

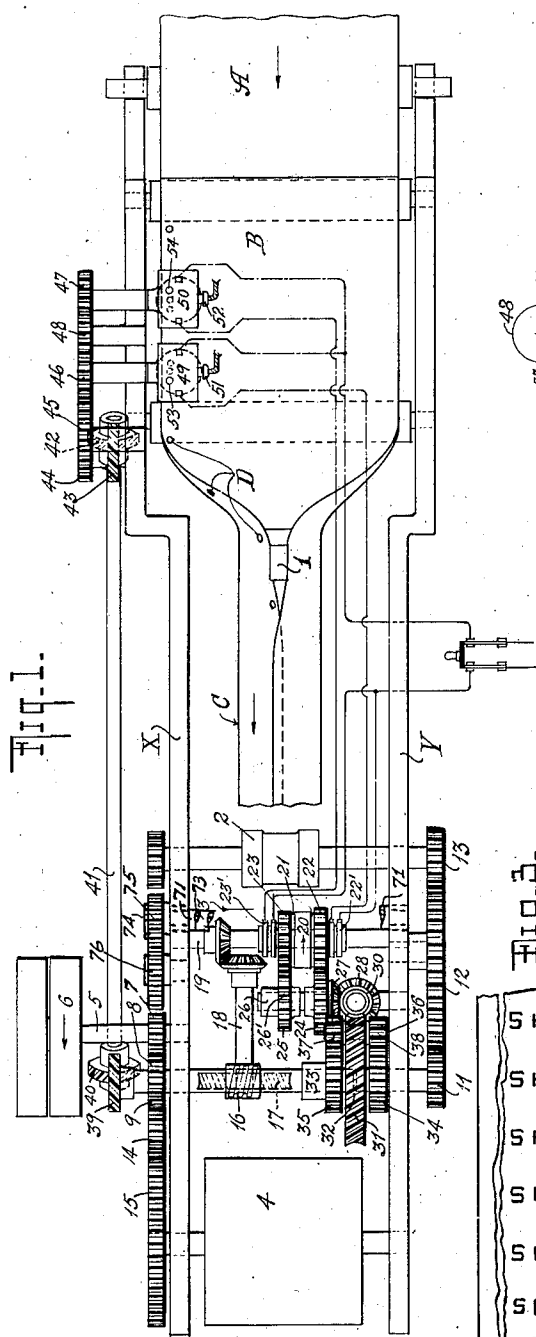
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H. SMITHWICK

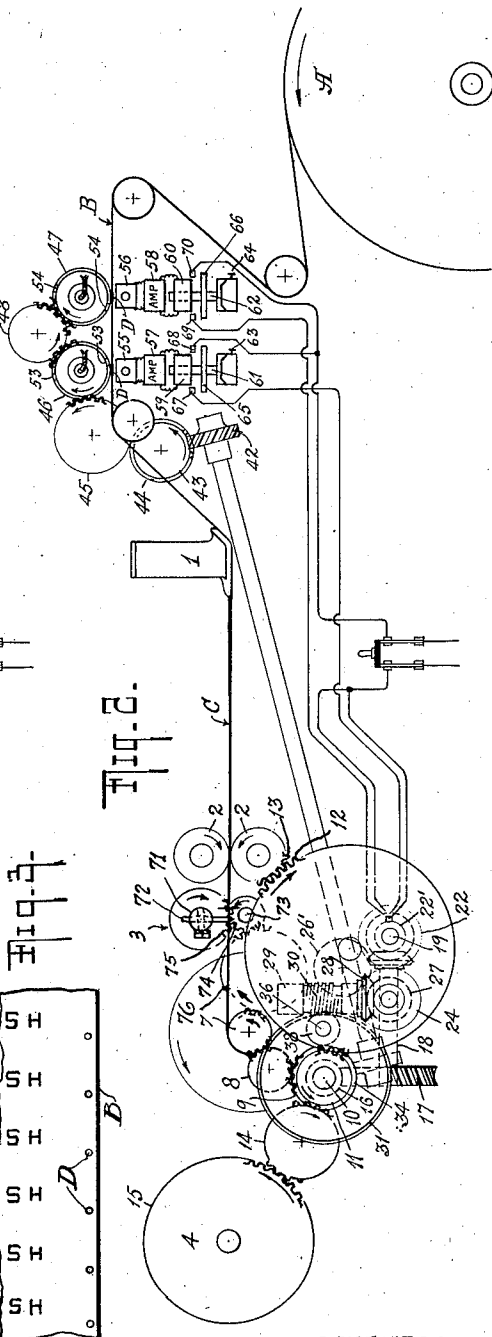
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AUTOMATIC ELECTRIC CONTROL MECHANISM

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AUTOMATIC ELECTRIC CONTROL MECHANISM

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This invention relates to automatic electric control mechanism, and more particularly to a control mechanism involving the use of a photo-electric cell in combination with an amplifier by means of which the passage of a ray of light to the cell, or the interruption of such passage, may be used to influence or control another mechanism and thus regulate the operation thereof.

