

May 25, 1937.

O. WOHLRABE
WEB FEEDING DEVICE

2,081,654

Original Filed May 23, 1929

Fig. 1.

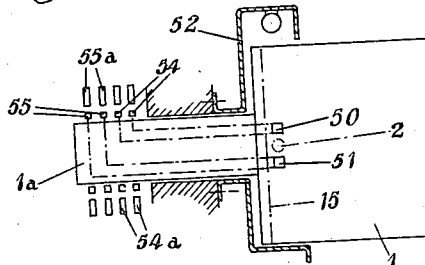


Fig. 2.

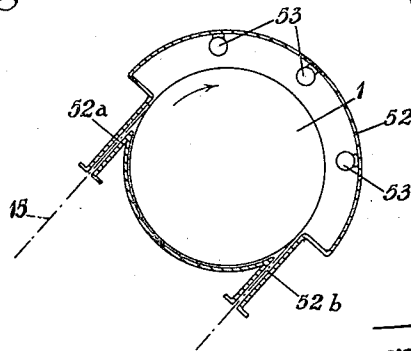


Fig. 3.

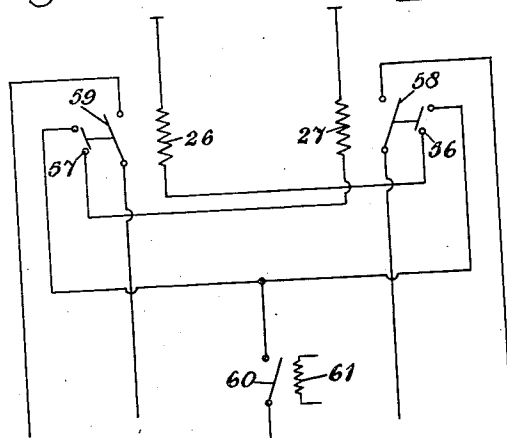


Fig. 5.

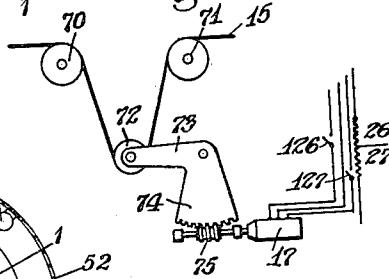
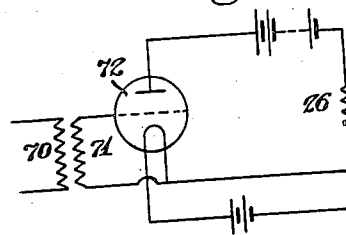


Fig. 4.



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UNITED STATES PATENT OFFICE

2,081,654

WEB FEEDING DEVICE

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Original application May 23, 1929, Serial No.
365,353. Divided and this application April
22, 1933, Serial No. 667,443. In Germany June
13, 1928

19 Claims. (Cl. 271—2.6)

This invention relates to a device for the auto-
matic feeding of a printed web to maintain the
web in perfect register, that is to say, the web
having areas of preprinted matter disposed at
regular intervals along its length is arranged to
be fed under the control of the device so that the
areas of preprinted matter are maintained in reg-
ister with other members such as a severing knife
arranged to cut the web into sheets, or the web
may be fed in register with other printed webs
issuing from a printing press and thereafter sev-
ered into sheets with the said other webs. The
function of the device according to the invention
is to maintain the correct register of the pre-
printed web in spite of shrinkage or expansion of
the web or other causes which tend to make the
web run out of correct register and the above are
examples of the uses to which the invention may
be applied. This application is a division of my
prior application Serial No. 365,353, filed May 23,
1929, which has now matured into Letters Patent
1,970,352, granted August 14, 1934.

The principal object of the invention is to pro-
vide a device of the above character by which
errors in registration of a preprinted web may be
readily detected by light sensitive means or other
means responsive to variations in intensity or
radiation incident thereon as the web is continu-
ously fed and the automatic regulation of the
feeding speed of the printed web effected upon
errors being so detected.

