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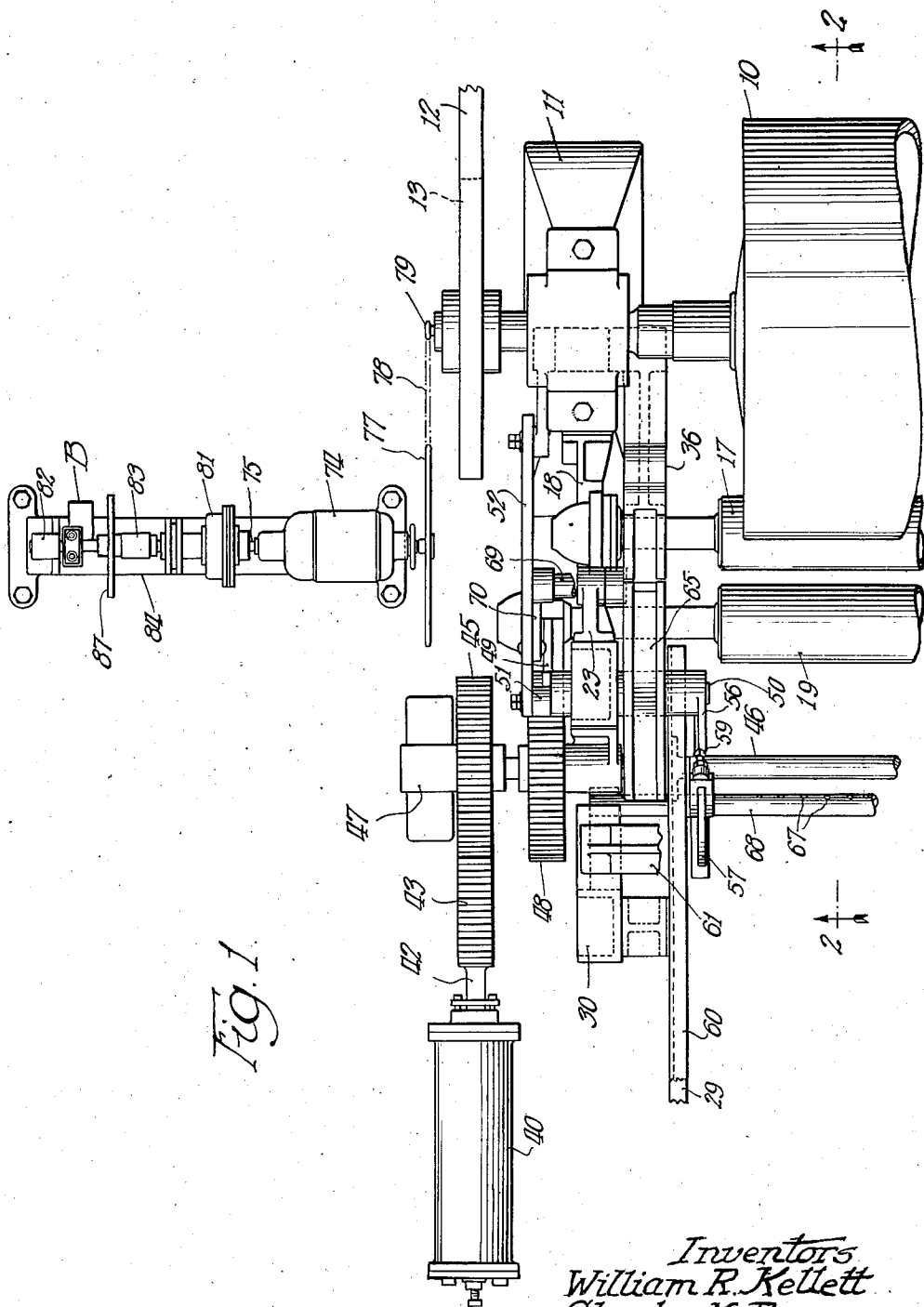
W. R. KELLETT ET AL