In its broader aspects my invention contemplates the utilization of a photo-electric cell in association with a source of a ray of light, the continuity of which is established or interrupted by the presence or absence of any definite condition or object at any predetermined time or place. The current generated in the photo-electric cell, or the breaking of such current, is made to operate or control a machine or mechanism designed to affect, alter or influence said condition or object in a predetermined manner, or else perform an operation at a point removed from the locale of such condition or object. The current generated by the cell is preferably first greatly amplified and is then made to control the machine or mechanism either directly or indirectly through a relay.

The inventive idea above outlined may be embodied in a large number of mechanisms and apparatus which themselves, or in which the articles operated upon by them, are normally so designed or colored or may be so modified that the continuity, intensity or character of a ray of light may be altered to make or break an electric current in a photo-electric cell so as to control the operation of the apparatus with which the cell directly cooperates or of a device only indirectly associated with said cell.

As an example of the numerous forms that my invention may take I shall describe the same in association with a paper-feeding machine, but it will be understood that my invention is not limited to such machine. More specifically I shall illustrate my invention in connection with the feeding of a printed web into a machine which subsequently folds, cuts off and otherwise operates on the severed portions of the printed web to form a finished paper bag.

It will be readily understood that in making a printed article which is sold in a folded condition, such as a bag, much more elaborate printing on such article may be accomplished if the continuous web from which the article is to be made is first printed in its flat condition and then wound up on a roll from which it is subsequently unwound and fed to the bag-forming machine. The printing may be an all-over design or it may

be an individual design which recurs at definite intervals along the length of the web; these intervals corresponding to the definite lengths to be cut off and made into special articles, such as bags, on each of which the printed design must occupy a definite position.

While this design may be accurately spaced along the web when printed, changes may occur due to change in moisture content or other condition of the printed material, or to inaccuracies or irregularities in the machine in which the printed web is fed and cut off, or to slip of the printed web when being drawn into the machine, which cause the definitely spaced impression to get out of register with the machine and thus cause the printed impression to get into a wrong location on the finished article. Where, for instance, a cutter operated from a constant speed shaft is arranged to sever portions of the printed web at definite intervals, slipping of the feed rolls, whereby the feed of the web is slowed down, or shrinkage of the web, the feeds rolls operating properly to feed a predetermined length during a definite time interval, whereby the real feed of the web is relatively increased, will cause the cutter to lead or lag the web. Such lead or lag may be very small and negligible for a single severed section of the web, but if such abnormal condition exists for any considerable length of time or for a long stretch of web, the lead or lag will accumulate to such an extent that the cutter will sever the web through the printed portions thereof, in which case the articles made from such sections will be practically worthless.

It has been customary to use a manually operated device by which the rolls which draw or feed the printed material into the machine may have their speed changed slightly and for a limited time without changing the speed of the rest of the machine, such as the cutter, by which arrangement the web feed may be changed in relation to the rest of the machine and the printed impressions brought again into register, that is, in their proper position with respect to the cutter. This hand operation has not been altogether satisfactory, among other reasons, because of the labor involved, the unreliability of the human factor, and because the adjustment of the speed of the feed rolls would necessarily be made only after there had been an appreciable accumulation of lag or lead, and I have therefore devised an electrical control for a mechanical web feeding device which I have used successfully as a hand operated mechanism. This is the specific case mentioned in the second paragraph

which will illustrate the electric control mentioned in the first paragraph.

I have therefore devised an automatic control mechanism embodying the basic features of my invention and including a source of a ray of light in association with a photo-electric cell which, through the current generated therein, is caused to actuate a speed control mechanism which operates to speed up the feed rolls when slipping of the web occurs and to slow them down when the web has shrunk for any reason, so that the cutter which operates at constant speed will sever the web along substantially constant and definite lines between the printed sections thereof and an accumulation of lag or lead to any appreciable extent thereby avoided.

It is broadly an object of my invention to provide an automatic controlling mechanism, including a photo-electric cell, which mechanism is regulated by an electric current generated in such cell in response to the incidence of a ray of light thereon.

More specifically, it is an object of the present invention to provide a speed controlling mechanism for paper bag making machines whereby an accumulation of lead or of lag in the feed of a paper web will be prevented and the web presented to a cutter at substantially fixed, predetermined points along the length thereof.

