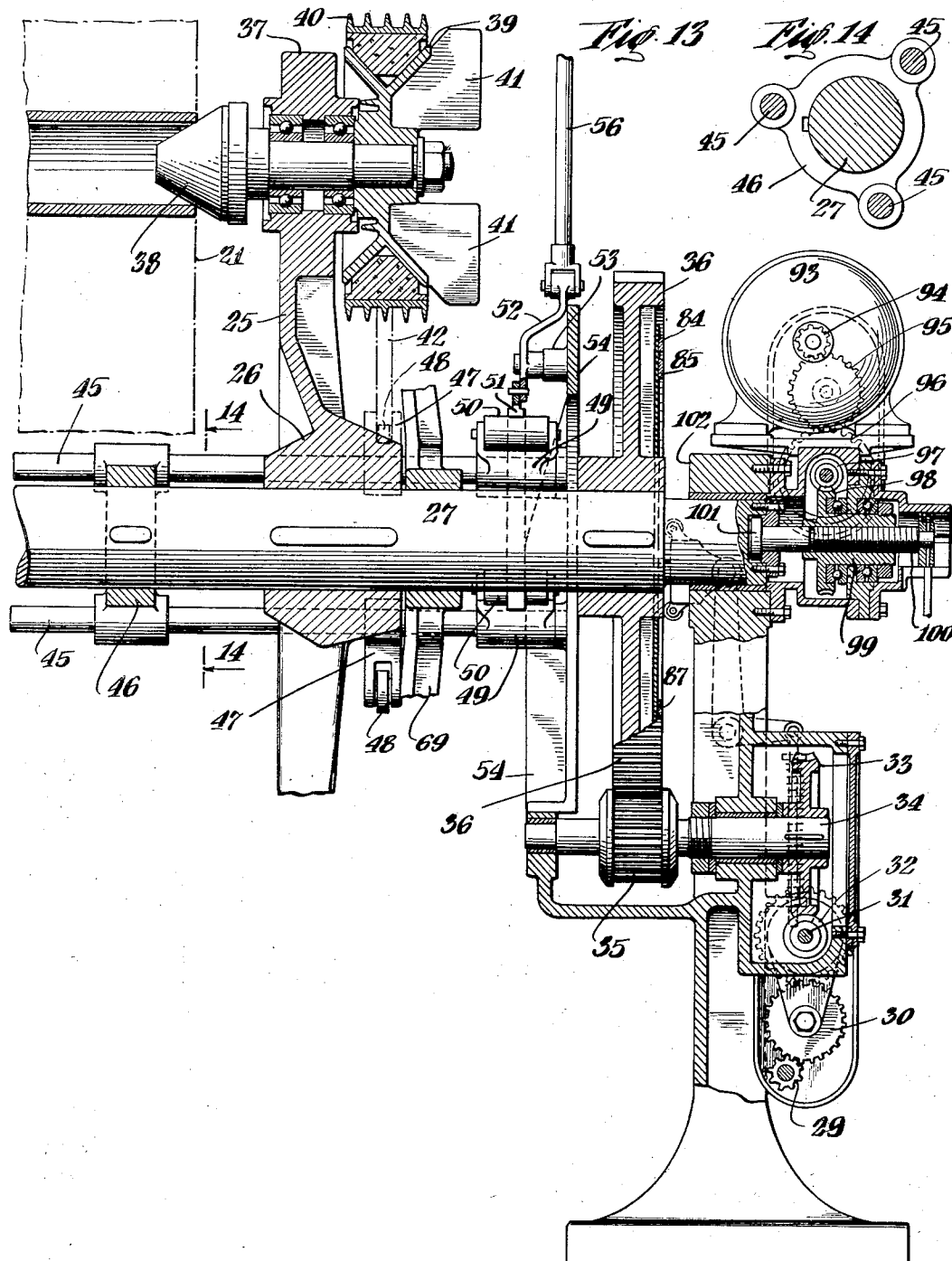
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WEB SUPPLY MEANS