In order that the invention may be fully under-
stood, reference is directed to the accompany-
ing drawing, in which:—

Figure 1 is a diagrammatic plan of a device
constructed in accordance with the invention
employing light sensitive or similar cells for de-
tecting errors in registration of a continuously
fed preprinted web;

Figure 2 is a diagrammatic cross section of the
device shown in Figure 1;

Figure 3 illustrates the circuit diagram of elec-
trical relays employed for actuating the feed reg-
ulating mechanism under the control of the de-
vice shown in Figures 1 and 2;

Figure 4 illustrates the circuit diagram of an
amplifier for the impulses derived from the light-
sensitive cells; and

Figure 5 illustrates diagrammatically an ar-
rangement for effecting control of the web feed.

Referring to the drawing, the device comprises
a cylinder 1 over which the preprinted web is ar-
ranged to extend as it is continuously fed so that
the preprinted matters on the web normally reg-
ister with predetermined points or areas on the

circumference of the cylinder. In the case of the
web being fed to the product issuing from a
press or to another element with which the web
is to register, the cylinder 1 is arranged to be
rotated in synchronism with the press or other
element in any convenient and obvious manner,
not shown. The web is provided with a series
of transparencies, such as the hole indicated at
2, Figure 1, spaced at regular intervals along the
length thereof in some simple proportion to the
length of the preprinted areas along the web and
the circumference of the cylinder is also dimen-
sioned in some such simple proportion. A pair
of selenium cells 50 and 51 are arranged on the
cylinder at a short distance apart, and are elec-
trically connected respectively to pairs of contact
rings 54 and 55 mounted upon and rotatable with
an extension 1a of the cylinder 1. Brushes 54a
and 55a are arranged in electrical contact with
the rings 54 and 55 and serve for operatively con-
necting the device to a mechanism for controlling
the feed regulating motor, for example, to a sys-
tem of relays as hereinafter described. Around
that circumferential portion of the cylinder 1
occupied by the cells 50 and 51, a hood 52 is dis-
posed which is provided with inlet and outlet pas-
sages 52a and 52b which enable the web 15 to run
on to the cylinder through the passage 52a and
leave it through the passage 52b. Where the web
contacts with the cylinder which, in the example
shown, is around an angle of about 180° of the
circumference of the cylinder, the hood 52 is
formed into a reflecting casing in which several
lamps 53 are positioned. Normally when the
web 15 is in correct register, the transparencies
2 are located between the cells 50 and 51 when the
web travels around the cylinder, but if the web
leads or lags from correct register and a trans-
parency wholly or partly overlaps one of the cells,
the same will be illuminated by the light from
the lamps 53 and that reflected by the inner wall
of the hood 52. The difference in the electrical
resistance of the cell so illuminated produces a
change in the electrical characteristics of the
circuit in which it is connected through the re-
spective contact rings and brushes and this
change is caused to actuate a relay as above
stated which in turn effects an actuation of the
feed regulating motor for adjusting the feed of
the webs. When the correct register of the web
has been restored, the transparencies are again
located between the cells 50 and 51. In lieu of
effecting the illumination of the cells through
perforations in the web, the difference in trans-
parency of the printed and non-printed parts of

the web may be utilized for this purpose, the non-printed portions, such as the transverse margins between successive printed areas then constituting the aforesaid transparencies controlling the regulating motor, the cells, of course, being positioned on the cylinder so that the said transverse margins or other transparencies are effective to control them. In lieu of selenium cells, carolus cells or other known devices may be used which are responsive to variations in intensity of radiation effected by index means on the web such as the transparencies above referred to.

Should the controlling currents produced by means of the light sensitive or like devices on the cylinder 1 be insufficient to effect direct operation of relays, the said currents may be intensified by known means such as three electrode tubes or the like. Thus each of the circuits through the light-sensitive cells 50 or 51 may be connected to the input of an amplifying device of any conventional design, for instance as shown in Figure 4. In this construction the light-sensitive cell circuits are connected to the primary windings 70 of a transformer, the secondary winding 71 being connected across the grid and filament of a three-electrode valve 72. The anode circuit of the valve 72 includes the respective relays 26 or 27, the relay 26 being shown in Figure 4.