It is a further object of my invention to provide a controlling mechanism of the above-indicated character which can be associated with existing machines of various types, is simple in construction, and reliable and positive in operation.

Other objects and advantages of my invention will appear from the description hereinafter and the features of novelty will be pointed out in the claims.

In the accompanying drawing which illustrates a form of my invention without defining its limits, Figure 1 is a plan and Figure 2 is a side elevation of a paper bag making machine having my invention embodied therein; and Fig. 3 is a plan view of a portion of the web, showing the relation of the imprints to the apertures.

Referring to the drawing, A indicates a roll of printed paper web from which the web B is drawn over guide rolls over a former 1 by draw rolls 2 into a tube C which is cut into equal lengths at 3 by any well known means. The lengths of the tube C cut off at 3 are fed by rolls (not shown) to a cylinder 4 on which further necessary operations are performed on the severed lengths.

I have shown only such details of the machine as are necessary for a complete understanding of my invention and have omitted such details as would serve no useful purpose here and which would only confuse the drawing.

The drive for the machine includes a shaft 5 driven from a pulley 6 mounted thereon. 7 is a gear on the pulley shaft 5 which through an intermediate gear 8 drives gear 9 keyed to shaft 10. The shaft 10 carries the change gear 11 which drives the draw rolls 2 through gears 12 and 13. Gear 9 is a sub-multiple of the cylinder gear 15 which it drives through gear 14. The cutting mechanism located at 3 is so intergeared with shaft 10 that a tube length is cut off at each complete revolution of shaft 10. The tube length is equal to the circumference of change gear 11. Each tube length cut, regardless of what change gear is in use and of what the consequent length

of the cut may be is fed to the same point or points on cylinder 4 where the finishing operations may be performed.

The web of paper on the roll A has been printed by printing cylinders which have a circumference which is equal to or is a multiple or sub-multiple of the circumference of the change gear 11. The spacing of the printed impression along the web should therefore be equal to the circumference of gear 11 which is also the length of tube cut off.

The position of the impression on the tube cut off is theoretically always in a certain zone between the ends of the tube. In practice it has been found that there is a very small amount of slip of the web between the draw rolls 2 and that other factors, such as slightly inaccurate printing, paper shrinkage or possibly wear of the draw rolls 2 may combine to make the printed impression get out of place lengthwise on the tube lengths cut off.

In accordance with my invention, I provide a mechanical device and an electrical control therefor to automatically correct these inaccuracies and to keep the web and tube drawn up in its proper relation to the rest of the machine so that the printed impression will always be in approximately its proper location on the tubes as it is cut off. This is accomplished by means of the following mechanism:

On shaft 10 is keyed the right-hand worm 16 which drives the worm wheel 17 on the shaft 18. The shaft 18 drives shaft 19 through miter gears mounted on said shaft. On shaft 19 is keyed a clutch member 20. On either side of the clutch member 20 are magnetic clutch plates 21 to each of which is fixed a gear, 22 on one and 23 on the other. On the hub of the clutch plates are mounted slip ring connections 22' and 23'. Gears 22 and 23 mesh with gears 24 and 25 fixed on a horizontal shaft 26. Gear 22 meshes directly with gear 24 while gear 23 meshes with 25 through an intermediate or idler gear 26'. In action gears 22 and 24 would drive the shaft 26 clockwise while 23 would drive it counter-clockwise as viewed in Fig. 2. On shaft 26 is also mounted a miter gear 27 which drives a miter gear 28 and a shaft 29 fixed thereto. On shaft 29 is left hand worm 30 which drives worm gear 31 which is loosely mounted on shaft 10. Shaft 10 is in two pieces being cut in two inside of the gear 31 at 32. The longer part has bearings in the frame of the machine X and also at 33. The shorter part has one bearing only in frame Y. At the sides of worm 31 is a gear 35 fast to the longer part of shaft 10 and a gear 34 fast to the shorter part of shaft 10. Mounted loosely in a bearing in worm gear 31 is a shaft 36 at the ends of which are fastened gears 37 and 38 which, like gears 34 and 35, are of equal diameter.

At the outer end of shaft 10 is keyed a helical gear 39 in mesh with a helical gear 40 which is fast to the end of shaft 41. On the other end of shaft 41 is gear 42 which drives a gear 43, the latter being fast to gear 44 which drives gears 46 and 47 through intermediates 45 and 48. On the same shaft with 46 and 47 are cylinders 49 and 50 which revolve with their respective gears. Mounted through holes in the cylinders 49 and 50 and extending thereinto are lamps 51 and 52. Below cylinders 49 and 50 are photo-electric cells 55 and 56 of any suitable construction connected to amplifiers 57 and 58. Below the amplifiers are relays 59 and 60. In each relay is hung an armature 61 or 62 whose return to inoperative position

is delayed by dashpots having regulators 63 and 64 thereon. On 61 and 62 respectively are insulated plates 65 and 66 on which are contacts which when 61 or 62 is raised close the circuit between connections 67—68 or 69—70 and allow the current from the line to pass through one or the other of the magnetic clutch plates 21.

