June 1, 1937. J. J. LOGAN 2,082,705

LOCALIZER FOR WEB CUTTING MACHINES

Filed Nov. 3, 1931 2 Sheets-Sheet 1

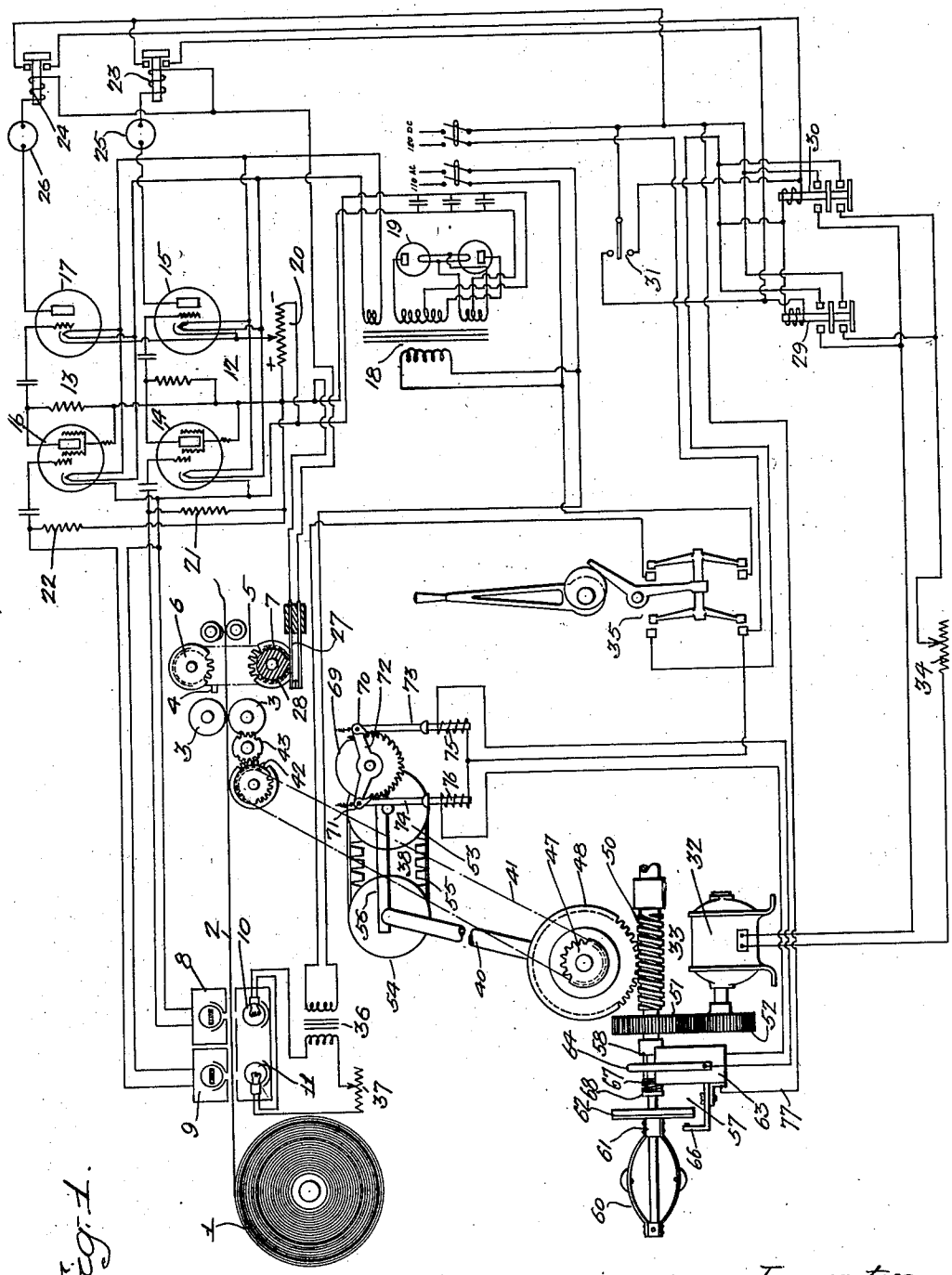

Fig. 1.