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PAPER REELING APPARATUS

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4 Sheets-Sheet 1



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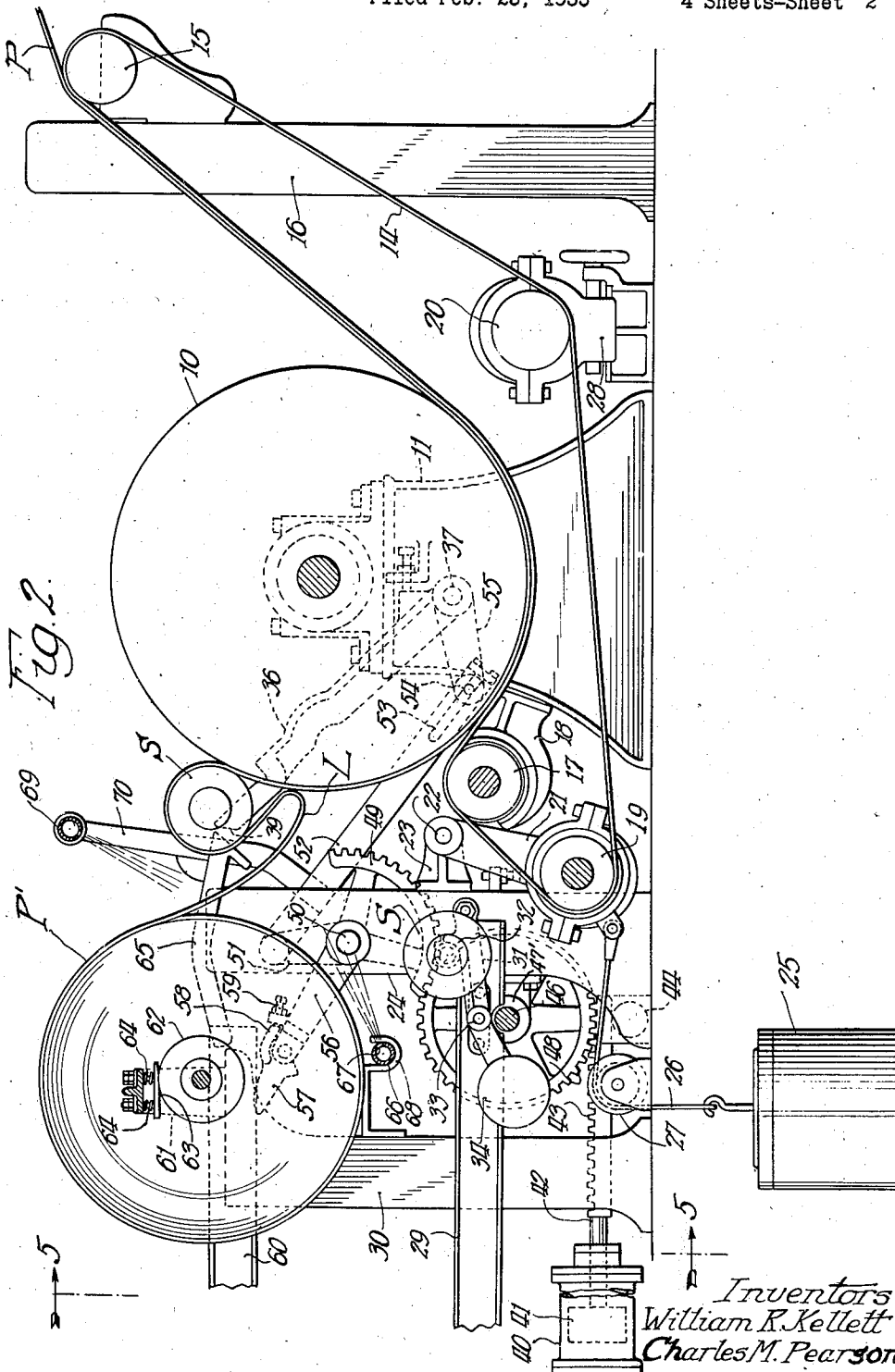