The web of paper is punched, preferably when being printed, so as to provide a series of uniformly spaced holes along one edge as at D. The cylinders 49 and 50 are provided with holes 53 and 54 in their surfaces which are arranged to travel in the same vertical plane as said series of holes in the web. The hole spacing in the web is the same as the spacing of the holes around the circumference of the cylinders, the said circumference being a multiple of the normal distance between adjacent holes in the web. The hole spacing in the web need have no connection with the spacing of the imprints on the paper except that both may be made at the same operation. A conventional form of cutting device is shown at 3 in Fig. 2, and its associated driving mechanism is illustrated in Fig. 1. The cutting device comprises a knife shaft 71, a knife 72 adjustably clamped in a slot in the shaft by suitable screws. The knife cuts against a hardened surface of the shaft 73 which carries at the end thereof a gear 74 meshing with the gear 75 on the end of the knife shaft 71. The gear 74 meshes with a gear 76 which in turn is driven by the gear 7.

The operation of the above-described mechanism is as follows:

The machine is started with the printed impressions in such a relation to the draw rolls 2 and the cut-off at 3 that the impression is properly spaced on the cut-off tube. With the machine and tube running thus the holes in the paper web are in the relative position shown directly under the centers of cylinders 49 and 50. In this position the holes in the cylinders do not register with the holes in the paper. The lower hole 53 of cylinder 49 is just behind the nearest hole in the paper and hole 54 in cylinder 50 is just ahead of its nearest hole in the paper. We will now assume that for some reason the paper begins to lag while the machine, including the cutter, continues to run at a uniform speed, the drawing rolls 2 being driven from the pulley section of the split shaft 10 through gears 34, 37, 38, 35, 11, 12 and 13, the worm wheel 31 being held stationary by the worm 30. Hole 53 in cylinder 49 and its nearest hole in the paper will begin to come together until they overlap and the light from lamp 51 will shine through hole 53 and the hole in the paper. This light passing through will strike the photo-electric cell 55 and will set up an electric current therein which will be built up by the amplifier 57 to a strength that will act on the relay 59 to raise the armature 62. This will bring the contacts on plate 65 up against terminals 67 and 68 and close the circuit so that the line current of 110 volts will pass through the slip rings 21 on the hub of the electro-magnetic clutch plate and thus fix gear 22 to the member 20 which revolves at all times, being driven counterclockwise (Fig. 2) from right hand worm 16 on shaft 10 through worm gear 17, shaft 18 and through the miter gears to the shaft 19 on which 20 is fixed. When gear 22 is fixed to 20 by the magnetic clutch action, gear 24 will be driven clockwise by gear 22. Miter gear 27 is thus driven clockwise (Fig. 2). Vertical shaft 29 will be driven clockwise

looking at it in Figure 1. Worm 30 being a left hand worm and being revolved clockwise (Fig. 1), will turn worm gear 31 counterclockwise. When worm gear 31 is at rest, gears 34 and 35 revolve at the same speed in the same direction (counterclockwise). When 31 is turned clockwise, I find by a study of the epicyclic train of gears 34, 37, 38 and 35 that gear 35 gets an additional amount of counterclockwise rotation and that instead of revolving an amount equal to 34, it now revolves at a higher speed than 34 and thus speeds up 11 and also 12—13 and the draw rolls 2, thus pulling up an additional amount of paper while the rest of the machine continues to run at its usual uniform speed. The amount of gain in speed of gear 35 is governed by the proportion of the gearing and by the length of time the current passes through the magnetic clutch. When the holes come in register the light will pass through for a very short space of time, not long enough to cause such length of action in the photo-electric cell that the armature would be held up in the relay until the next pair of holes were in register. The delay in the return of the armature, and hence in the breaking of the electromagnetic clutch circuit is effected by the dash pot on the end of the armature which is provided with an adjustable release so that the time of dropping of the armature may be made slow enough to last until the next pair of holes comes into operative position. Thus the circuit will not be broken if the misadjustment of the printed paper should be of sufficient extent to let the light through the next pair of holes. In practice the action would be that light would be sent through each succeeding pair of holes for a short interval. The photo-electric cell will be energized repeatedly (but not constantly) with a series of current surges of varying intensity but will maintain a closed clutch circuit with only occasional breaks. In this case the worm gear will be turned counterclockwise very slowly the majority of the time with occasional rest periods.