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8 Sheets-Sheet 6



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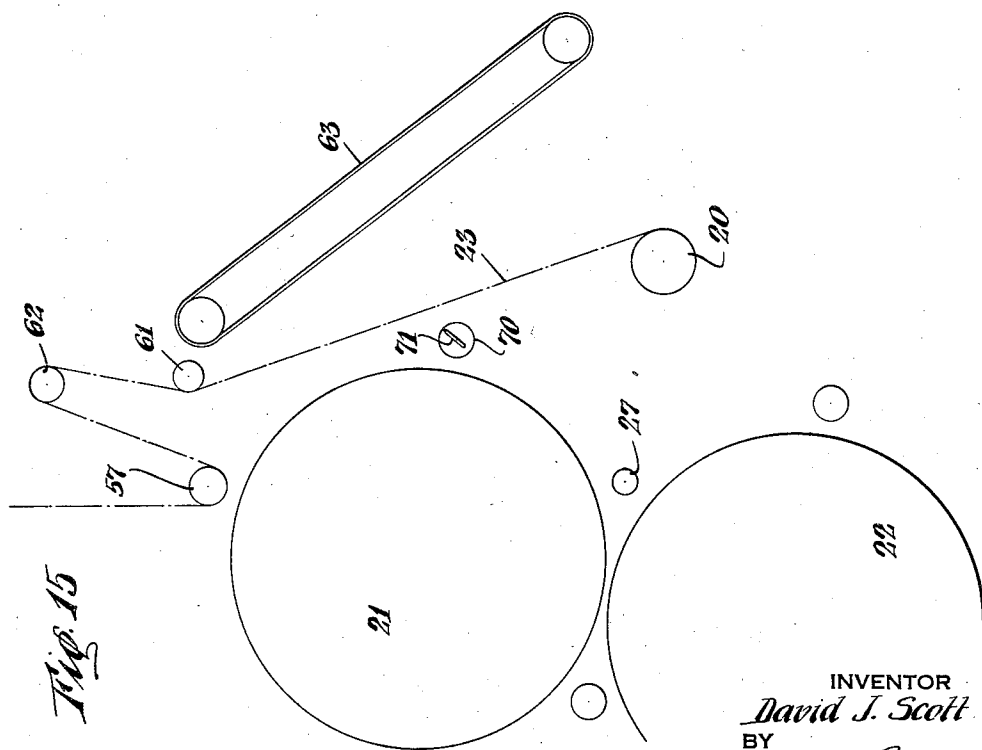
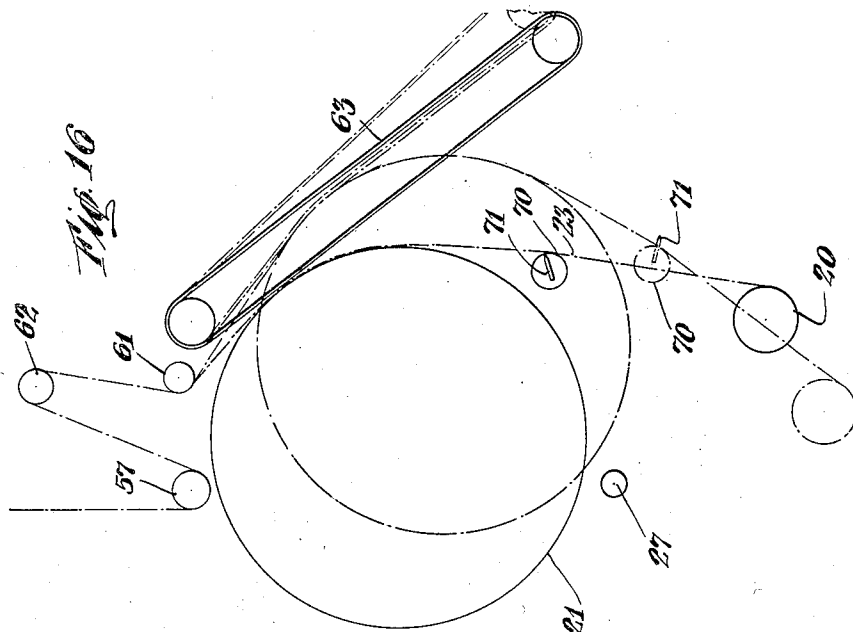
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WEB SUPPLY MEANS