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Fig. 2.

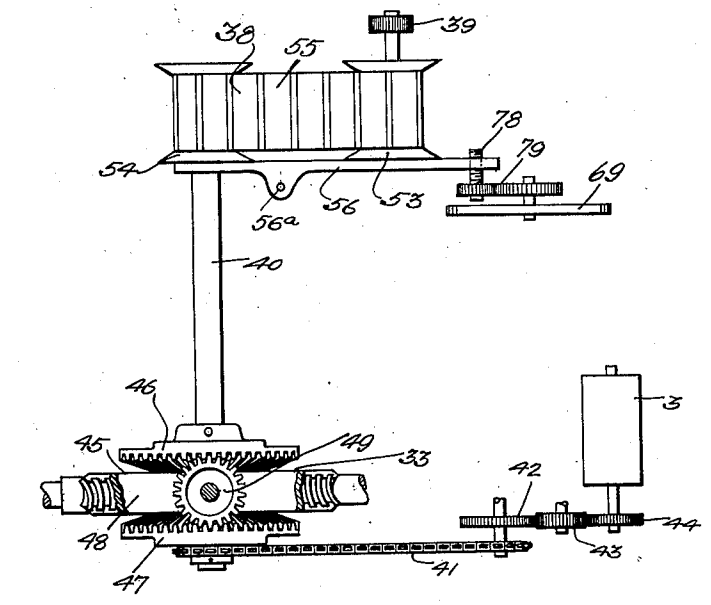
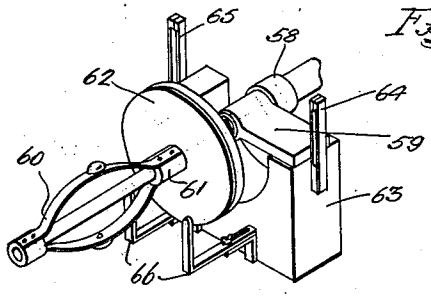


Fig. 3.



Inventor:
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UNITED STATES PATENT OFFICE

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LOCALIZER FOR WEB CUTTING MACHINES

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Application November 3, 1931, Serial No. 572,348

17 Claims. (Cl. 271—2.6)

The present invention relates to apparatus for automatically correcting the position of a web in a web-feeding and cutting machine, such, for example, as is incorporated in paper bag manufacturing apparatus, wherein predetermined lengths of printed or marked web are cut and then individual bags are formed from these lengths. Otherwise stated, the invention relates to apparatus for automatically localizing a web at predetermined intervals.

The general object of the invention is to provide a device which functions in a highly efficient manner and which constitutes an improvement over those heretofore used for the intended purpose.

The improved device of the invention, as illustrated herein, makes use of two light sensitive cells which are arranged so as to respond respectively to backward and forward positioning of the web when it is to be severed. These cells when activated energize highly sensitive amplifiers which, in turn, energize relays to control a variable-speed power-transmitting device interposed in the drive for the draw rolls of the web-feeding machine. A second variable-speed power-transmitting device is also interposed in the said drive and arranged to be controlled by the first-mentioned power-transmitting device to assist the same in correcting the web position. An important feature of the device resides in the provision of means for normally rendering the control system inoperative and for rendering such system operative only at the predetermined intervals just prior to cutting of the web.

The above and other objects as well as the details of construction and the mode of operation of the device of the invention will be more clearly apparent from the following detailed description when read in connection with the accompanying drawings. In the drawings:

Fig. 1 is a schematic diagram of the apparatus of the invention;

Fig. 2 is a plan view of the elements comprising the drive for the draw rolls, illustrating clearly the previously mentioned variable-speed power-transmitting device; and

Fig. 3 is a detail view of the governor-controlled directional switch which functions to control the second power-transmitting device.

Referring to Fig. 1 of the drawings, there is shown a take-off roll 1 upon which the printed or otherwise marked web 2 is wound. Upon leaving the take-off roll, the web passes between draw rolls 3 and predetermined lengths thereof are cut by knife 4 carried by suitable actuating mechanism here illustrated as comprising a flexible connection 5 and sprocket wheels 6 and 7. The above elements are all commonly found in web-cutting machines and are merely illustrated diagrammatically herein for the purpose of disclosing the invention. The draw rolls and web-cutting mechanism may be actuated by any suitable source or sources of power (not shown), but the draw rolls are, in the present instance, driven through the previously-mentioned power-transmitting devices, as will be more clearly apparent hereinafter.