When the light cell associated with the amplifying circuit is energized, an increase in potential developed on the grid of the valve 72 causes the anode circuit through the valve to be established to energize the relay for actuating the correcting mechanism. Greater amplification may of course be obtained by the use of a plurality of valve circuits of this character in a cascade arrangement, and any other well-known type of amplifier may be employed, the details of the amplifier forming no part of the present invention. If desired, arrangements may be made to cause an uninterrupted flow of current through the regulating means as soon as the web leads or lags relatively to the desired rate of feed. In one such arrangement, the cylinder 1 is dimensioned twice as large in diameter as the impression cylinder employed for printing the matter on the web and the cylinder 1 is provided with two error detecting devices in accordance with the invention at two diametrically opposite points so that always at least one of them is in operative condition for producing the control current for the feed regulating mechanism.

In view of the fact that with devices of the character described, it is always possible that the paper web may tear, and in such circumstances, the regulating means would be actuated in an attempt to drive the regulating motor simultaneously in both directions, means are provided to eliminate this possibility. One simple arrangement for preventing the simultaneous operation of two relays arranged to control the regulating motor in opposite directions is shown in Figure 3. In this arrangement, the relays are connected by means of auxiliary switches to the control lines of the motor. Relays 26 and 27 are connected in circuit respectively with the cells 50 and 51 on the cylinder 1 and the winding of relay 26 is connected through the contact 56 of the switch controlled by the relay 27 and the winding of relay 27 is connected through the contact 57 of the switch controlled by the relay 26. Thus, when the relay 26 actuates the main switch 59 for the regulating motor circuit, the winding of the relay 27 is cut out of circuit at 57 and likewise, when relay 27 actuates the main switch 58 for

operating the regulating motor in the opposite sense the circuit of the winding of relay 26 is interrupted at 56. It is thus evident that both relays cannot operate simultaneously.

As an additional precaution for ensuring that the correcting mechanism is rendered inoperable if the web tears, the current supply system above described may be provided with a switch 60 controlled by a relay 61 which is connected in circuit with a master switch which is operatively controlled by the web so that as soon as the paper tears, the master switch closes, energizing the relay 61 which thereupon opens the switch 60 and interrupts the current supply system. Such switches are well known per se and by the action of the switch as described the relays 26 and 27 will be cut off completely from their supply current in the event of the web being torn. It will be appreciated that any convenient means may be employed to effect regulation of the web feed in response to energization of either of the coils 26 or 27. For instance, a conventional arrangement such as that illustrated in Figure 5 of the drawing may be employed in which the web 15 is shown as being carried over a pair of guide rollers 70, 71, between which it takes an extended path over an adjusting roller 72 carried by an arm 73 provided on a pivotally mounted toothed segment 74 with which meshes a worm 75 driven by a reversible motor M. The relay 26 controls a switch contact 126 for one direction of rotation of the motor while the relay 27 controls a switch contact 127 for the other direction of rotation.

Rotation of the motor in one direction or the other increases or decreases the extended path of the web and thereby retards or advances the web, this adjustment device being preferably disposed between the roll of pre-printed web and the conveyor carrying the error detecting device. The foregoing arrangement is similar to that disclosed in the prior patents to Wood 589,519 and Fuchs 1,677,472.

What I claim and desire to secure by Letters Patent of the United States is:—

1. Apparatus for use in maintaining the registration of a continuously fed preprinted web of material having index means disposed at regular intervals along the length thereof, comprising a conveyor with which the web engages, said conveyor being provided with an element adapted normally to move in synchronous registration with said moving index means and means for controlling the web to register the same correctly with said element, said controlling means including a source of radiation of which the intensity is variable by relative displacement of said element and said index means, and a device responsive to the degree of intensity of said radiation incident thereon during the continuous feeding of said web to effect said control when the said index means and the said movable element are out of register.