If for some reason (such as shrinkage of the web) the printed impressions should gain on the machine, the openings 54 in cylinder 50 will come into registry with the holes in the web and a ray of light passing therethrough will energize the other photo-electric cell amplifier relay 62 to close the line circuit through rings 23 to actuate the clutch to effect meshing of the reversing and magnetic clutch gears 23 and 25 so as to turn worm 30 in the other direction and rotate worm wheel 31 counterclockwise (viewed in Fig. 2) which will slow up gear 35 in relation to gear 34 and thus slow up gears 11, 12 and 13, rolls 2, and consequently the printed web in relation to the rest of the machine.

It will thus be seen that the gearing 34, 37, 31, 38, 35 is a change speed gearing operating in such manner that if gear 31 is stationary, both sections of the split shaft 10 rotate at the same speed; whereas if gear 31 is rotated upon operation of the electromagnetic clutch, the section of the shaft carrying the gear 11 will travel more rapidly or more slowly than the other section depending on the direction of rotation of said gear 31. Obviously, any well-known form of change speed gearing may be associated with the electrically operated clutch, but the gearing illustrated has the advantage that the variations in speed are effected gradually and without shock or jar.

The electromagnetic clutch has not been illustrated in detail because such clutches are well

known and any of a large number of them may suitably be used in the above machine. It will be clear that the clutch is provided with means, such as springs to return the gears 22 and 23 to inoperative position upon breaking of the electric circuits.

While I have shown means controlled by the photo-electric cell for speeding up or slowing down the speed of the rolls 2 to make correction for the inaccuracies or irregularities explained above, I wish it to be understood it is within the scope of my invention to effect such correction by varying the speed of the cutter at 3 instead of the rolls 2.

It is not necessary that a direct ray of light fall upon the photo-electric cells 55 and 56 through holes in the web in order to generate a current therein. Such current may be generated or interrupted by means of a contrasting spot or band of color upon the edge of the web from which light is reflected into the photo-electric cell. For instance, a black dot or band may be printed on a white web or vice versa, printing instead of punching such web.

It will be clear from the above description that the length of the cut off sections of the web vary in length between definite limits and that accumulation of discrepancies is avoided. These limits are governed by the lead or lag of the holes 53, 54 over the holes in the web.

Continuous energization of the photo-electric cell to give the change speed gearing time to act may be effected, and the dash pots dispensed with, by employing an endless belt with holes therein for the escape of a ray of light from a lamp located between the runs of the belt. In this case, the holes in the belt will travel with the holes in the web until, when the change speed gearing has produced the proper correction, the holes are no longer in registry. The holes in the belt will be arranged in two series, the holes of each series being spaced the same distance as the holes in the web, but the series being displaced from each other by a distance equal to the permissible variation in the length of the cut sections of the web.

It will be clear that the cylinders 49 and 50, and their equivalent, the traveling belt referred to, perform the function of shutters and that instead of such moving cylinders, there may be used stationary boxes for the lamps having an opening controlled by shutters synchronized with the rest of the machine.

I have illustrated my invention as applied to a paper bag making machine to prevent excessive variation in the feed of a web of paper by a pair of drawing rolls, but it will be clear that my invention may broadly be employed to control operations in general wherein the character (i. e. color-intensity, etc.) of a ray of light may be varied; for instance, my invention may be employed to detect and correct the lateral shifting of a web or conveyer belt, such shifting being employed to establish or break the continuity of a ray of light from a source of light to a photo-electric cell; also to detect the presence of differently colored articles on an opaque carrying surface or of differently colored, translucent or opaque articles on a transparent carrying surface; or to control a machine when an operation, such as drilling or boring, has been completed, thereby permitting a ray of light to pass through the article worked upon; or to discover defects, in the form of holes or variations in opacity, in webs or fabrics whereupon suitable

machinery is operated or regulated. Numerous other applications of my invention will suggest themselves to those skilled in the art.

Variations may be resorted to within the scope of the claims without departing from the spirit of the invention.

I claim:

1. In a mechanism comprising a device for operating on a web of material, means for continuously advancing said web to said operating device, and electrically operated means for varying the speed at which said web is advanced to control the position of an imprint on said web with relation to said operating device, a light controlled device arranged on one side of the path of said web and having means to control a circuit for said electrically operated means, and light projecting means arranged on the other side of the path of said web and comprising a source of light and a device to cause light from said source to be projected toward said light controlled device at predetermined intervals, said web having means located in a definite position with relation to each imprint thereon to control the passage of light from said projecting device to said light controlled device.