As is well known, in such a machine, the web sometimes becomes displaced or assumes an incorrect position due to causes which need not be enumerated here. The web may assume an incorrect forward position commonly spoken of as "creep" or it may assume a backward position, commonly known as "lag", and if not corrected, this condition will necessarily result in improper cutting of the web. The successive lengths of web which are to be cut will not only be incorrect in dimension but will vary in their relative dimensions. It is the purpose of this invention to effectively overcome this inherent defect in the usual web-cutting machine. It is to be understood that the word "web", as used herein, is to be construed broadly as meaning any continuous length of sheet material. It is necessary that the web be to some degree transparent so as to permit the transmission of light therethrough to practice the invention as illustrated herein. The opaque markings on the web, which control the response of the light sensitive cells utilized, may take any form and may be either designs which are to appear on a completed bag, for example, or marks purposely placed on the web for the sole purpose of the invention. For the purpose of the present description, the word "design" will be used to indicate any desired marking or markings on the web.

In accordance with the present invention, there is disposed adjacent web 2 at a suitable position along its length, a pair of light sensitive cells 8 and 9, which are adapted to respond respectively to "lag" and "creep" of the web, as will be more clearly apparent hereinafter. Cooperatively associated with cells 8 and 9, there are positioned on the opposite side of the web light sources 10 and 11 which are arranged to emit light beams in the direction of cells 8 and 9, respectively. The cells and lights may each be arranged in unitary structures or they may constitute mechanically separate elements. Cells 8 and 9 are con-

nected respectively to amplifier circuits 12 and 13. These circuits are similar and each may comprise one or more amplifying devices such as conventional vacuum tubes to constitute a single or multistage amplifier system. Preferably each of these amplifier circuits comprises a pair of vacuum tube amplifiers of modern type. As illustrated, circuit 12 comprises a "screen grid" vacuum tube 14 and a power amplifier tube 15. Circuit 13 comprises similar tubes 16 and 17, respectively. The tubes constituting the amplifying stages in these respective circuits are preferably resistance coupled, as illustrated. Since vacuum tube amplifiers in general, and those illustrated and preferred, are well known in connection with radio and analogous arts, it is unnecessary here to describe in detail the devices and their circuits. It suffices to state that they are arranged in conventional manner to give a desired high degree of amplification. The chief reason that the specific types of tubes and their arrangements illustrated herein are preferred is that they give the desired high gain or amplification to convert the minute current impulses from the light sensitive cells into currents of appreciable amplitude.

The thermionic or vacuum tube amplifiers may have their various elements or electrodes supplied with the necessary energy from a single source of alternating current AC. In order to supply the necessary voltages for the vacuum tubes, a conventional power supply unit comprising a transformer 18 and rectifier tubes 19 may be utilized. Here again, it is unnecessary to describe in detail this power supply unit which is commonly known in connection with radio. Since the plates or anodes of tubes 15 and 17 require a lower voltage than those of tubes 14 and 16, a potential divider or potentiometer 20 is connected across the output of the power supply unit. The necessary voltages may be obtained by connection to the potentiometer as illustrated.

It will be noted that resistors 21 and 22 are connected across the input circuits of tubes 14 and 16, respectively, and these resistors are included respectively in series circuits which include cells 8 and 9 and the output of the power supply unit. It will be apparent then that current flowing in these series circuits, and through resistors 21 and 22 included therein, will be proportional to the light falling upon the light sensitive cells. The voltage or potential drop across the resistors will, of course, be proportional to the current and, therefore, proportional to the light entering the cells. These voltage drops, although feeble, may be amplified to the desired degree by means of the amplifier circuits illustrated.