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8 Sheets-Sheet 7



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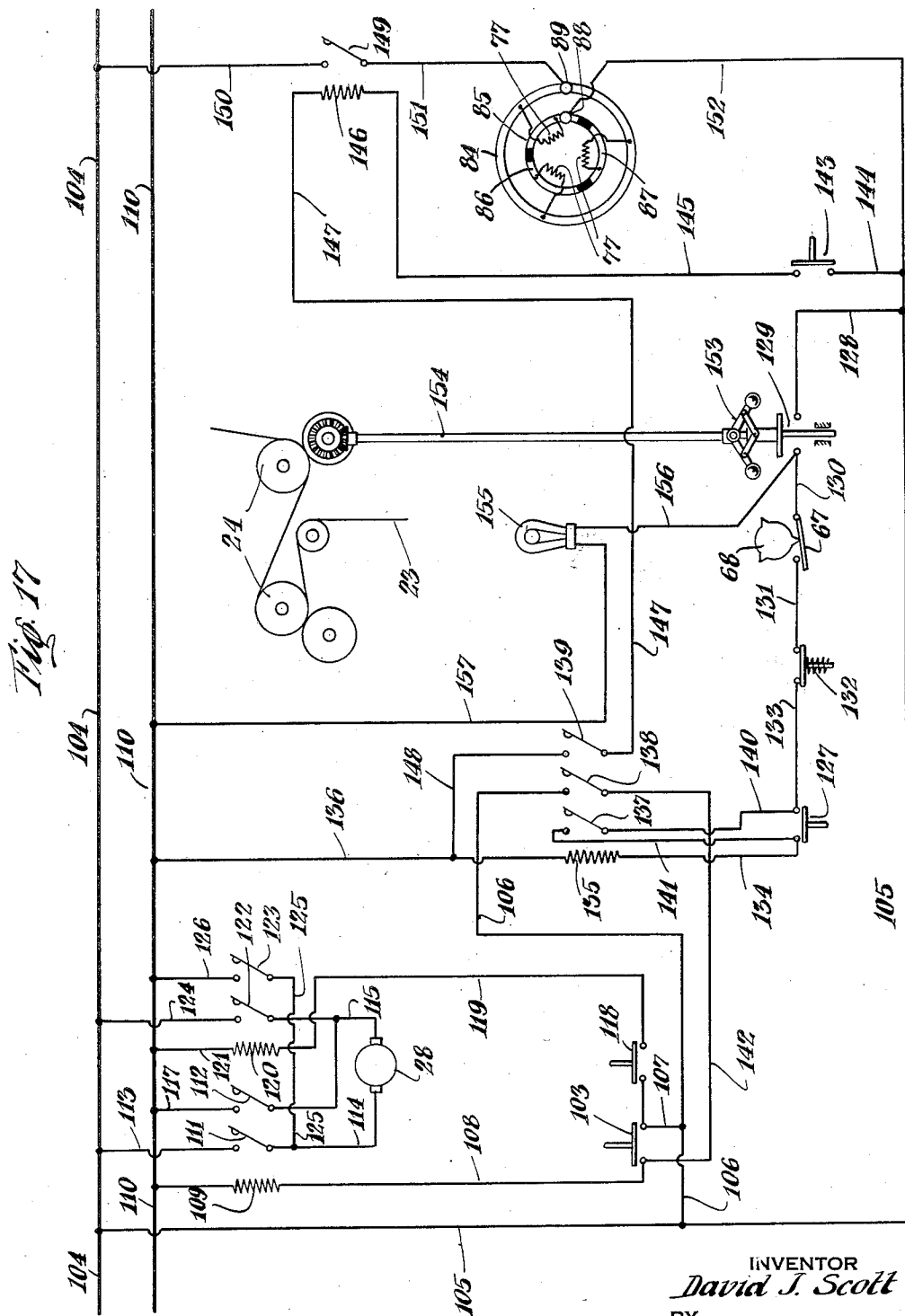
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WEB SUPPLY MEANS

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8 Sheets-Sheet 8



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UNITED STATES PATENT OFFICE

2,009,707

WEB SUPPLY MEANS

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Application November 15, 1932, Serial No. 642,714

18 Claims. (Cl. 242—58)

This invention relates generally to web supply means, and has more particularly reference to roll change mechanism such as is used in connection with printing or other web-pulling machines.

The main object and feature of the invention is to provide simple and effective means whereby a replenishing web roll can be substituted for an active web roll without the necessity of stopping the printing machine, or without slowing it down unduly, in such a way as to avoid undue stress on the running web when effecting a roll change. Other features of invention will appear as the specification proceeds.