2. In a mechanism comprising a device to operate on a continuously moving web of material at a predetermined location with relation to each of a series of imprints on said web, and means for normally feeding said web to said operating device with said imprints in proper relation to said operating device, said web having an aperture arranged in definite relation to each imprint, mechanism to vary the speed at which said web is fed to said operating device, electrically operated means for controlling said speed varying mechanism, a light controlled device arranged on one side of said web and having means for controlling a circuit for said electrically operated means, a device arranged on the other side of said web to project a ray of light through an aperture in said moving web and onto said light controlled device to energize the latter, and means actuated in timed relation to said operating device to so control the passage of light from said projecting device to said light controlled device that said light controlled device will be energized only when said web is in an abnormal position with relation to said operating device.

3. In a mechanism comprising a device to operate on a continuously moving web of material at a predetermined location with relation to each of a series of imprints on said web, and means for normally feeding said web to said operating device with said imprints in proper relation to said operating device, said web having an aperture arranged in definite relation to each imprint, mechanism to vary the speed at which said web is fed to said operating device, electrically operated means having two separate circuits to control the operation of said speed varying mechanism, light controlled devices arranged on one side of said web and each having means for controlling one of said circuits, light projecting devices mounted on the other side of said web and actuated in timed relation to said operating device, said light projecting devices being so arranged that when the imprint on said web is in one abnormal position with relation to said operating device one of said devices will project a ray of light through an aperture in said web onto one of said light controlled devices and when said imprint is in another abnormal position with relation to said operating device the other light pro-

jecting device will project a ray of light through an aperture in said web onto the other light controlled device and when said web is in its normal position with relation to said operating device the apertures therein will be out of line with both light projecting devices.

4. In a mechanism comprising a device to operate on a web of material at a predetermined location with relation to each of a series of imprints on said web, and means for normally feeding said web to said operating device with said imprints in proper relation to said operating device, said web having an aperture arranged in definite relation to each imprint, mechanism to vary the speed at which said web is fed to said operating device, electrically operated means for controlling said speed varying mechanism, a light controlled device arranged on one side of said web and having means for controlling a circuit for said electrically operated means, a lamp arranged on the other side of said web to project a ray of light through an aperture in said web onto said light controlled device, and a device actuated in timed relation to said operating device and having a part interposed between said lamp and said web and provided with an opening arranged to register with an aperture in said web when the imprint on said web is in an abnormal position with relation to said operating device.

5. In a mechanism comprising a device to operate on a continuously moving web of material at a predetermined location with relation to each of a series of imprints on said web, and means for normally feeding said web to said operating device with said imprints in proper relation to said operating device, said web having an aperture arranged in definite relation to each imprint, mechanism to vary the speed at which said web is fed to said operating device, electrically operated means having two separate circuits to control the operation of said speed varying mechanism, light controlled devices arranged on one side of said web and each having means for controlling one of said circuits, light projecting devices mounted on the other side of said web and actuated in timed relation to said operating device, said light projecting devices being so arranged that when an imprint on said web is in one position with relation to said operating device one of said devices will project a ray of light through an aperture in said web onto one of said light controlled devices and when said imprint is in another position with relation to said operating device the other light projecting device will project a ray of light through an aperture in said web onto the other light controlled device.

6. In a mechanism comprising a device to operate on a web of material at a predetermined location with relation to each of a series of imprints on said web, and means for normally feeding said web to said operating device with said imprints in proper relation to said operating device, said web having an aperture arranged in definite relation to each imprint, mechanism to vary the speed at which said web is fed to said operating device, electrically operated means having separate circuits and adapted to initiate and interrupt the operation of said speed varying mechanism, light controlled devices arranged on one side of said web and each having means for controlling one of said circuits, light projecting devices mounted on the other side of said web and actuated in timed relation to said actuating device, each light projecting device comprising a hollow rotatable member having an opening in

the peripheral wall thereof, and having means for projecting a ray of light through said opening, and said opening being so arranged that it will register with an aperture in said web when the imprint on said web is in a predetermined position with relation to said operating device, and thereby cause said ray of light to pass through said aperture onto one of said light controlled devices.

7. In a mechanism comprising a device for operating on a web of material, means for continuously advancing said web to said operating device, and electrically operated means for varying the speed at which said web is advanced to control the position of an imprint on said web with relation to said operating device, a light controlled device arranged on one side of said web and having means to control a circuit for said electrically operated means, a source of light arranged to project light toward that side of said web opposite said light controlled device, and a device operated in timed relation to said operating device to cause light from said source to be projected toward said web at predetermined intervals, said web having means located in a definite position with relation to each imprint thereon to control the passage of light from said source to said light controlled device.