The windings of a pair of sensitive relays 23 and 24, respectively, are included in the plate or anode circuits of tubes 15 and 17. A pair of milliammeters 25 and 26 may also be included in these circuits to enable the determination of the current amplitude at any desired time. A cam-actuated switch 27 is common to both anode circuits of tubes 15 and 17 and serves to open and close these circuits, thereby rendering the amplifier systems inoperative and operative. In order to render the amplifier circuits operative only at the times that web 2 is to be cut, a cam 28 is provided which engages one of the flexible contact arms of switch 27 to close the same only at the desired times. The actuating cam may be carried by the same shaft as carries one of the sprocket wheels of the cutter mechanism, in the present instance, it being illustrated as mounted on the shaft of wheel 7. Relays 23 and 24 have their contacts connected in parallel branch circuits which also include the windings of relays 29 and 30, respectively. These parallel branch circuits are connected across a source of unidirectional current DC, as illustrated. From this arrangement, it will be apparent that relays 23 and 24 are adapted to selectively control relays 29 and 30 respectively. In order to permit selective manual energization of relays 29 and 30 in any emergency which may necessitate the same, there is provided a double-throw switch 31 arranged so as to close a circuit for either of the relays depending upon its manner of closure. This switch is illustrated schematically but may, of course, take any desired form. For example, a switch of conventional type having a pair of push buttons to close its contacts selectively may be used.

The purpose of relays 29 and 30 is to control a reversible motor 32 of a variable-speed power-transmitting device designated generally by reference character 33, which will be described in detail hereinafter. To carry out the desired end, motor 32 is connected to source DC through the medium of the contacts of relays 29 and 30, the connections being such that the relays, when alternately energized, function to reverse the polarity of the motor, thereby reversing its direction of rotation. Normally, the motor circuit is open and energization of either of the relays serves to start the motor in one direction or the other, depending upon which relay is energized. A manually controllable rheostat 34 may be connected in the motor circuit. A hand lever operable switch 35 has one set of contacts included in the motor circuit to control the same and its other set of contacts controls the energizing circuits for light sources 10 and 11. This switch constitutes a manually operable master switch which must be actuated to render the apparatus of the invention operative. Light sources 10 and 11 may be energized from the alternating current source AC through the medium of transformer 36 and a variable resistance 37.

In Fig. 2, there is illustrated more clearly the power drive for draw rolls 3 and it will be noted that this drive includes power-transmission device 33, which has already been mentioned, and a second power-transmitting device 38 to be described more in detail hereinafter. A gear 39 is arranged to be driven by any suitable source of power (not shown) such, for example, as an electric motor and this gear drives the draw rolls through device 38, device 33, shaft 40 coupling these devices, chain 41, and gears 42, 43 and 44, respectively.

Considering the details of construction of the device 33, it will be noted that it comprises a differential gear assembly 45, which is adapted to have its speed transmission ratio varied by means of motor 32. This differential gear arrangement comprises a bevel gear 46 carried by and rigidly attached to shaft 40, a second bevel gear 47 mounted upon the end of shaft 40 but free to rotate thereon, and a ring gear 48 carrying one or more pinions 49 which are interposed between the bevel gears and in mesh with the same. A worm 50 meshes with ring gear 48 which serves as a worm-wheel. The shaft of worm 50 is connected through gears 51 and 52 (see Fig. 1) to the shaft of motor 32 and is adapted to be driven thereby. Normally, motor 32 is inoperative and chain 41 is driven by shaft 40 through gears 46, 49 and 47 at a certain predetermined ratio such, for example, as a 1 to 1

ratio. When motor 32 operates to turn worm 50, however, thereby rotating ring gear 48, the transmission ratio between gears 46 and 47 is increased or decreased depending upon the direction of rotation of the motor. Thus, motor 32 and the elements driven thereby serve to increase or decrease the speed of the draw rolls in response to the previously-described control devices to correctly position the web when necessary.

