Dec. 8, 1964 W. J. LUBY 3,160,095

WEB PRINTING AND CUTTING APPARATUS DELIVERING A SUCCESSION OF IDENTICAL SHEETS

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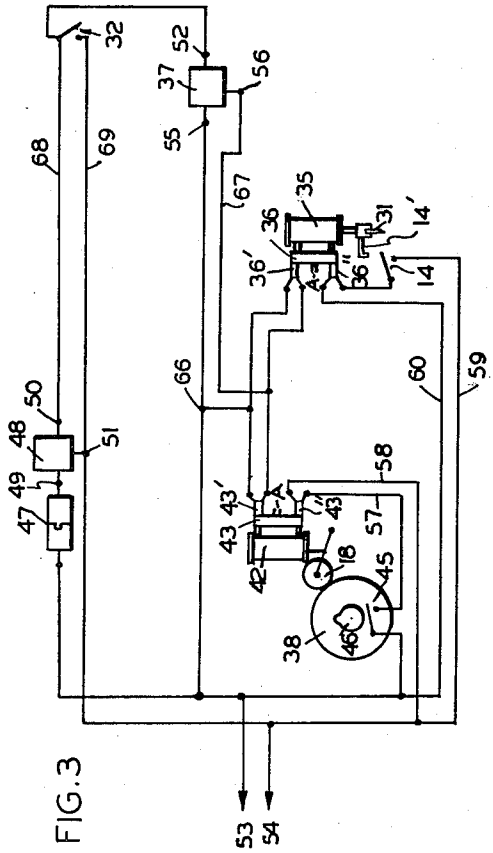


FIG. 3

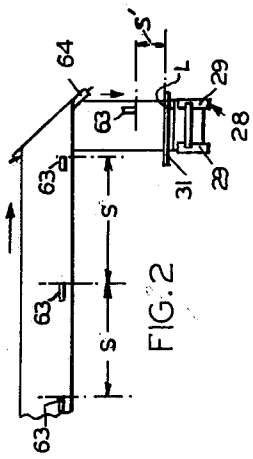


FIG. 2

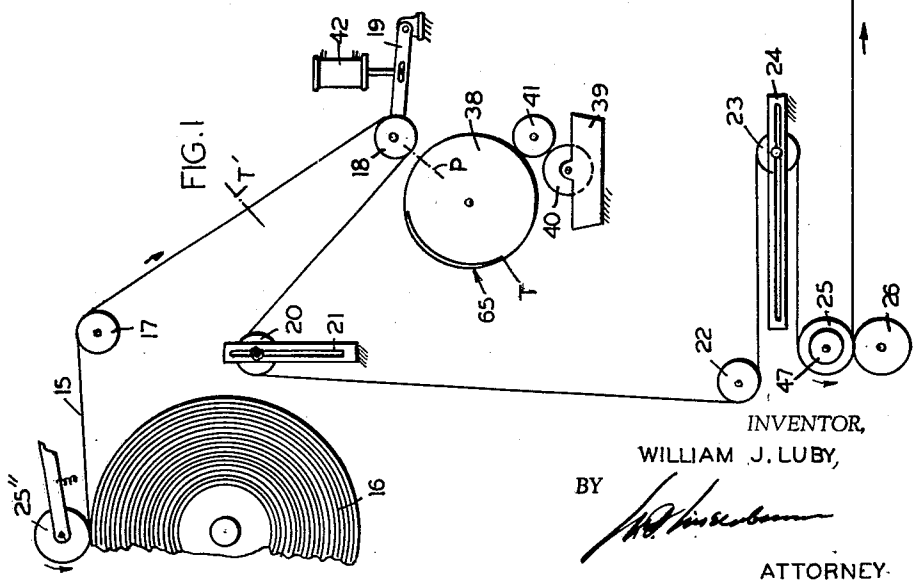


FIG. 1

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3,160,095

# WEB PRINTING AND CUTTING APPARATUS DELIVERING A SUCCESSION OF IDENTICAL SHEETS

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The present invention relates to automatic wrapping machines of the type wherein a web of wrapping paper intermittently supplied off a roll, is printed during its travel to the wrapping station where a required length thereof is cut off. After one article is wrapped, another approaches the wrapping station and is supplied with the next sheet cut off. More particularly, this invention is concerned with printed area position on wrapped articles of different sizes.

This invention contemplates the utilization of standard article-transportation and wrapping mechanisms and hence shows and concerns itself only with novel and improved means to transport, print and cut the wrapping paper in changeable arrangements.