2. Apparatus for use in maintaining the registration of a continuously fed preprinted web of material having index means disposed at regular intervals along the length thereof, comprising an element adapted normally to move in synchronous registration with said moving index means and means for controlling the web to register the same correctly with said element, said controlling means including a source of radiation of which the intensity is variable by relative displacement of said element and said index means, and a device responsive to the degree of

intensity of said radiation incident thereon during the continuous feeding of said web to originate an impulse to actuate said controlling means when the said index means and the said movable element are out of register, and means for prolonging the impulse over a period substantially in excess of that required for said index means to move past a fixed point at the feeding speed of the web.

3. Apparatus for use in maintaining the registration of a continuously fed preprinted web of material having index means disposed at regular intervals along the length thereof, comprising an element adapted normally to move in synchronous registration with said moving index means and means for controlling the web to register the same correctly with said element, said controlling means including a source of radiation of which the intensity is variable by relative displacement of said element and said index means, and a device responsive to the degree of intensity of said radiation incident thereon during the continuous feeding of said web to produce an impulse to effect said control when the said index means and the said movable element are out of register, and means for prolonging the impulse over a period substantially in excess of that required for said index means to move past a fixed point at the feeding speed of the web.

4. Apparatus for use in maintaining the registration of a continuously fed preprinted web of material having index means disposed at regular intervals along the length thereof, comprising an element adapted normally to move in synchronous registration with said moving index means and means for controlling the web to register the same correctly with said element, said controlling means including a source of radiation of which the intensity is variable by relative displacement of said element and said index means, and a device responsive to the degree of intensity of said radiation incident thereon during the continuous feeding of said web to originate an impulse when said index means leads or lags from correct register with said movable element, a first relay responsive to said impulse when said index means leads and a second relay responsive to said impulse when said index means lags, and means for prolonging the impulse for a period substantially in excess of that necessary for said index means to pass a fixed point at the feeding speed of the web.

5. Apparatus for use in maintaining the registration of a continuously fed preprinted web of material having index means disposed at regular intervals along the length thereof, comprising an element adapted normally to move in synchronous registration with said moving index means and means for controlling the web to register the same correctly with said element, said controlling means including a source of radiation of which the intensity is variable by relative displacement of said element and said index means, and a device responsive to the degree of intensity of said radiation incident thereon during the continuous feeding of said web to originate an impulse when said index means leads or lags from correct register with said movable element, means for amplifying said impulse, a first relay responsive to said amplified impulse when said index means leads and a second relay responsive to said amplified impulse when said index means lags, and means for prolonging the impulse for a period substantially in excess of that

required for said index means to pass a fixed point at the feeding speed of the web.

6. Apparatus for use in maintaining the registration of a continuously fed preprinted web of material having index means disposed at regular intervals along the length thereof, comprising an element adapted normally to move in synchronous registration with said moving index means and means for controlling the web to register the same correctly with said element, said controlling means including a source of radiation of which the intensity is variable by relative displacement of said element and said index means, and a device responsive to the degree of intensity of said radiation incident thereon during the continuous feeding of said web to produce an impulse when said index means leads or lags from correct registration with said movable element, means for prolonging said impulse over an extended period substantially in excess of that necessary for said index means to move past a fixed point at the feeding speed of the web, a first relay responsive to said impulse when said index means leads, and a second relay responsive to said impulse when said index means lags, said relays being operable to affect said controlling means to restore the web to register.

7. Apparatus for use in maintaining the registration of a continuously fed preprinted web of material having index means disposed at regular intervals along the length thereof, comprising an element adapted normally to move in synchronous registration with said moving index means and means for controlling the web to register the same correctly with said element, said controlling means including a source of radiation of which the intensity is variable by relative displacement of said element and said index means, and a device responsive to the degree of intensity of said radiation incident thereon during the continuous feeding of said web to produce an impulse when said index means leads or lags from correct registration with said movable element, means for prolonging said impulse over an extended period substantially in excess of that required for said index means to move past a fixed point at the feeding speed of the web, means for amplifying said impulse, a first relay responsive to said amplified impulse when said index means leads and a second relay responsive to said amplified impulse when said index means lags, said relays being operable to affect said controlling means to restore the web to register.