The second variable-speed power-transmission device 38 comprises a drive which is commonly known as a "Reeves" drive. These devices are well known and it is deemed unnecessary to describe elaborately the construction thereof. For the purpose of the present disclosure, it suffices to state that such a device comprises a pair of cone pulleys 53 and 54 connected by a link driving member 55. The cone pulleys are each formed in separable parts or halves, one of which is movable longitudinally of the axis of the pulley by a pivoted yoke 56. This yoke is pivoted intermediate its ends at 56a and functions to move the movable parts of the respective cone pulleys in opposite directions, thereby increasing the effective driving diameter of one pulley while decreasing that of the other. It is customary practice to arrange actuating means for yoke 56, either in the form of a hand-operated device or an automatic device. The purpose of the Reeves drive in the present apparatus is to assist device 33 to correctly position the web when the web has become improperly positioned to such a degree as to necessitate motor 32 running at an excessive speed. Occasionally, the web becomes improperly positioned to such an excessive degree and without some such provision as is in the present invention, proper cutting thereof would be impossible.

The present invention contemplates control of the ratio of the Reeves drive by device 33. More specifically stated, the speed of motor 32, which constitutes an element of device 33, is utilized to control the ratio of the Reeves drive. To accomplish this purpose, there is provided a governor-controlled directional switch designated generally by reference character 57 (see Fig. 3). There is provided adjacent gear 51 on the worm shaft a collar 58, which prevents movement along the shaft of a rotatable arm 59, whose purpose will be clearly understood later. A governor construction 60 of conventional form is provided at the end of the shaft and has attached to its longitudinally movable sleeve 61 a metal disk 62. A recessed supporting block 63 is disposed for cooperation with arm 59 and carries normally open sets of switch contacts 64 and 65. This block also carries adjustable contact brackets 66, the upstanding arms or contact portions of these arms being disposed in the path of disk 62, as clearly illustrated in Fig. 1. A coil spring 67 is arranged on the shaft between the hub of arm 59 and a stationary collar 68. Arm 59 is free to rotate upon the shaft but during periods of standstill, the spring constitutes a frictional connection between the shaft and the arm to cause the arm to rotate with the shaft during initial movement thereof and prior to the overcoming of the static friction of the elements. Arm 59 is of such dimension that it engages the inner contact arm of either of switches 64 and 65 when actuated in the direction thereof. The supporting block serves to prevent further movement of arm 59 than that desired. As clearly apparent from Fig. 3, the arm is adapted to move through a half portion of the shaft.

In order to control the pivoted yoke 56 described above in connection with the "Reeves" drive, there is provided a ratchet wheel 69 having opposed sets of teeth and cooperating pawls 70 and 71. The ratchet wheel is adapted to pivotally actuate yoke 56 when it rotates and to this end, a suitable worm 78 and gear connection 79 between the ratchet wheel shaft and yoke 56 may be utilized. Pawls 70 and 71 are carried upon a pivotal structure 72 mounted loosely upon the ratchet wheel shaft and having vertical arms 73 and 74, the lower ends of which constitute the cores for solenoids 75 and 76, respectively. The purpose of this arrangement is to enable selective rotation of ratchet wheel 69 in either direction depending upon which of the solenoids is energized to actuate yoke 56 and thereby vary the speed ratio of the Reeves drive a desired amount. Pawls 70 and 71 are each provided with springs which normally maintain the pawls and their pivotal supporting structure in such position that the pawls are just in engagement with the ratchet wheel. Energization of either solenoid causes the associated pawl to actuate the ratchet wheel and the other pawl to move out of engagement with the wheel.

The windings of solenoids 75 and 76 are connected across the motor supply circuit in respective parallel branch circuits which include respectively switches 64 and 65. A common conductor 77 for these parallel branch circuits is connected from one side of the supply circuit to metallic brackets 66. As will appear more clearly hereinafter, these brackets, as well as disk 62, governor 60, the worm shaft, spring 67 and arm 59 constitute a common path for both of the parallel branch circuits. Supporting block 63 may be formed of insulating material or it may be a metallic block with insulating means provided to electrically insulate switches 64 and 65 and brackets 66 therefrom.

The apparatus of the invention having been fully described, the operation thereof will now be set forth. Assuming that the web-cutting machine is in operation, and that master switch 35 has been closed to render the apparatus operative, the draw rolls will, of course, be driven at a predetermined speed through the power-transmitting devices and the cutter 4 will be operated at regular intervals to cut predetermined uniform lengths of the web. Just prior to the actual cutting of the web, cam 28 will function to close switch 27 to thereby render the amplifier circuits operative. If the web is properly positioned, the design thereon, which serves to control the operation of the device, will be positioned in the paths of the light beams and the beams will, therefore, be intercepted. Since little or no light will fall upon the light sensitive cells, no impulse will be sent through the amplifier and control circuits to actuate motor 32. This motor will, therefore, remain in its normal standstill condition and neither of the power-transmitting devices will have their ratios changed, the draw rolls continuing to be driven at the desired predetermined speed.