The principal object of this invention is to provide in a wrapping machine of the character described, novel and improved means to accommodate runs of bundles, bales and the like, of different sizes respectively and yet maintain the printed area at a desired postion on the wrapped articles.

Another object thereof is to provide novel and improved means of the kind set forth, which is simple in construction, reasonable in cost, easy to adjust and affording a novel method of adjustment to attain proper spacing of the printed areas on the web for different sized articles to be wrapped and which is efficient in carrying out the purposes for which it is designed.

Other objects and advantages will become apparent as this disclosure proceeds.

For one practice of this invention, I provide that the wrapping paper from a supply roll, shall be threaded through a system of guide rollers and driven nipping rollers so that it shall be led to the wrapping station of the machine where the paper's leading edge actuates a micro-switch when the length along the paper, measured from said leading edge to the plane of movement of a cutting blade poised across the paper, equals the length of the sheet required to wrap a bundle, bale or other pack of a given size. Soon after the wrapping paper comes off the supply roll, it straddles a roller which is on a swingable arm and spaced from a printing roller which is associated with an inking device. The means for shifting said arm so that the paper shall contact the printing wheel, is a double-acting pneumatically-operated cylinder controlled by a solenoid-operated valve. The means for operating the shearing blade which cuts the paper, is a similar cylinder controlled by its own solenoid-operated valve. Intermediate the printing and cutting stations, I provide means for adjusting the length of paper between such stations.

Upon the closing of said micro-switch, various circuits are actuated employing independent timing devices to stop paper movement, to bring the paper into contact with the printing wheel and to operate the cutter, all in a proper timed relation. The article to be wrapped, meets

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the cut-off sheet and is caused to be enveloped. Of course, the next article is brought to the wrapping station, and after an interval determined by said timers, the machine is again in condition to repeat the cycle of operation. The printing wheel is of the self-registering type and the printing is done while the wrapping paper coming off the supply roll is in motion with provision to shift the paper away from the printing wheel when the impression is completed to free such wheel for its automatic registering. For the control of paper movement, an electrically-operated clutch is used, whose manipulation is effected by one of the timing devices.

In the embodiment illustrated herein, the respective positions of the micro-switch and the cuting means, are adjustable to determine the length of sheet cut off. Any adjustment of these, usually requires a change in the paper length which exists between the printing and cutting stations, as will be explained. Means for changing the length of the paper run, is provided therefor. This last adjustment is made in order to have the printed area in the same position on each parcel in any one run of the machine.

In the accompanying drawing forming a part of this specification, similar characters of reference indicate corresponding parts in all the views.

FIG. 1 is a diagrammatic elevational view of a wrapping machine embodying the teachings of this invention. It is to be noted that article transportation and wrapping means are not shown because this invention is not concerned with such.

FIG. 2 is a fragmentary top plan view of a web inverter, which if required, is interposed between the printing and cutting stations, whereupon the cutting and wrapping stations are positioned differently than is shown in FIG. 1, as will be explained.

FIG. 3 is a diagram of the electrical system which may be employed in the machine, embodiment herein illustrated.

In the drawing, the wrapping paper indicated by the numeral 15, coming off the revolvably mounted supply roll 16, is passed over a guide roller 17, thence around the roller 18 which is on a swingable arm 19, thence around the guide roller 20 whose position may be adjusted along the track 21, thence around the roller 22, thence around the roller 23 whose position may be adjusted along the track 24 to be at various distances from both rollers 22 and 25, thence around said roller 25 which is power-driven and in pressure contact with the roller 26; said associated rollers 25, 26, and the similarly driven roller set 25', 26' before the cutting station, being nip rollers to draw the paper web 15 and direct it through the shearing apparatus indicated generally by the numeral 27 and thence to the wrapping station to be positioned in a storage stand 28 comprised of the opposite C-form channel members 29 as is well known in the art, to be met in due time by the article 30 which is to be wrapped after the paper has been sheared by the cutting blade 31, subsequent to the time the leading edge L of the paper did intercept the operating element 70 of the micro-switch 32 to close such switch. The position of this switch 32 is adjustable along the track 33 and is releasably fixed at any set position thereon by means of a set screw 71 and the position of the shearing apparatus 27 is adjustable along the track 34 and is releasably fixed at any set position thereon by means of a set screw 72. These tracks and of

course all other parts of the machine shown in FIG. 1, are suitably mounted on appropriate framework indicated generally by the numeral 73.