In the accompanying drawings, the invention is disclosed in a concrete and preferred form in which:

Fig. 1 is a view in elevation, looking in the direction of arrow 1 of Fig. 2, showing a device embodying a preferred form of the invention;

Fig. 2 is a vertical sectional view substantially on the plane of line 2—2 of Fig. 1;

Fig. 3 is a fragmentary detail view of the limit switch, looking in the direction of arrow 3 of Fig. 1;

Fig. 4 is a detail sectional view substantially on the plane of line 4—4 of Fig. 2;

Fig. 5 is a view in elevation looking in the direction of arrow 5 of Fig. 2;

Fig. 6 is an enlarged sectional view substantially on the plane of line 6—6 of Fig. 1;

Fig. 7 is a view in elevation, partly broken away, of the web-severing device, looking substantially in the direction of arrows 7—7 of Fig. 6;

Fig. 8 is a view looking in the direction of arrow 8 of Fig. 7;

Fig. 9 is a longitudinal sectional view through a part of the web-severing device shown in Fig. 7;

Figs. 10 and 11 are transverse sectional views substantially on the plane of lines 10—10 and 11—11 respectively of Fig. 9;

Fig. 12 is a detail sectional view substantially on the plane of line 12—12 of Fig. 7;

Fig. 13 is an enlarged detail sectional view substantially on the plane of line 13—13 of Fig. 2;

Fig. 14 is a detail sectional view substantially on the plane of line 14—14 of Fig. 13;

Figs. 15 and 16 are diagrammatic views showing the steps in making a transfer from one roll to another; and

Fig. 17 is a diagrammatic view showing the electrical controlling means of the apparatus.

A plurality of rotatable web rolls (Figs. 2 and 6), here three in number, are employed, said rolls being indicated by 20, 21 and 22. 20 is the

active roll and has its running web 23 threaded into a printing or other machine 24 (Fig. 17) that unwinds the web from the roll. 21 and 22 are replenishing web rolls awaiting to be employed and which in turn become active rolls. The three rolls are carried by spaced-apart arms 25 of a spider 26, the center of rotation of which is indicated by shaft 27 and, when a roll change is to be effected, shaft 27 is turned clockwise in Fig. 2 to bring the periphery of replenishing roll 21 into contact with running web 23 so as to unite the webs of the active and replenishing rolls by means of a pasted joint in a manner well understood. Any suitable means can be employed to turn shaft 27 but, as here shown, an electric motor 28 is used for this purpose, said motor driving said shaft by a train of transmission elements here consisting of armature pinion 29, gears 30, shaft 31, worm 32, worm wheel 33, shaft 34, pinion 35 and gear 36. Arms 25 of the spider carry bearings 37 for the reception of rotatable core-engaging means or web roll supporting means 38 that are provided with brake drums 39 for the reception of brake shoes 40, said brake drums having non-radial cooling fins 41 that by rotation of the brake drums, during the unwinding operation, tend to cool the braking elements. Each brake shoe is actuated by a brake lever 42 pivotally connected to one brake shoe member at 43 and pivotally connected to the other brake shoe member by a link 44. Although each web roll supporting means is equipped with a brake mechanism, it is only desired to control the brake mechanism of the active web roll. In order to accomplish this, the following means are employed: a plurality of rockshafts 45 (Figs. 13 and 14) are supported by brackets 46 on shaft 27. On each rockshaft is an actuating lever 47 carrying a roller 48 to engage its corresponding brake lever. Also mounted on said rockshafts are a plurality of arms 49, one on each rockshaft and each carrying a roller 50. 51 indicates a cam to engage each roller 50 as the latter passes beneath the same, and said cam is pivotally carried by two levers 52 that are mounted on pins 53 supported on brackets 54 of the framework. Levers 52 are connected by link 55 and one of said levers is further pivotally connected to controller arm 56 which latter in turn is connected to controller roller 57 pivotally supported on shaft 58 which carries a balancing weight 59 and has connection with the plunger of a dashpot 60, in accordance with the well-known Jones tension construction. Web 23 is carried over rollers 61 and 62 and around roller 57, and said roller 57 moves