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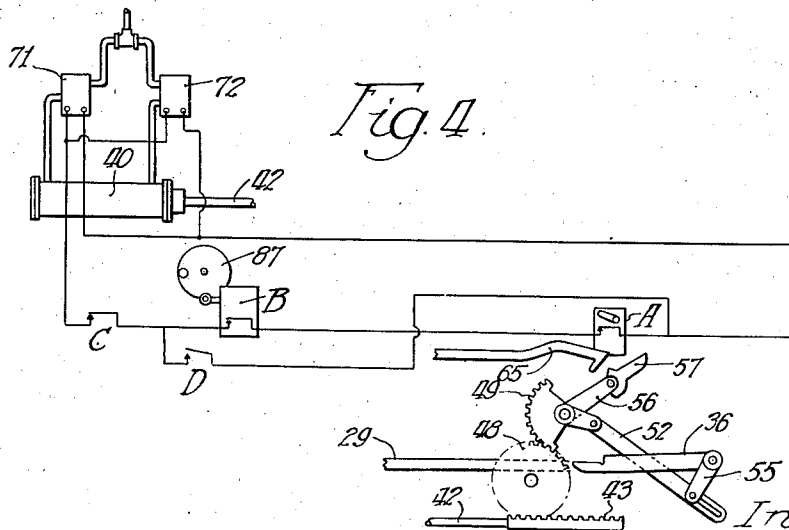
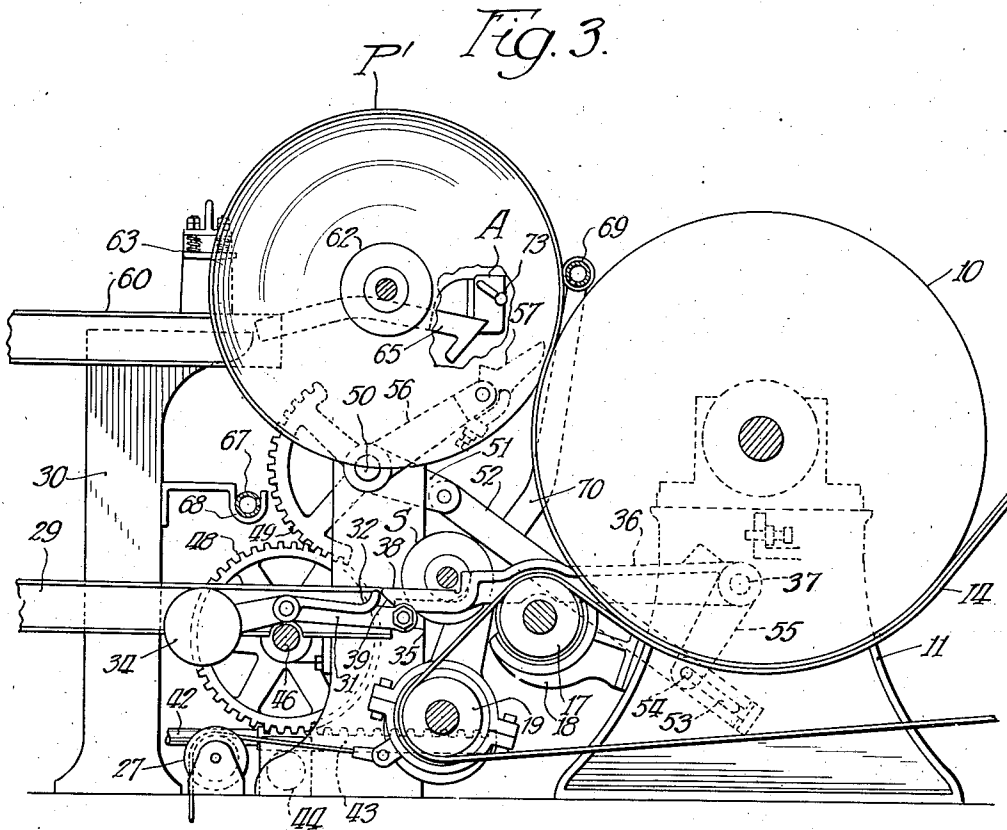
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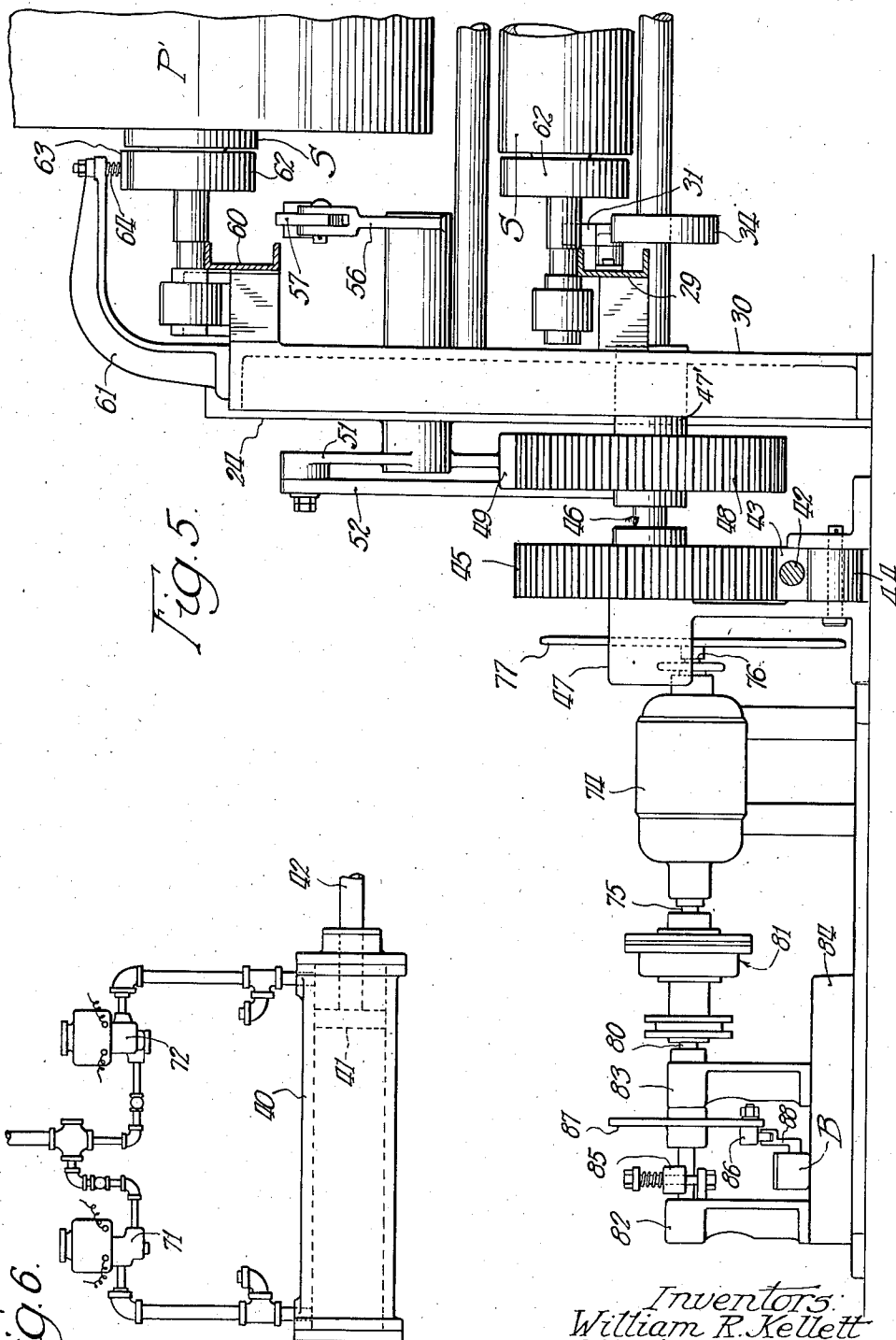
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PAPER REELING APPARATUS