8. Apparatus for use in maintaining the registration of a continuously fed preprinted web of material having index means disposed at regular intervals along the length thereof, comprising a rotatable element adapted normally to rotate in synchronous registration with said moving index means and means for controlling the web to register the same correctly with said element, said controlling means including a source of radiation of which the intensity is variable by relative displacement of said element and said index means, and a device responsive to the degree of intensity of said radiation incident thereon during the continuous feeding of said web to originate an impulse when said index means leads or lags from correct registration with said element, a first relay responsive to said impulse when said index means leads, and a second relay responsive to said impulse when said index means lags, means for prolonging the responsive operation of said relays over a period substantially in excess of that required for said index means to move

past a fixed point at the feeding speed of the web but less than the period corresponding to one rotation of said rotatable element, said relays being operable through the medium of said impulse to affect said controlling means to restore the web to register.

9. Apparatus for use in maintaining the registration of a continuously fed preprinted web of material having index means disposed at regular intervals along the length thereof, comprising a rotatable element adapted normally to rotate in synchronous registration with said moving index means and means for controlling the web to register the same correctly with said element, said controlling means including a source of radiation of which the intensity is variable by relative displacement of said element and said index means, and a device responsive to the degree of intensity of said radiation incident thereon during the continuous feeding of said web to originate an impulse when said index means leads or lags from correct registration with said element, means for amplifying said impulses, a first relay responsive to said amplified impulse when said index means leads and a second relay responsive to said amplified impulse when said index means lags, means for prolonging the responsive operation of said relays over a period substantially in excess of that required for said index means to move past a fixed point at the feeding speed of the web but less than the period corresponding to one rotation of said rotatable element, said relays being operable through the medium of said impulse to affect said controlling means to restore the web to register.
10. Apparatus for use in maintaining the registration of a continuously fed preprinted web of material having index means disposed at regular intervals along the length thereof, comprising a rotatable element adapted normally to rotate in synchronous registration with said moving index means and means for controlling the web to register the same correctly with said element, said controlling means including a source of radiation of which the intensity is variable by relative displacement of said element and said index means, and a device responsive to the degree of intensity of said radiation incident thereon during the continuous feeding of said web to originate an impulse when said index means leads or lags from correct registration with said element, means for amplifying said impulse, a first relay responsive to said amplified impulse when said index means leads and a second relay responsive to said amplified impulse when said index means lags, means for prolonging the responsive operation of said relays over a period substantially in excess of that required for said index means to move past a fixed point at the feeding speed of the web but less than the period corresponding to one rotation of said rotatable element, a motor for regulating the feed of the web and control circuits for operating the motor in one direction or the other, the said relays being arranged to govern the control of the said circuits to affect said controlling means and restore the web to register.
11. Apparatus for use in maintaining the registration of a continuously fed preprinted web of material having index means disposed at regular intervals along the length thereof, comprising a rotatable element adapted normally to rotate in synchronous registration with said moving index means and means for controlling the web to register the same correctly with said element, said

controlling means including a source of radiation of which the intensity is variable by relative displacement of said element and said index means, and a device responsive to the degree of intensity of said radiation incident thereon during the continuous feeding of said web to originate an impulse when said index means leads or lags from correct registration with said element, a first relay responsive to said impulse when said index means leads, and a second relay responsive to said impulse when said index means lags, said relays being operable through the medium of said impulse to affect said controlling means to restore the web to register and means to prolong the responsive operation of said relays until an error in registration has been wholly corrected.

12. Apparatus for use with a high speed printing press, in which a web having preprinted matter disposed at regular intervals along the length thereof is fed, comprising means movable with said web during a substantial portion of the travel thereof and disposed adjacent one side of the web, light sensitive means carried by said last named means, a source of light arranged on the opposite side of the web, said web being provided at spaced intervals with portions pervious to such impulses, whereby the shifting of the web with respect to the means movable therewith serves to establish or interrupt the transmission of light to said light sensitive means, and means responsive to said light sensitive means for controlling by said light sensitive means the feeding of the web.