Assume now that the web is improperly positioned. Assume, for example, that a lagging condition of the web exists at the time that switch 27 closes just prior to cutting. Since the design on the web will be incorrectly positioned backward, the light beam projected toward cell 8 will not be intercepted, and appreciable current flow will take place through resistor 21, the potential drop

thereacross being applied to amplifier 14. This potential will be amplified by amplifiers 14 and 15 and plate current of the desired amplitude will flow through the winding of relay 23. This relay will, therefore, be energized and in turn will energize relay 29 to close the circuit of motor 32, the polarity being such that this motor is caused to rotate in a clockwise direction as viewed from the right side in the illustration of Fig. 1. The motor will cause counter-clockwise rotation of worm 50 which will function to drive ring gear 48 in a counter-clockwise direction. This direction of rotation of the ring gear will in effect increase the speed of pinions 49 relative to bevel gear 46 and the draw rolls will, therefore, have their speed momentarily increased to correct the lagging condition of the web.

If the web is in an advanced or creeping condition, the design will be in advance of the light beam projected toward cell 9 and this cell will, therefore, operate in the manner described above to send impulses through amplifiers 16 and 17 to operate relays 24 and 30 and start motor 32 in the opposite direction. This will cause rotation of ring gear 48 in a clockwise direction, thereby in effect decreasing the speed of pinions 49 relative to that of bevel gear 46. This action will, of course, decrease the speed of the draw rolls momentarily to correct the position of the web.

Considering now the operation of the system when the web is improperly positioned to such an extent that motor 32 is forced to rotate at an excessive speed, at such time, the governor 60 will move the conductive disk 62 along the shaft until such disk engages the contact arms of brackets 66. Prior to this, however, the rotatable arm 59 has been rotated into one of its two effective positions at the beginning of rotation of the motor, depending upon the direction of such rotation. Obviously, if this arm were in the position shown in Fig. 3, clockwise rotation of the motor, as previously considered, would cause rotation of the worm shaft in such direction as to have no affect upon the position of the arm. If, however, the motor had rotated in the opposite direction, the arm would be moved from the position shown to the other position where it would engage switch 65. Thus the motor at the outset of its operation initially prepares one of the branch circuits through either solenoid 75 or 76 for subsequent energization by virtue of the directional switch. The branch circuit selected, however, is not immediately completed and no energization of the particular solenoid takes place until the governor functions to close the common path of the parallel branch circuits through disk 62 and brackets 66. Let it be assumed that the direction of rotation of motor 32 is such as to cause arm 59 to assume the position as shown in Fig. 3, thus closing switch 64. When the governor has caused disk 62 to contact brackets 66, as explained above, the branch circuit of solenoid 75 will be closed, such circuit including the winding of the solenoid, the contact arms of switch 64, arm 59 in contact therewith, spring 67, the worm shaft, governor 60, disk 62, and brackets 66. Completion of this circuit causes energization of solenoid 75 to operate the ratchet wheel 69 in a clockwise direction as viewed in Fig. 1. Such actuation of the ratchet wheel causes a predetermined variation in the ratio of the Reeves drive, in the manner previously explained, thereby correcting the speed of the draw rolls to such a value as is within the normal operating corrective range of motor 32 and its associated elements. Excessive rotation of the motor in the opposite direction will, of course, cause similar operation of the solenoid 76 to vary the transmission ratio of the Reeves drive in the opposite manner. It is important to note that normally device 33 alone would be effective to correct the position of the web, the variation of the Reeves drive ratio being effected only in relatively rare instances when the speed of the draw rolls must be varied a considerable amount.