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

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PAPER REELING APPARATUS

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13 Claims. (Cl. 242—65)

This invention relates to paper reeling apparatus and has particular reference to apparatus for winding a web of paper in predetermined lengths on suitable spools.

The main objects of the invention are to provide means for automatically transferring the web from a full roll to an empty spool; to provide means controlled by the spool and by the length of paper web wound on the roll for effecting operation of the automatic spool-changing mechanism; to provide such automatic mechanism which will operate efficiently and smoothly without jars or shocks; and, in general, it is the object of this invention to provide improved paper reeling apparatus.

Other objects and advantages of this invention will be understood by reference to the following specification and accompanying drawings (four sheets) wherein there is illustrated a paper reeling apparatus embodying a selected form of the invention.

In the drawings—

Fig. 1 is a plan.

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

Fig. 3 is a view similar to Fig. 2 but showing certain parts in a changed position.

Fig. 4 is a schematic illustration including a wiring diagram.

Fig. 5 is a section on the line 5—5 of Fig. 2; and

Fig. 6 is a detail illustration of certain pneumatic mechanism.

Referring now to the drawings, the apparatus illustrated includes a main drum 10 which is journaled in suitable end frames such as indicated at 11. The drum 10 may be driven from any suitable source of power, for example, by means of a power-driven belt 12 which extends around a pulley 13 carried by the drum shaft.

A paper feed belt 14 extends around a suitable roller 15 carried by a support 16, under the drum 10, over a roller 17 journaled in suitable brackets such as 18 which are carried by the end frames 11, around a roller 19 and under a roller 20. The belt 14 serves to carry a web of paper P from a paper machine, calendering rolls or other apparatus, and to deliver such web to the drum 10. For maintaining the belt 14 in properly adjusted relation to the drum 10, the roll 19 is journaled in brackets such as 21 which are suspended on pivots such as 22 carried by brackets 23. The brackets 23 are mounted on end frame members 24. The arm 21 is yieldingly urged to swing away from the drum 10 by means of a weight 25 which is connected to the arm 21 through the agency of a suitable cable 26. The cable 26 extends around a

roller 27 which is rotatably supported in a suitable bracket. The roller 20 may also conveniently be rotatably mounted in brackets 28 which may be adjustably mounted in any suitable manner to facilitate horizontal or other adjustment of the roller.

Empty spools on which the web of paper is to be wound are delivered to the apparatus on tracks 29 which may conveniently be in the form of channel iron members suitably mounted on supporting frame members 30. In Figs. 2 and 5, an empty spool is illustrated on the delivery end of the track 29 and is designated S. For preventing the empty spool S from rolling off the end of the track, an arm 31 provided with an upstanding portion 32, is pivoted on the inside of the track as indicated at 33. The arm 31 is normally urged to swing upwardly so as to maintain the projecting portion 32 in the path of the spool shaft, by means of a weighted arm 34. Of course it will be understood that tracks like 29 are provided for each end of the empty spools and that each track end is provided with the described spool-retaining arm arrangement. At the free end of the arm 31 there is provided an extension 35 which is adapted to be engaged by an arm presently to be described, for swinging the latch arm 31 downwardly to permit the roll S to roll off the end of the track to such arm. The tracks 29 are preferably inclined at a slight angle which is sufficient to cause the rolls to normally roll toward the delivery end of the track and off the track when the latch 31 is disengaged.

Arms such as indicated at 36 are pivoted as at 37 on the inside of the respective end frames 11 and these arms are adapted to carry an empty spool received from the tracks 29, to operative position relative to the drum (shown in Fig. 2) in which the paper web may be wound on the spool. The arms 36 are provided at their free ends with spool-receiving seats 38 and the end portions 39 of these arms serve to engage the extended ends of the latch arms 31 to disengage the same as previously explained. The position of the arm 36 illustrated in Fig. 3 is the lowered or spool-receiving position and the latch 31 is there shown in its disengaged position. By comparison of Figs. 2 and 3, it will be understood that the arms 36 are adapted to be swung upwardly on their pivots 37 to carry the empty spool received by the arms into said operative position.