13. Apparatus for use with a high speed printing press in which a web of material having light controlling index means disposed at regular intervals along the length thereof is continuously fed, comprising in combination a conveyor arranged to engage and travel with the web for a substantial distance, a light source and a light responsive device, at least one of which is carried by the conveyor, the operative association between said light source and said light responsive device being effective over a substantial portion of said substantial distance under the control of said index means so as to vary the intensity of the light imparted to the light sensitive device from said light source in accordance with the relative position between said index means and a predetermined normal position thereof on said conveyor, and means responsive to the variation of illumination of the light sensitive device for registering the web by controlling the feed of the latter.

14. Apparatus for use with a high speed printing press in which a web of material having index means disposed at regular intervals along the length thereof is continuously fed, comprising a conveyor arranged to engage and travel with the web for a substantial distance, means including a light sensitive device for controlling the feed of the web to properly register the latter, and a device for supplying light to said light sensitive device, at least one of the said devices being carried with said conveyor, said conveyor being provided with means arranged for registry with said index means to vary the light supplied to said light sensitive device, and means whereby said last named means is rendered effective during a substantial portion of the period of engagement of said index means and conveyor to control the feed of the web.

15. Apparatus for use with a high speed printing press in which a web of material having index means disposed at regular intervals along the

length thereof is continuously fed, comprising a conveyor arranged to engage and travel with the web for a substantial distance, means including a light sensitive device for controlling the feed of the web to properly register the latter and a device for supplying light to said light sensitive means, at least one of the said devices being carried with said conveyor, said index means being operable on displacement thereof with respect to said conveyor to vary the light supplied to said light sensitive device during a substantial portion of the period of engagement of said index means and conveyor.

16. Apparatus for use with a high speed printing press in which a web of material having light controlling index means disposed at regular intervals along the length thereof is continuously fed, comprising in combination, a conveyor arranged to engage and travel with the web for a substantial distance, a light source and a light responsive device, at least one of which is carried by the conveyor, the operative association between said light source and said light responsive device being effective over a substantial portion of said substantial distance under the control of said index means so as to vary the intensity of the light imparted to the light sensitive device from said light source in accordance with the relative position between said index means and a predetermined normal position thereof on said conveyor, and means responsive to the variation of illumination of the light sensitive device for registering the web by controlling the feed of the latter.

17. Apparatus for use with a high speed printing press in which a web of material having index means disposed at regular intervals along the length thereof is continuously fed, comprising a conveyor arranged to engage and travel with the web for a substantial distance, means including a light sensitive device for controlling the feed of the web to properly register the latter, and a device for supplying light to said light sensitive

device, at least one of the said devices being carried with said conveyor, said conveyor being provided with means arranged for registry with said index means to vary the light supplied to said light sensitive device, and means whereby said last named means is rendered effective during a substantial portion of the period of engagement of said index means and conveyor.

18. Apparatus for use with a high speed printing press in which a web of material having index means disposed at regular intervals along the length thereof is continuously fed, comprising a conveyor arranged to engage and travel with the web for a substantial distance, means including a light sensitive device for controlling the feed of the web to properly register the latter, and a device for supplying light to said light sensitive device, at least one of the said devices being carried with said conveyor, and means whereby said index means is rendered operable on displacement thereof with respect to said conveyor to vary the light supplied to said light sensitive device during a substantial portion of the period of engagement of said index means and conveyor.

19. Apparatus for use with a high speed printing press, in which a web having preprinted matter disposed at regular intervals along the length thereof is fed, comprising means arranged to travel with said web for a substantial distance thereof and disposed adjacent one side of the web, light sensitive means carried by said last named means, a source of light arranged on the opposite side of the web and effective over a substantial portion of said substantial distance, said web being provided at spaced intervals with portions pervious to such impulses, whereby the shifting of the web with respect to the means movable therewith serves to control the transmission of light to said light sensitive means, and means responsive to said light sensitive means for controlling the feeding of the web.

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