8. In a mechanism comprising a device for operating on a web of material, means for continuously advancing said web to said operating device, and electrically operated means for varying the speed at which said web is advanced to control the position of an imprint on said web with relation to said operating device, a light controlled device arranged on one side of the path of said web and having means to control a circuit for said electrically operated means, and light projecting means arranged on the other side of the path of said web and comprising a source of light, and a device actuated in timed relation to said operating device and having a part arranged to move between said source of light and said web and to cause light from said source to be projected onto said web at intervals, said web having means located in a definite position with relation to each imprint thereon to control the passage of light from said projecting device to said light controlled device.

9. In a web feeding mechanism having electrically operated means for controlling the position of an imprint on said web with relation to a device which operates on said web, a light controlled device arranged on one side of said web and having means to control a circuit for said electrically operated means, a lamp arranged on the other side of said web, and a device mounted for rotation in timed relation to said operating device and having a part interposed between said lamp and said web and provided with an opening through which light from said lamp may be projected onto said light controlled device, said web having means arranged in definite relation to each imprint thereon to control the passage of light from the opening in said rotatable device to said light controlled device.

10. In a web feeding mechanism having electrically operated means for controlling the position of an imprint on the web with relation to a device which operates on said web, a device for detecting errors in the feeding of said web comprising a light controlled device arranged on one side of said web and having means to control a circuit for said electrically operated means, a hollow element mounted on the other side of said web for rotation at a constant speed and having

an opening arranged to move over said web as said hollow element rotates, and means mounted within said hollow element for projecting a ray of light through said opening, said web having means arranged in definite relation to each imprint thereon to control the passage of light from said opening to said light controlled device.

11. In a web feeding mechanism having electrically operated means for controlling the position of an imprint on the web with relation to a device which operates on said web, a device for detecting errors in the feeding of said web comprising a light controlled device arranged on one side of said web and having means to control a circuit for said electrically operated means, a hollow element mounted on the other side of said web for rotation at a constant speed and having an opening arranged to move over said web as said hollow element rotates, and means mounted within said hollow element for projecting a ray of light through said opening, said web having an aperture arranged in a definite position with relation to each imprint and adapted to register with said opening when the imprint on said web assumes an inaccurate position with relation to said operating device.

12. In a web feeding mechanism having electrically operated means for controlling the position of an imprint on said web with relation to a device which operates on said web, a device for detecting errors in the feeding of said web comprising light controlled devices arranged on one side of said web and having means for controlling circuits for said electrically operated means, hollow elements mounted on the other side of said web, spaced apart in the direction of movement of said web and having openings arranged to move over said web as said hollow elements rotate, and means within each hollow element to project a ray of light through the opening therein, said web having means arranged in definite relation to each imprint thereon to control the passage of light from the openings in said rotatable elements to said light controlled devices.

13. In a web feeding mechanism having electrically operated means for controlling the position of an imprint on said web with relation to a device which operates on said web, said web having an aperture arranged in definite relation to each imprint thereon, a device for detecting errors in the feeding of said web comprising light controlled devices arranged on one side of said web and having means for controlling circuits for said electrically operated means, hollow elements mounted on the other side of said web for rotation in timed relation to said operating device and having openings arranged to move over said web as said hollow elements rotate, and means within each hollow element to project a ray of light through the opening therein, the openings in said elements being so arranged with relation one to the other and to said operating device that when an imprint on said web assumes a position in the rear of its normal position the adjacent aperture will register with the opening in one of said rotatable elements, and the light from said opening will be projected through said aperture toward one of said light controlled devices, and when an imprint on said web assumes a position in advance of its normal position the adjacent aperture will register with the opening in the other of said rotatable elements and the light from that opening will be projected toward the other of said light controlled devices.

14. In a machine having a device to operate

on a web of material at a predetermined location with relation to each of a series of imprints on said web, means for feeding a web to said operating device, driving mechanism for said operating device and said feeding means, a device to vary the speed at which said web is fed to said operating device, means including a clutch to operatively connect said speed varying device with said driving mechanism, electrically operated means to actuate said clutch to first establish said connection and to then interrupt the same, and means controlled by the position of the imprints on said web with relation to said operating device to control the circuit for said electrically operated means.