While there is disclosed herein, for the purpose of illustration, a specific embodiment of the invention, it will be apparent to those skilled in the art that many changes and modifications are possible, especially in the details involved. For example, control of the light sensitive cells may be had by means of any suitable arrangement of opaque and transparent portions of the web, or any other suitable means responsive to incorrect positioning of the web may be used. All such changes as fall within the scope of the appended claims are deemed to be within the spirit and scope of the invention.

I claim:

1. In a web-feeding machine having draw rolls, apparatus for correcting the position of the web, comprising a drive for said rolls, a variable-speed power-transmitting device interposed in said drive, means for controlling said device, a second variable-speed power-transmitting device interposed in said drive, means operable by said first device for controlling said second device, and means responsive to incorrect positioning of said web for actuating said first means.

2. In a web-feeding machine having draw rolls, apparatus for correcting the position of the web, comprising a drive for said rolls, a variable-speed power-transmitting device including a motor interposed in said drive, means for controlling said motor to control said device, a second variable-speed power-transmitting device interposed in said drive, means operable by said motor for controlling said second device, and means responsive to incorrect positioning of said web for actuating said first means.

3. In a web-feeding machine having draw rolls, apparatus for correcting the position of the web, comprising a drive for said rolls, a variable-speed power-transmitting device including a motor interposed in said drive, a switch operable by said motor in accordance with the speed thereof, means for controlling said motor to control said device, a second variable-speed power-transmitting device interposed in said drive, electrically operable means controlled by said switch for controlling said second device, and means responsive to incorrect positioning of said web for actuating said first means.

4. In a web-feeding machine having draw rolls, apparatus for correcting the position of the web, comprising a drive for said rolls, a variable-speed power-transmitting device including a motor interposed in said drive, a switch operable by said motor in accordance with the speed thereof, means for controlling said motor to control said device, a second variable-speed power-transmitting device interposed in said drive, a solenoid operable ratchet device controlled by said switch for controlling said second device, and means responsive to incorrect positioning of said web for actuating said first means.

5. In a web-feeding machine having draw rolls, apparatus for correcting the position of the web,

comprising a drive for said rolls, a variable-speed power-transmitting device including a reversible motor interposed in said drive, means for actuating said motor in either direction to control said device, a second variable-speed power-transmitting device interposed in said drive, means operable by said motor for controlling said second device, and means responsive to incorrect forward or backward positioning of said web for actuating said first means.

6. In a web-feeding machine having draw rolls, apparatus for correcting the position of the web, comprising a drive for said rolls, a variable-speed power-transmitting device including a reversible motor interposed in said drive, a switch operable by said motor in accordance with the speed thereof, means for actuating said motor in either direction to control said device, a second variable-speed power-transmitting device interposed in said drive, electrically operable means controlled by said switch for controlling said second device, and means responsive to incorrect forward or backward positioning of said web for actuating said first means.

7. In a web-feeding machine having draw rolls, apparatus for correcting the position of the web, comprising a drive for said rolls, a variable-speed power-transmitting device including a reversible motor interposed in said drive, a switch operable by said motor in accordance with the speed thereof, means for actuating said motor in either direction to control said device, a second variable-speed power-transmitting device interposed in said drive, a solenoid operable ratchet device controlled by said switch for controlling said second device, and means responsive to incorrect forward or backward positioning of said web for actuating said first means.

8. In a web-feeding machine, means for feeding a translucent web having spaced opaque designs thereon, a pair of spaced light responsive devices disposed adjacent said web, means for projecting light toward said web and said devices, the spacing of said devices bearing such relation to the size of said designs that a design when directly in front of said devices interrupts the light thereto, and when forwardly or backwardly positioned the design interrupts the light to one device only, an electric circuit connected to each of said devices, means controllable by said circuits for correcting forward or backward positioning of the web, and means for periodically closing said circuits at intervals corresponding to the spacing of said designs, whereby one or the other of said devices will send an impulse through its associated circuit to actuate said web-correcting means when a design is improperly positioned with respect to said devices.

9. A control system for a machine having a moving element operating upon a moving strip of material provided with spaced indicia, comprising a pair of spaced light responsive devices disposed adjacent said strip, light projecting means cooperatively associated with said devices and said strip, the spacing of said devices bearing a definite relation to said indicia, so that the position of the indicia with respect to said devices selectively controls the light projected onto the respective devices in response to forward or backward positioning of the strip, and means controllable by said devices for varying the relative speeds of said strip and said element sufficiently to correct a lagging or leading condition of the strip.