For actuating the arms 36 and other parts which will presently be described, there is provided a pneumatic cylinder 40 having a piston 41 and piston rod 42 adapted to be reciprocated

in accordance with the admission of compressed air into one end of the cylinder and release of air from the other end. The piston rod 42 is provided at its free end with a rack bar 43, which is suitably supported for reciprocation

on a roller bearing 44. The rack bar meshes with a gear 45, which is secured to a shaft 46, the latter being journaled in suitable bearing stands such as 47 and 47' (see Figs. 2 and 5). The shaft 46 also carries gears such as 48 located adjacent the outside of the respective supporting frame members 24. The gears 45 and 48 are of like construction and in Fig. 2 are concentrically disposed and hence the gear 45 is directly in back of the gear 48. The gears 48 mesh respectively with gear segments such as 49 which are pivotally mounted as indicated at 50, on respective side frame members 24. It will be evident that by reciprocating the rack 43, the gear segment 49 will be oscillated. Extending from the hub of the gear segment 49 is an arm 51 to the free end of which there is pivotally connected one end of a link 52. The lower or opposite end of the link 52 is provided with an elongated slot 53 which receives a pin 54 projecting from an arm 55 which is rigidly connected to the arm 36.

When the rack bar 43 is moved outwardly, i. e., to the right in Fig. 2, the gear segment 49 will be turned in a clockwise direction with the result that the arm 36 will be lowered. It will be evident that the weight of the arm 36 causes the same to swing downwardly when permitted to do so by downward movement of the link 52. It will also be evident that when the rack bar 43 is moved toward the left in Fig. 2, the segment gear 49 will be turned in a counter-clockwise direction, thereby moving the link 52 upwardly. Initial upward movement of the link 52 will not actuate the arm 36 inasmuch as the slot 53 provides for lost motion in the connection between the link 52 and arm 55. However, when the lower end of the slot 53 engages the pin 54, upward swinging movement of the arm 36 will be effected.

The hub of the segment gear 49 is extended inwardly as indicated in Fig. 5 and at its inner end it is provided with an arm 56. The free end of the arm 56 is bifurcated as clearly shown in Fig. 5 and a member 57 is pivoted in said bifurcations. The member 57 is provided with a tail piece 58 having its end arranged to engage an adjustable stop screw 59 carried by a lug formed integral with the arm 56. The member 57 is thus permitted to swing in one direction on its pivotal connection with the arm 56, but limited in swinging in the opposite direction by the stop screw 59. The purpose of this construction will appear in the description of the operation of the mechanism hereinafter given.

For receiving full spools, there are provided tracks such as indicated at 60, these tracks being in vertical alignment with the tracks 29 and suitably mounted on the supporting frame members 30. Associated with the receiving ends of the tracks 60 are brake devices, which consist of brackets such as 61 mounted on the upper ends of the supporting frame elements 30 and extending inwardly so that their free ends overlap brake drum members 62 provided on the shafts of the spools. Plates or brake shoes such as indicated at 63 are normally pressed downwardly by means of coil springs 64 which are conveniently disposed around rods connected to

the brake shoe and slidable through the free end of the bracket 61.

For initially receiving a spool from the arm 36 after paper is wound on the spool and for conveying the full spool to the tracks 60, track extensions 65 are provided. The track extensions 65 are preferably of humped formation as best shown in Figs. 2 and 3 and these extensions may be supported by suitable connections to the tracks 60 and to the respective frame members 24.

For facilitating the automatic transfer of the paper web from a full spool to an empty spool, air showers are provided. One such shower is indicated at 66 and consists merely of a suitable pipe provided with air jets 67, the pipe being supported in suitable brackets 68 carried by the frame members 30. Another air shower is indicated at 69 and consists of a similar pipe carried by arms such as 70 which extend upwardly from the links 52. The source of compressed air for the shower pipes 66 and 69 may be any convenient source and in this instance the respective shower pipes may be connected to the air supply for the pneumatic cylinder 40.

In Fig. 6, the control of air supply for the pneumatic cylinder is shown as including a pair of electrically operated valves 71 and 72. The valve 71 is of a more or less standard type of solenoid controlled valve so arranged that when the current is turned on the valve 71 will be opened so as to permit compressed air to enter the left hand end of the cylinder. The valve 72 which is a similar but inverted type of solenoid controlled valve is so arranged that when the current is on, the right hand end of the cylinder is opened to the atmosphere to relieve or exhaust the air from the portion of the cylinder to the right of the piston. The valves 71 and 72 are furthermore so arranged that when the current is off, the valve 71 will open the left hand end of the cylinder to the atmosphere and the valve 72 will admit compressed air to the right hand end.