15. In a mechanism comprising a device to operate on a web of material at a predetermined location with relation to each of a series of imprints on said web, and means for normally feeding said web to said operating device with said imprints in proper relation to said operating device, said web having an aperture arranged in definite relation to each imprint, normally inoperative means for varying the speed at which said web is fed to correct variations in the position of said imprints with relation to said operating device, electrically operated means to control the operation of said speed varying means and having separate circuits, and a detector comprising two parts adapted to separately operate through apertures in said web to close the respective circuits, each circuit having means to maintain the same closed independently of said detector, said parts of said detector being so arranged that one of said parts can operate through an aperture in said web only when the imprint on said web is in the rear of its normal position and the other of said parts can operate through an aperture in said web only when said imprint is in advance of its normal position.

16. In a web feeding mechanism having electrically operated means for controlling the position of imprints on said web with relation to a device which operates on said web, a source of light, a device mounted for movement in timed relation to said operating device and having a part interposed between said source of light and said web to cause light from said source to be projected toward said web at intervals, and a light controlled device arranged to receive light from said source and having means to control a circuit for said electrically operated means, said web having means associated with the imprints thereon to control the passage of light from said source to said light controlled device.

17. In a web feeding mechanism having electrically operated means for controlling the position of imprints on said web with relation to a device which operates on said web, a source of light, a device mounted for rotation in timed relation to said operating device and having a part interposed between said source of light and said web and provided with an opening through which light from said source may be projected toward said web at intervals, and a light controlled device arranged to receive light from said opening and having means to control a circuit for said electrically operated means, said web having means associated with the imprints thereon to control the passage of light from said opening to said light controlled device.

18. In a web feeding mechanism having electrically operated means for controlling the position of imprints on said web with relation to a device which operates on said web, a light pro-

jecting device comprising a source of light, and a hollow element mounted about said source of light for rotation at a constant speed and having an opening arranged to move over said web as said hollow element rotates to cause light from said source to be projected toward said web at intervals, and a light controlled device arranged to receive light from said projecting device and having means for controlling a circuit for said electrically operated means, said web having means associated with the imprints thereon to control the passage of light from said light projecting device to said light controlled device.

19. In a mechanism comprising a device for operating on a web of material, means for advancing said web to said operating device, electrically operated means for varying the speed at which said web is advanced to control the position of imprints on said web with relation to said operating device, a continuously illuminated source of light, means for causing a ray of light to be projected from said source toward said web at predetermined intervals, and a light controlled device arranged to receive light from said source and having means to control the circuit for said electrically operated means, said web having means associated with said imprints thereon to control the passage of light from said source to said light controlled means.

20. In a mechanism comprising a device for operating on a web of material, means for continuously advancing said web to said operating device, electrically operated means for varying the speed at which said web is advanced to control the position of the imprints on said web with relation to said operating device and comprising two circuits, means for projecting two separate rays of light toward said web at predetermined intervals and at different times with relation to the operation of said operating device, and two light controlled devices arranged to receive the respective rays of light and having means to control the respective circuits, said web having means associated with the imprints thereon to control the passage of said rays of light from said projecting means to said light controlled device.

21. In a mechanism comprising a device for operating on a web of material, means for continuously advancing said web to said operating device, electrically operated means for varying the speed at which said web is advanced to control the position of imprints on said web with relation to said operating device, means for projecting a ray of light toward said moving web at

predetermined intervals, and a light controlled device arranged to receive said ray of light and having means to control said electrically operated means, said ray of light constituting the sole means for controlling said light controlled device, and said web having means associated with the imprints thereon to control the passage of said ray of light from said projecting means to said light controlled device.

22. In a mechanism comprising a device for operating on a web of material, means for continuously advancing said web to said operating device, and means for varying the speed at which said web is advanced to control the position of an imprint on said web with relation to said operating device, an electro-magnet to control the operation of said speed varying means, a source of light, a device operated in timed relation to said operating device to cause light from said source to be projected toward said web at predetermined intervals, and a light controlled device arranged to receive light from said source of light and having means to control the energization of said electro-magnet, said web having means associated with each imprint thereon to control the passage of light from said source to said light controlled device.

23. In a web feeding mechanism, means for continuously advancing the web, means including an electric circuit for controlling the speed at which said web is advanced, a continuously illuminated source of light, means for causing light from said source to be projected toward said web at predetermined intervals, and a light controlled device arranged to receive light from said source and having means for controlling said circuit, said web having means for controlling the passage of light from said source to said light controlled device.

24. In a web feeding mechanism, means for continuously advancing a web having a series of imprints thereon, means including two electric circuits for controlling the speed at which said web is advanced, means for projecting two separate rays of light toward the moving web at predetermined intervals and at different times, and light controlled devices arranged to receive the respective rays of light and having means for controlling the respective circuits, said web having a single means associated with each imprint thereon and arranged for movement successively into positions to control the passage of the respective rays of light to said light controlled devices.

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