back and forth in response to the tightness or slackness of the web. Thus if the active web roll is rotating too fast in response to the pull of the printing machine, slack will accumulate in the web and said roller 57 will move to the right in Fig. 2 thereby exerting an upward pull on rod 56 which has the effect of bringing cam 51 nearer the center of shaft 27, thereby depressing roller 56 and actuating brake lever 42 to make the brake of the web roll more effective. Conversely, if the active web roll is rotating too slowly in response to the pull of the printing machine, web 23 will move roller 57 to the left in Fig. 2, and this will, through the connections previously described, render the brake of the active web roll less effective. It will be seen that when replenishing roll 21 is brought into contact with web 23 to make a pasted joint, it is necessary to provide a backing means for the running web. As here shown, this backing means consists of a set of tapes or aprons 63 carried by a frame 64 pivotally supported at 64^a on the main frame of the machine, and having sustaining means 64^b that admit of a limited pivotal movement of said frame but which normally hold the tapes out of contact with the running web. One end of the tapes may also be mounted in a spring-pressed bearing 66 that permits the tapes to more readily conform to the contour of the replenishing roll when the latter brings the running web against the tapes. Continued rotation of shaft 27 causes the replenishing roll to pass by the tapes to the final position occupied by roll 20 in Fig. 2. In order to avoid placing undue tension on the running web, these tapes have a speed in excess of the speed of the running web. Two small electric motors 65 are here utilized to tend to drive the tapes at this excessive speed, but the motors are of such character that they will be retarded when pressure is brought to bear against the tapes. Or the tapes may be considered a slip-friction drive, the slippage taking place either between the tapes and the running web or between the tapes and the pulleys over which they pass. The backing member therefore assists the running web in bringing the web of the replenishing roll up to the speed of the running web when the replenishing roll brings the running web against the backing member.

In addition to assisting the running web to bring the replenishing web up to speed, the driven backing member performs an additional function if the brake control means, previously described, are used. As will be understood, the amplitude of movement of roller 57 is such that it will respond to variations in tension of the running web within relatively narrow limits. Should it now be attempted, by turning the spider on center 27, to bring the periphery of replenishing roll 21 from the position shown in Fig. 15 into the successive positions shown in Fig. 16, it will be seen, owing to the fact that roll 21 is not rotating on its own axis at this time, that the running web from active roll 20 will be subjected not only to the retarding influence of its brake but also to the inertia of web roll 21, because the replenishing roll will not merely contact the running web, but will bring said web against the backing means, here tapes 63. This will cause such abnormal fluctuations in the tension of the running web that excessive movement of controller 57 and the brake mechanism will result. This condition is, however, avoided by the driven backing member which assists the running web and thereby prevents excessive movement of controller 57 and the brake mechanism.

If a motor, as 28, is utilized to turn the spider, it is desirable to employ a limit switch, as indicated in Fig. 3, where contact 67 controlling the circuit of the motor is shown open, this having been effected by one of the high points of cam 68, carried by shaft 27, at the time the web rolls reach the position indicated in Fig. 2. If desired this limit switch can also control motors 65, and said motors can be energized by the same switch that energizes motor 28 or can be constantly energized.

After the pasted joint between the webs has been effected, the web from the now practically exhausted roll can be severed by hand, but it is preferred to have a web-severing device carried by the spider, which device here takes the following form: carried by shaft 27 are three pairs of auxiliary arms 69 that are intermediate the arms 25 which carry the web rolls. Each pair of auxiliary arms carries a web-severing member, so that there is a device for the web of each web roll. 70 indicates a tubular member extending between two arms 69, and within this member, but capable of protrusion therefrom, is a severing blade 71 secured to bar 72 having cam slots 73 engaged by pins 74 carried by the brackets of the tubular member. It will be seen that when bar 72 is moved to the right in Figs. 7 and 9 (in opposition to spring 72^a), pins 74 and slots 73 will cause blade 71 to protrude from the tubular member. An antifriction roller 75 and a steadying member 76 facilitate this action. The lengthwise movement of bar 72 is effected by energizing and deenergizing solenoid or motor 77. Energization of said solenoid attracts plunger 78, and the lower end 79 of said plunger acts to depress one arm 80 of a bell crank pivoted at 81. The other arm 82 of the bell crank is engaged in slot 83 of bar 72, and it will therefore be seen that when the solenoid is energized said bar 72 is moved to the right in Figs. 7 and 9, and when said solenoid is deenergized the parts are restored to their normal position. In order to energize the solenoids, gear 36 carries two insulated rings, one of which, 84, is continuous, and the other of which is made up of three sectors 85, 86 and 87 insulated from each other and from 84. Contacting with these two rings are two brush members 88 and 89, and these are carried by a bell crank 90 (Figs. 2, 4 and 13) pivoted at 91 and provided with a spring 92 that tends to urge the shoes or brushes against the rings, and in fact constitutes a self-adjusting mounting so that if shaft 27 is moved longitudinally, as it sometimes is to bring the web roll into line with the printing cylinders, said brushes will remain in contact with the rings. It will be apparent that by these means the proper solenoid 77 can be energized at the proper time to sever the expiring web and that this can be done automatically or by hand.