The electrical control of the valves 71 and 72 may be arranged for manual operation but it is preferably arranged so as to be both manually and automatically operable.

One switch for controlling the valves 71 and 72 is designated A, this switch being suitably mounted adjacent the end of the track extension 65 as clearly shown in Fig. 3. The switch A is a normally closed switch and is adapted to be opened by engagement of a portion of the spool shaft with the switch lever 73. The switch A is so arranged that when an empty spool is delivered to operative position relative to the drum 10, the switch A is opened to break the circuit controlling the valves 71 and 72. The arrangement is also such that the switch A is held open by the empty spool shaft until such time as the roll of paper on the spool shaft has reached such a side that the roll will be transferred from the end of the arm 36 to the track 65. When such transfer takes place, the switch A is closed.

Another automatic switch designated B (see Figs. 1 and 5) is provided for also controlling the valves 71 and 72, the specific purpose of this switch being to effect transfer of the paper web from a full roll to an empty spool at such time as a predetermined length of paper has been wound upon the full spool.

Paper measuring apparatus which controls the switch B is illustrated in Figs. 1 and 5. By reference to the said figures, it will be seen that 75

the measuring apparatus includes a speed-reducing unit 74 which may be of any suitable standard make, which can be set so that the slow speed shaft 75 thereof makes one revolution for any number (within practical limits) of revolutions of the high speed shaft 76 thereof. In the present instance, the unit 74 may be of such construction that the slow speed shaft 75 may be caused to rotate one revolution to any number between approximately 220 and 650 revolutions of the shaft 76. Depending upon the setting of the variable speed unit 74, the shaft 75 may be caused to rotate one revolution for any length of paper between approximately 2,000 and 6,000 feet. The high speed shaft 76 of the variable speed unit is provided with a large sprocket wheel 77 which is connected by means of a suitable chain indicated at 78 to a very small sprocket wheel 79 carried by the free end of the shaft of the drum 10.

The slow speed shaft 75 of the variable speed unit 74 is connected to a shaft 80 through the agency of a suitable magnetic or other clutch 81 so that the connection between the shaft 80 and shaft 75 may be broken to permit manual adjustment of the shaft 80 and parts carried thereby. The shaft 80 is rotatably mounted in suitable bearing members 82 and 83, which are supported on a base 84. A spring pressed drag element 85 is arranged to bear on the shaft 80 to prevent too free rotation thereof.

As clearly shown in Fig. 5, the switch B is mounted on the base 84 and it is controlled by a cam roller 86 mounted on a disc 87 which is in turn secured to the shaft 80. The arrangement is such that when the disc 87 has made one complete revolution, the cam roller 86 will engage the free end of the switch arm 88 to throw the switch. The switch B is also a normally closed switch, which is opened and, therefore, breaks the electric circuit controlling the valves 71 and 72 when the measured amount of paper has been wound on the spool.

The operation of the mechanism may be described as follows.

As shown in Fig. 3, a roll of paper has been built up to include the desired number of feet and it may be assumed that the measuring apparatus, best shown in Fig. 5, will now actuate the switch B to open the circuit controlling the valves 71 and 72. When the electric circuit is thus broken, the valves 71 and 72 will be so adjusted that compressed air will be delivered into the right hand end of the pneumatic cylinder 40 to thereby move the rack bar 43 to the left. Such movement of the rack bar, transmitted through the gears 46 and segments 49, causes the arm 53 and part 57 to swing in a counter-clockwise direction so that the part 57 engages the spool shaft and propels the full roll upwardly over the humps of the track extensions 65, whereupon the full roll rolls down the inclined portions of said extensions and comes to rest as an incident to engagement of the brake shoes 63 on the brake drums 62.

During the initial portion of the counter-clockwise movement of the arms 55, the links 52 are pulled upwardly, but because of the pin and slot connection with the arm 55, no movement is transmitted to the arm 36. During the time of the lost motion between the link 52 and arm 55, the full roll of paper is being moved away from operative position relative to the drum 10 so as to permit an empty spool to be delivered to such position. When the lower end of the slot 53 en-

gages the pin 54, continued upward movement of the link 52 will of course cause the arm 36 to be swung in a clockwise direction so as to thereby carry an empty spool S into paper-receiving position, as illustrated in Fig. 2.

By reference to Fig. 2, it will be seen that the paper web will then extend over and around the empty spool S and through a loop formation designated L, and thence to the full roll P¹. It will be understood that the loop L will be formed because of the fact that the paper web P is continuously fed to the drum 10 while the rotation of the full roll P¹ is stopped by the described brake arrangement. The air showers 66 and 69 assist in forming the loop L by blowing the paper web in the proper direction. The lower shower 67 also serves to direct the paper loop into engagement with the web of paper coming up on the drum 10 so that the loop is thereby carried into the nip between the empty spool S and the drum 20 to thereby attach the paper web to the empty spool. When the paper web is of a thin and light character such as a filmy crepe or tissue paper, the portion of the web between the empty spool and the full roll will be readily broken so as to separate the web from the full roll and to permit continued winding of the web on the empty spool. In the case of heavier paper, various well known arrangements for severing or breaking the web may be utilized. In the present instance, the mechanism is illustrated as arranged for handling thin crepe paper which may be readily broken and hence no severing mechanism is illustrated.