10. A control system for a machine having an element operating upon a strip of material provided with spaced indicia, comprising a pair of spaced light responsive devices disposed adjacent said strip, light projecting means cooperatively associated with said devices and said strip, the spacing of said devices bearing a definite relation to said indicia, so that the position of the indicia with respect to said devices selectively controls the light projected onto the respective devices in response to forward or backward positioning of the strip, an electric circuit connected to each of said devices, means controllable by said circuits for varying the relative positions of said strip and said element to correct a lagging or leading condition of the strip, and means for periodically closing said circuits at intervals corresponding to the spacing of said indicia, whereby one or the other of said devices will send an impulse through its associated circuit to actuate said correcting means when the indicia are improperly positioned with respect to said devices.

11. A control system for a machine having strip-feeding means and an element operating upon the strip, comprising means including a differential device for controlling said strip-feeding means, a reversible motor for controlling said differential device, means including light sensitive means cooperating with spaced indicia on said strip for actuating said motor in either direction, and a variable speed transmission device adapted to additionally control said strip-feeding means.

12. A control system for a machine having strip-feeding means and an element operating upon the strip, comprising means including a differential device for controlling said strip-feeding means, a reversible motor for controlling said differential device, means including light sensitive means cooperating with spaced indicia on said strip for actuating said motor in either direction, and an adjustable pulley transmission device adapted to additionally control said strip-feeding means.

13. A control system for a machine having strip-feeding means and an element operating upon the strip, comprising means including a differential device for varying temporarily the speed relation between said strip-feeding means and said element to correct normal displacement of the strip relative to said element, a reversible motor for controlling said differential device, means including light sensitive means cooperating with spaced indicia on the strip for actuating said motor in either direction in response to incorrect positioning of the strip relative to said element, and means inactive during normal correction for changing the speed relation between said strip-feeding means and said element in a relatively permanent manner to correct abnormal displacement of the strip with respect to said element.

14. A control system for a machine having strip-feeding means and an element operating upon the strip, comprising means including a differential device for controlling said strip-feeding means, a reversible motor for controlling said differential device, and means including light sensitive means cooperating with spaced indicia on said strip for actuating said motor in either direction to correct a leading or lagging condition of said strip relative to said element.

15. A control system for a machine having strip-feeding means and an element operating upon the strip, comprising means including a differential device for varying temporarily the

speed relation between said strip-feeding means and said element to correct normal displacement of the strip relative to said element, a reversible motor for controlling said differential device, means including light sensitive means cooperating with spaced indicia on the strip for actuating said motor in either direction in response to incorrect positioning of the strip relative to said element, and an adjustable pulley transmission device for changing the speed relation between said strip-feeding means and said element in a relatively permanent manner to correct abnormal displacement of the strip with respect to said element.

16. In a web-feeding machine, the combination of a pair of drawing rolls adapted to feed a web of paper to a cutting station, driving mechanism for said rolls, and means operative upon lag or lead of the web for increasing or decreasing the speed of said rolls, said means including a source of two rays of light, photo-electric cells arranged to be struck by said rays, means on said web spaced further apart than said rays of light and adapted, upon lag or lead of said web, to alter the character of one or the other of said rays to vary the magnitude of the current generated in the associated cell, amplifiers for said cells, and relays operated by the currents generated in said cells and operatively connected to said first mentioned means.

17. In a web-feeding machine, the combination of a pair of drawing rolls adapted to feed a web of paper to a cutting station, driving mechanism for said rolls and means operative upon lag or lead of the web for increasing or decreasing the speed of said rolls said means including a source of two rays of light, photo-electric cells arranged to be struck by said rays, means on said web spaced further apart than said rays of light and normally positioned beyond the same and adapted upon lag or lead of said web, to alter the character of one or the other of said rays to vary the magnitude of the current generated in the associated cell, amplifiers for said cells, relays operated by the current generated in said cells, a change speed gearing operatively connected to said rolls, and electro-magnetic devices controlled by said relays to operate said gearing.

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