93 indicates a reversible motor to adjust shaft 27 and its equipment endwise, and transmits its power, by means of armature pinion 94, to gear 95, and thence by means of gear 96 to worm 97 which latter engages a worm wheel 98. Worm wheel 98 is carried by a bushing 99 that is internally threaded and engages externally threaded stem 100 which therefore moves lengthwise in one direction or the other. Said stem is provided with a head 101 engaging the end of shaft 27 which therefore is made to slide in bearings 102.

A preferred form of electrical equipment is shown in Fig. 17. Motor 28 should be capable not

only of turning the spider to effect the bringing together of the two webs, but should also be capable of adjusting the position of the spider in either direction, and said motor is therefore reversible. By closing contact 103, current will flow from line wire 104, over wires 105, 106 and 107, contact 103, wire 108, coil or relay 109 to line wire 110. The energization of coil 109 closes contacts 111 and 112, and current now flows from line wire 104, over wire 113, contact 111, wire 114, motor 28, wires 115 and 116, contact 112, and wire 117 back to line wire 110. This will cause motor 28 to run in a forward direction to turn the spider clockwise in Fig. 2. When contact 118 is closed and 103 is open, current will flow from line wire 104, over wires 105, 106 and 107, contact 118, wire 119, coil or relay 120 and wire 121 back to line wire 110. The energization of coil 120 closes contacts 122 and 123, and current now flows from line wire 104, over wire 124, contact 122, wire 115, motor 28, wire 114, wire 125, contact 123, and wire 126 back to line wire 110. This will cause motor 28 to run in reverse direction to turn the spider counter-clockwise in Fig. 2.

When a roll change is to be effected, the following equipment may be used: contact 127 is closed thereby establishing a circuit from line wire 104, over wires 105 and 128, contact 129, wire 130, contact 67, wire 131, contact 132, wire 133, contact 127, wire 134, coil or magnet 135, and wire 136 back to line wire 110. Energization of coil 135 closes contacts 137, 138 and 139. When contact 137 is closed, it establishes a shunt around contact 127 from wire 133, wire 140, contact 137, wire 141, wire 134, magnet 135, wire 136 and line wire 110, and therefore contact 127 can be released without deenergizing coil or magnet 135. Consequently contacts 137, 138 and 139 will remain closed. When contact 138 is closed current will flow from line wire 104, over wires 105 and 106, contact 138, wire 142, wire 108, magnet 109 and back to line wire 110. It will be seen that this circuit shunts contact 103, but nevertheless energizes magnet 109 to thereby rotate motor 28 in a forward direction as previously described. If desired, motors 65 can be included in this arrangement by inserting them say in line 136. Contact 143 is now closed and current then flows from line wire 104, over wires 105 and 144, contact 143, wires 145, coil or magnet 146, wire 147, contact 139, and wires 148 and 136 back to line wire 110. It will be observed that this circuit cannot be established unless contact 139 was previously closed by magnet 135. The energization of magnet 146 closes contact 149, and current will now flow from line wire 104, wire 150, contact 149, wire 151, brush 89, ring 84, one of the coils or solenoids 77, one of the segments, in this case 85, shoe or brush 88, wires 152 and 144, contact 143, wire 145, coil 146, wire 147, contact 139, wires 148 and 136, back to line wire 110. Thus the web-severing device is actuated, and it will be noted that the circuit through the web-severing solenoid cannot be established unless the motor circuit has been previously closed by closing contact 127, because otherwise contact 149 will not be closed and that therefore the solenoid circuit is interlocked electrically with the motor circuit. Contact 129 is speed-governed being controlled by governor 153 and held closed when said governor is running below a given speed. The governor is driven by shaft 154 and the gearing shown from printing machine 24 so that, in the present case, a roll change cannot be effected unless the printing machine has had its speed reduced to a given

point. In order to readily ascertain when such reduced speed has been reached, a lamp or other indicating device as 155 may be employed and it will be seen that this lamp is included in a circuit between contact 129 and line wire 110, said circuit here consisting of wires 156 and 157, which is closed, even though contacts 127, 132 and 67 be open, because current can then flow from line wire 104, over wires 105 and 128, contact 129, wire 156, lamp 155, wire 157 and back to line wire 110.