Various other arrangements for directing the web of paper into winding engagement with the empty spool S may obviously be used instead of the air showers described and, in fact, the mechanism has been successfully operated without any air shower or similar mechanism. The air for the showers 66 and 69 may be controlled by the valves 71 and 72 or it may be independently controlled as desired.

When an empty spool S is raised to the operative position illustrated in Fig. 2, the switch A is opened. Inasmuch as the switch B is already open, the opening of the switch A has no immediate effect on the electric circuit or on the valves 71 and 72. However, the disc 87 is continuously driven by reason of its connection to the drum and hence the cam roller 86 will soon release the switch arm 88 and permit the same to again close the circuit. Hence when the switch B closes the circuit, the circuit nevertheless remains broken by the switch A until such time as the empty spool is filled to such a point that it is transferred from the arm 36 to the track extension 65. When such transfer takes place, the switch A will again be closed, whereupon the circuit is again completed and the valves 71 and 72 so adjusted that the air pressure is turned to the left end of the cylinder to thereby cause the rack 73 to move outwardly or to the right, with the result that the arm 36 is again lowered to the position illustrated in Fig. 3. The arm 56 is also returned from its advanced position as shown in Fig. 2, to its starting position as shown in Fig. 3. In such rearward movement of the arm 56, the back edge of the end members 57 engage the spool shaft and swing on their respective pivots so as to pass the spool shaft without pressing the partially completed roll of paper against the drum 10. When the part 77 clears the spool, a suitable spring arrangement associated with the pivot pin or otherwise (not shown) serves to restore the part to its operative position as shown in Fig. 3.

By reference to the wiring diagram shown in Fig. 4, it will be noted that switches C and D are also incorporated in the electric circuit. The switch C is a normally closed switch and is provided for the purpose of permitting manual control in place of the paper-measuring switch B so that the winding of the paper web on one roll may be terminated at any desired time and a new roll started. The switch D is a normally open switch and is so arranged that by closing the circuit therewith, the arms 36 may be lowered independently of the action of the spool on the switch A. In other words, while a spool is in operative position holding the switch A open, the switch D may be manually closed to cause the arms 36 to be lowered.

By the described arrangement of automatic switches and electrically controlled valves 71 and 72, the operation of the paper reeling mechanism may be completely automatic. It being only necessary for an attendant to supply the apparatus with empty spools and to release the full rolls from the brake devices.

Changes in the described structure may be made without departing from the spirit of the invention, the scope of which should be determined by reference to the following claims, the same being construed as broadly as possible consistent with the state of the art.

We claim:

1. In paper reeling apparatus, the combination of a drum, means rotatably supporting the drum, means for delivering a web of paper to the drum, a movable arm for delivering and temporarily supporting a spool in operative position relative to the drum for effecting winding of said web on said spool, a track for receiving said spool from said arm, pneumatic means for actuating said movable arm, and electric means for controlling said pneumatic arm actuating means.

2. In paper reeling apparatus, the combination of a drum, means rotatably supporting the drum, means for delivering a web of paper to the drum, a movable arm for delivering and temporarily supporting a spool in operative position relative to the drum for effecting winding of said web on said spool, a track for receiving said spool from said arm, pneumatic means for actuating said movable arm, and electric means for controlling the operation of said pneumatic means, said electric means including an electric switch actuated by the spool as an incident to its transfer from said arm to said track.

3. In paper reeling apparatus, the combination of a drum, means rotatably supporting the drum, means for delivering a web of paper to the drum, a movable arm for delivering and temporarily supporting a spool in operative position relative to the drum for effecting winding of said web on said spool, a track for receiving said spool from said arm, pneumatic means for actuating said movable arm, electric means for controlling the operation of said pneumatic means, said electric means including an electric switch actuated by the spool as an incident to its transfer from said arm to said track, means for measuring the length of web wound on said spool, and electric switch means actuated by said measuring means for also controlling the operation of said pneumatic means.

4. In paper reeling apparatus, the combination of a drum, means rotatably supporting the drum, means for delivering a web of paper to

the drum, a movable arm for delivering and temporarily supporting a spool in operative position relative to the drum for effecting winding of said web on said spool, a track for receiving said spool from said arm, and electric means for controlling the operation of said movable arm, said electric means including an electric switch actuated by the spool as an incident to its transfer from said arm to said track.