The blade 31 is normally in raised position and is operated to cut the paper 15 upon the downward stroke of the double-acting pneumatically-operated cylinder 35 which is controlled by a double solenoid valve 36; the actuation of whose solenoid 36' to effect such downward stroke, being determined by a delayed action electric timer 37. The upward stroke of said cylinder 35 is effected by the actuation of the solenoid 36'' which is controlled by the normally open switch 14, adapted to be closed upon completion of the downward stroke of the blade 31, by a finger 14' carried on the ram of the cutting apparatus 27. I suggest that the timing device 37 be a single cycle timing relay, as for instance, a product marketed by Eagle Signal Co., of Moline, Illinois, as designated in their Bulletin 170, HD Series Timoflex Reset Timer, Form 32, which provides the switch 14 as part thereof and functions to close such switch momentarily and automatically, after actuation of the solenoid 36'.

The arm 19 is normally in raised position to hold the paper 15 off the printing wheel 38 which is of the self-registering type and is associated with the usual ink reservoir 39 and the ink-transferring rollers 40 and 41; such type of printing wheel being of the class shown in Patent No. 2,632,383 which I cite as an example. Said arm 19, upon being lowered, presses the paper 15 against said printing wheel 38. This is accomplished upon the downward stroke of the double-acting pneumatically-operated cylinder 42 which is controlled by the double solenoid valve 43; the actuation of whose solenoid 43' to effect such downward stroke, being determined by said timer 37. There is a normally open switch 45 which is made to close momentarily by a cam 46 turning with the printing wheel 38, and thereby actuate the solenoid 43'' to effect the upward stroke of the cylinder 42, whereupon said arm 19 is raised. I may note that as an example, the double solenoid valves 36 and 42, may be of the type indicated in Pamphlet A366 of A Schrader's Son, Div. of Scovill Mfg. Co., Inc., of Brooklyn, New York, as Schrader #31500–0110.

The powered shaft which may be that of the nipping roller 25, has interposed therein a normally closed electrically-operated clutch 47, whose operation is controlled by the electric timer 48. This clutch is well known in the machine art and includes a brake means which is automatically applied when the clutch is open and released when the clutch is closed. There are suitable drives (not shown) from said shaft to the driven nipping roller 25' and the roller 25'', which latter is biased against the supply roll 16 and gives said roll the proper peripheral speed. The timer 48, upon actuation, effects instant contact to close the circuit and continues the circuit in closed condition for a specified interval. It may be of the type indicated as Form 42 in said Eagle Signal Co. Bulletin 170.

In the electrical circuit diagram given in FIG. 3, the numerals 53 and 54 designate the main power lines, in which of course, the motor (not shown) for driving the machine, is connected. Since it is the function of the micro-switch 32 to initiate the operation of the clutch 47 to cause paper movement to halt, to initiate the operation of the solenoid 43' to cause the roller 18 to bring the paper 15 against the printing wheel 38, and to initiate the operation of the solenoid 36' to effect the cutting of the paper, one manner of a suitable circuit, which is shown in FIG. 3, will now be described, for continuous operation of the machine which is herein shown as a preferred embodiment of this invention.

Identification of the terminals of the timers, will facilitate the description of the circuit. So it is to be noted that the timer 48 is of the type in which when current is applied to its terminals 49 and 50, a connection is instantly effected between its normally unconnected terminals 49 and 51, and such connection continues for a set period of time. This timer 48 acts to bring the normally closed clutch 47 into open condition and to hold it so, for such period of time as is sufficient to allow movement of the article 30 to the right in FIG. 1, at least until the storage stand is emptied of the paper sheet therein which is carried along by said article by such movement. The timer 37 is of the type that when current is applied to its terminals 52 and 55 for a specified period of time, a connection is thereupon effected between its normally unconnected terminals 52 and 56. Since the timer 37 controls the operation of the cutting apparatus 27, its terminals 52 and 56 shall become connected when the web 15 has come to a halt.

One of the conductors 57, 58 which connect the solenoid 43'' across the power lines 53, 54, has interposed therein the switch 45. One of the conductors 59, 60 which connect the solenoid 36'' across the power lines 53, 54, has interposed therein the switch 14. A conductor 66 connects the power terminal 53 with the timer terminal 55 and with one of the terminals of each of the solenoids 43' and 36'. A conductor 67 connects the other terminals of said solenoids 43', 36' with the timer terminal 56. A conductor 68 connects one terminal of the switch 32 with the timer terminals 50 and 52. A conductor 69 connects the other terminal of the switch 32 with the timer terminal 51 and the power terminal 54. One terminal of the clutch 47 is connected to the power terminal 53, and the other terminal of said clutch to the timer terminal 49.