A brief summary of the operation of the device is as follows: when the last previous roll change was effected, limit switch 67 was opened by one of the high points of cam 68 and thus all operating circuits were destroyed and rotation of shaft 27 was stopped, contact 67 remaining open. When it is now desired to make the next roll change, contact 103 is closed just long enough to energize motor 28 to turn shaft 27 sufficiently to bring the high point of cam 68 past contact 67 whereby the latter will close. Contact 127 will now be closed and (contacts 129, 67 and 132 being in their closed position) the circuit previously described will be established through motor 28 to thereby rotate shaft 27 to bring the replenishing roll against the running web so as to deflect the latter against the backing member. Contact 127 can be released as soon as magnet 135 becomes energized as said magnet will hold the motor circuit closed in the manner previously described. When a pasted joint has been made between the two webs, contact 143 is closed thereby actuating the web-severing solenoid while shaft 27 is still rotating. Upon completion of the required movement of shaft 27, contact 67 will be opened by the next high point of cam 68 and the circuits through the motor and the web-severing solenoid will be ruptured. Contact 132 is normally closed, but is a stop switch which can be opened at any time by the operator in case, for any reason, he desires to interrupt the roll change operation.

I claim:

1. Web supply means including: a support having an active web roll the web of which is threaded into a machine that unwinds the web from the roll; a support having a rotatable replenishing web roll the web of which is to be united to the running web; a backing member, normally out of contact with the running web, having a speed in excess of the speed of the running web but capable of a lower speed when pressure is exerted against it; and means to bring the periphery of the replenishing roll into contact with the running web under such pressure as to deflect such running web into engagement with the backing member so as to avoid placing undue tension on the running web when a joint is made between the two webs.

2. Web supply means including: a rotatable reel to support a plurality of rotatable web rolls, each of which is alternately an active roll with its web threaded into a machine and a replenishing roll the web of which is to be united to the running web of an active roll; a backing member, normally out of contact with the running web, having a speed in excess of the speed of the running web but capable of a lower speed when pressure is exerted against it; and means to turn the reel to bring the periphery of the replenishing roll into contact with the running web under such pressure as to deflect such running web into engagement with the backing member so as to

avoid placing undue tension on the running web when a joint is made between the two webs.

3. Web supply means including: a support having an active web roll the web of which is threaded into a machine that unwinds the web from the roll; a support having a rotatable replenishing web roll the web of which is to be united to the running web; a backing member normally out of contact with the running web; means, capable of being retarded by pressure exerted against the backing member, to tend to drive said backing member at a speed in excess of that of the running web; and means to bring the periphery of the replenishing roll into contact with the running web under such pressure as to deflect such running web into engagement with the backing member so as to avoid placing undue tension on the running web when a joint is made between the two webs.

4. Web supply means including: a rotatable reel to support a plurality of rotatable web rolls, each of which is alternately an active roll with its web threaded into a machine and a replenishing roll the web of which is to be united to the running web of an active roll; a backing member normally out of contact with the running web; means, capable of being retarded by pressure exerted against the backing member, to tend to drive said backing member at a speed in excess of that of the running web; and means to turn the reel to bring the periphery of the replenishing roll into contact with the running web under such pressure as to deflect such running web into engagement with the backing member so as to avoid placing undue tension on the running web when a joint is made between the two webs.

5. Web supply means including: a support having an active web roll the web of which is threaded into a machine that unwinds the web from the roll; a support having a rotatable replenishing web roll the web of which is to be united to the running web; a slip-friction backing member, normally out of contact with the running web, having a speed in excess of the speed of the running web; and means to bring the periphery of the replenishing roll into contact with the running web under such pressure as to deflect such running web into engagement with the backing member so as to avoid placing undue tension on the running web when a joint is made between the two webs.

6. Web supply means including: a support having an active web roll the web of which is threaded into a machine that unwinds the web from the roll; a support having a rotatable replenishing web roll the web of which is to be united to the running web; a slip-friction backing member, normally out of contact with the running web, having a speed in excess of the speed of the running web; and means to turn the reel to bring the periphery of the replenishing roll into contact with the running web under such pressure as to deflect such running web into engagement with the backing member so as to avoid placing undue tension on the running web when a joint is made between the two webs.

7. Web supply means including: a support having an active web roll the web of which is threaded into a machine that unwinds the web from the roll; variable brake mechanism that controls the speed of rotation of the active roll; a controller governed by the tension of the running web of the active roll to vary the effectiveness of the brake mechanism; a support having a rotatable

replenishing web roll the web of which is to be united to the running web; a backing member, normally out of contact with the running web, having a speed in excess of the speed of the running web but capable of a lower speed when pressure is exerted against it; and means to bring the periphery of the replenishing roll into contact with the running web under such pressure as to deflect such running web into engagement with the backing member so as to avoid placing undue tension on the running web and to prevent excessive movement of the controller and brake mechanism when a joint is made between the two webs.