5. In paper reeling apparatus, the combination of a drum, means rotatably supporting the drum, means for delivering a web of paper to the drum, a movable arm for delivering and temporarily supporting a spool in operative position relative to the drum for effecting winding of said web on said spool, a track for receiving said spool from said arm, electric means for controlling the operation of said movable arm, said electric means including an electric switch actuated by the spool as an incident to its transfer from said arm to said track, means for measuring the length of web wound on said spool, and electric switch means actuated by said measuring means for also controlling the operation of said movable arm.

6. In paper reeling apparatus, the combination of a drum, means rotatably supporting the drum, means for delivering a web of paper to the drum, a movable arm for delivering and temporarily supporting a spool in operative position relative to the drum for effecting winding of said web on said spool, a track for receiving said spool from said arm, pneumatic means for actuating said movable arm, and means, actuated by the spool as an incident to its transfer from said arm to said track, for controlling the operation of said pneumatic means.

7. In paper reeling apparatus, the combination of a drum, means rotatably supporting the drum, means for delivering a web of paper to the drum, a movable arm for delivering and temporarily supporting a spool in operative position relative to the drum for effecting winding of said web on said spool, a track for receiving said spool from said arm, pneumatic means for actuating said movable arm, means for measuring the length of paper wound on said spool, and a pair of devices, respectively actuated by the spool as an incident to its transfer from said arm to said track and by said measuring means, for controlling the operation of said pneumatic means.

8. In paper reeling apparatus, the combination of a drum, means rotatably supporting the drum, means for delivering a web of paper to the drum, a movable arm for delivering and temporarily supporting a spool in operative position relative to the drum for effecting winding of said web on said spool, a track for receiving said spool from said arm, an arm for propelling the full spool along said track away from said operative position, means actuated by the spool, as an incident to its transfer from said supporting arm to said track, for effecting movement of said arm to inoperative position for receiving an empty spool, said means also serving to effect movement of said propelling arm to starting position preparatory to propelling the transferred spool along the track, means for measuring the length of the web wound on said full spool, and means actuated by said measuring means for effecting movement of said supporting arm to operative position and movement of said propelling arm to propel the filled spool along the track.

9. In paper reeling apparatus of the class described, the combination of a drum, means for

delivering a web of paper to said drum, a spool, a track for supporting said spool in operative position relative to said drum for effecting winding of the web of paper on the spool, a pivoted arm, means for effecting swinging movement of said arm on its pivot alternately in opposite directions to propel the spool when filled along said track and thereafter to return the arm to starting position, and means for delivering an empty spool to said operative position when said arm is in forward position, said arm having a hinged member constituting its outer end portion, and said hinged member being adapted to fold on its hinge to pass under said empty spool when the arm is returned to starting position.

10. In paper reeling apparatus, the combination of a drum, means rotatably supporting the drum, means for delivering a web of paper to the drum, a movable arm for delivering and temporarily supporting a spool in operative position relative to the drum for effecting winding of said web of said spool, a track for receiving said spool from said arm, a second arm for engaging the spool on said track to propel the spool along said track away from said operative position, driving means for actuating both of said arms, said driving means including a lost-motion connection with said spool delivering arm so as to effect delivery of an empty spool after the spool on said track is sufficiently propelled away from said operative position.

11. In paper reeling apparatus, the combination of a drum, means rotatably supporting the drum, means for delivering a web of paper to the drum, a movable arm for delivering and temporarily supporting a spool in operative position relative to the drum for effecting winding of said web on said spool, a track for receiving said spool from said arm, an arm for engaging the spool on said track to propel the spool along said track away from said operative position, means associated with said track for stopping rotation of the full spool, and means for actuating said arms, the arrangement being such that the empty spool

being delivered by said first mentioned arm is caused to engage the paper web intermediate the reel and the spool being propelled along said track for facilitating transfer of the web to said empty spool for winding thereon.

12. In paper reeling apparatus, the combination of a drum, means rotatably supporting the drum, means for delivering a web of paper to said drum, means for supporting a spool in operative position relative to said drum to effect winding of the paper web on said spool, means for automatically discharging the spool when full and transferring the paper web to an empty spool, and means for measuring the length of the web wound on the spool and for effecting operation of said transferring means when a predetermined length of the web is wound on the spool, said measuring means including a variable speed drive unit, means connecting said unit to the drum for driving the unit, a disengageable clutch interposed in said driving connection to facilitate adjustment of said unit, a cam driven by said unit, and means actuated by said cam for effecting operation of said transferring means.

13. In paper reeling apparatus, the combination of a rotatably supported drum, said drum being adapted to receive a web of paper to be wound on a spool, means for supporting an empty spool in proximity but not in paper receiving position relative to said drum, a movable arm for receiving a spool from said means and for delivering and temporarily supporting such spool in paper receiving position relative to the drum for effecting winding of said web on said spool, a fixed track having a portion disposed with respect to the temporarily supported spool as to be adapted to receive such spool from said arm as an incident to enlargement of the paper roll on the spool due to the winding of the web thereon, said track overlying said empty spool supporting means, and means for actuating said movable arm.

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