8. Web supply means including: a rotatable reel to support a plurality of rotatable web rolls, each of which is alternately an active roll with its web threaded into a machine and a replenishing roll the web of which is to be united to the running web of an active roll; variable brake mechanism that controls the speed of rotation of the active roll; a controller governed by the tension of the running web of the active roll to vary the effectiveness of the brake mechanism; a backing member, normally out of contact with the running web, having a speed in excess of the speed of the running web but capable of a lower speed when pressure is exerted against it; and means to turn the reel to bring the periphery of the replenishing roll into contact with the running web under such pressure as to deflect such running web into engagement with the backing member so as to avoid placing undue tension on the running web and to prevent excessive movement of the controller and brake mechanism when a joint is made between the two webs.

9. In a web supply means: a rotatable reel to support a plurality of rotatable web rolls, each of which is alternately an active roll with its web threaded into a machine that unwinds the web from the roll and a replenishing roll the web of which is to be united to the running web of an active roll; a web-severing device for the running web; a motor to rotate the reel; a motor to actuate the web-severing device; means to actuate the reel motor; and means to actuate the motor of the web-severing device operatable only when the reel motor is being actuated.

10. In a web supply means: a rotatable reel to support a plurality of rotatable web rolls, each of which is alternately an active roll with its web threaded into a machine that unwinds the web from the roll and a replenishing roll the web of which is to be united to the running web of an active roll; a web-severing device for the running web; a motor to rotate the reel; a motor to actuate the web-severing device; means to actuate the reel motor; and means to actuate the motor of the web-severing device operatable only after the reel motor has been actuated for a given period.

11. In a web supply means: a rotatable reel to support a plurality of rotatable web rolls, each of which is alternately an active roll with its web threaded into a machine that unwinds the web from the roll and a replenishing roll the web of which is to be united to the running web of an active roll; a web-severing device for the running web; an electric motor to rotate the reel; an electro-magnetic device to actuate the web-severing device; means to energize the electro-magnetic device; and means to energize the reel motor so electrically interlocked with the energizing means of the electro-magnetic device that the

reel motor must be energized before the electromagnetic device can be energized.

12. Web supply means including: a support having an active web roll the running web of which is threaded into a machine that unwinds the web from the roll; a support having a rotatable replenishing web roll the web of which is to be united to the running web; means to bring the webs of the two rolls together to effect a joint therebetween; and means to prevent the bringing together of said webs unless the running web is moving below a given speed.

13. The combination with a web-pulling machine of web supply means including: a support having an active web roll the running web of which is threaded into the web-pulling machine; a support having a rotatable replenishing web roll the web of which is to be united to the running web; means to bring the webs of the two rolls together to effect a joinder thereof; and means to prevent the bringing together of said webs unless the pulling machine is moving below a given speed.

14. The combination of a printing machine; web roll change mechanism; means to actuate said mechanism to effect a roll change; and a device governed by the speed of the printing machine to prevent the roll change from being effected unless the printing machine is running below a given speed.

15. The combination of a printing machine; a rotatable reel to support a plurality of web rolls; means to rotate the reel to effect a roll change; and a device governed by the speed of the printing machine to prevent rotation of the reel unless the printing machine is running below a given speed.

16. The combination of a printing machine; a rotatable reel to support a plurality of web rolls; means to rotate the reel to effect a roll change; a device governed by the speed of the printing machine to prevent rotation of the reel unless the printing machine is running below a given speed; and means to rotate said reel regardless of the speed of the printing machine.

17. In a web supply means: a rotatable reel to support a plurality of rotatable web rolls, each of which is in turn an active roll with its running web threaded into a machine that unwinds the web from the roll, and a replenishing roll the web of which is to be united to the running web of an active roll; a brake mechanism for each roll carried by the reel; a web-severing device for each roll carried by the reel; and means controlled by the rotation of the reel to render the actuating means for both the brake mechanism and the web-severing device of a roll operatable when in active position and to render them inoperative when it moves out of active position.

18. In a web supply means: a rotatable shaft; a plurality of circumferentially-spaced main arms, to support rotatable web rolls, arranged in pairs on said shaft, the arms of each pair being spaced lengthwise of the shaft; a plurality of circumferentially-spaced auxiliary arms arranged in pairs and mounted independently of said main arms near opposite ends of said shaft between said main arms and the ends of the shaft and circumferentially intermediate said main arms; and a web-severing device extending between the arms of each pair of auxiliary arms.

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