The electrically-operated clutch 47 is normally closed, and is made to open upon being actuated upon the closing of the switch 32. The switch 32 as mentioned, is normally open and adapted to be closed by the leading edge L of the web 15. The valve 36 is normally in condition to operate the cylinder 35 so that the piston therein is in upward position whereby the cutting blade 31 is in raised position. Upon actuation of the solenoid 36', the valve 36 is put into the condition to operate the cylinder 35 so that the piston therein is moved downward and hence the shearing of the web 15 by the blade 31 will be done. Upon actuation of the solenoid 36'', said valve 36 will return to its normal condition whereon the piston in the cylinder 35 will be raised and hence the blade 31 will come back to its normal raised position. The valve 43 is normally in condition to operate the cylinder 42 so that the piston therein is in upward position whereby the roller 18 holds the web 15 away from the printing roller 38. Upon actuation of the solenoid 43', the valve 43 is put into condition to operate the cylinder 42 so that the piston therein moves downward, shifting the arm 19 to have the roller 18 moved to press the web 15 against said printing roller, whereon provision is had (not shown) for said printing roller 38 to be turned by paper movement independent of the arcual length of the printing type section 65 which prints the area 63 on the web. Upon actuation of said solenoid 43'', the valve 43 is put into the condition to operate the cylinder 42 for the piston therein to return to its normal upward rest position and hence the roller 18 will move the web 15 away from the printing roller, the wheel 38. The cylinders 35 and 42 are operated by compressed air fed from a common line (not shown) to the valve intake ports A.

When the machine is running and the paper 15 runs in to fill the storage stand 28, the leading edge L of the paper will meet and move the operating element 70 of the switch 32 to place such switch in closed condition. Upon the closing of said switch, the following will happen: Current will flow from the power terminal 53, through the clutch 47, then through the timer 48, thence along the conductor 68 and through the closed switch 32 and thence along the conductor 69 to the power terminal 54. This will cause the clutch 47 to open and the timer 48 will instantly connect the terminals 49, 51, thereby shunting said switch 32. Thus current continues to flow through said clutch and the character of said timer 48 is such that its terminals 49 and 51 remain connected for a

length of time which is sufficient to allow the cutting apparatus 27 to operate after the paper web 15 has come to rest and for the article 30 to move to the right in FIG. 1, to move the cut sheet out of the storage stand 28. Since this invention is not concerned with the transportation of the articles to be wrapped and the folding of the wrapping sheets thereabout, no apparatus to accomplish such functions are shown, but same is well known in this art.

Also, upon the closing of said switch 32, current will flow from the power terminal 53, along the conductor 66, then through the timer 37, thence through the closed switch 32 and thence along the conductor 69 to the power terminal 54. This will trigger said timer 37, and after a time sufficient to allow the paper web to come to a halt, will cause its terminals 52 and 56 to become connected. Thereupon, current will flow from the power terminal 53, then along the conductor 66, thence through the solenoids 36′ and 43′ which are in parallel, thence through the closed switch 32, and finally through the conductor 69 to the power terminal 54. This will actuate said solenoids 36′ and 43′. The cylinder 35 will be actuated to bring the blade 31 down to cut the web 15, whereupon the switch 14 will close momentarily thereby closing the circuit of the solenoid 36″. This will actuate the cylinder 35 so that the blade is raised to its normal rest position. Also the cylinder 42 will be actuated to cause the roller 18 to move towards the printing wheel 38 and press the paper web 15 thereagainst. Now, the article 30 will move towards the right in FIG. 1, and take with it the cut off sheet and thereby empty the storage stand 28 and of course, the switch 32 will assume its normal open position because there is nothing to hold it closed. When said switch 32 has assumed its open condition as aforesaid, the circuit of the timer 37 will be opened and such timer will reset itself to its normal rest condition, where its terminals 52, 56 are disconnected and its terminals 52, 53 are again connected. Now a new article 30 comes into position within the confines of the storage stand 28. The machine is now ready to again feed paper into the storage stand. The timer 48 has now assumed its normal rest condition because the interval for it is set, has passed. Thereupon the clutch 47 has no current passing through its circuit because the switch 32 is open, and hence said clutch closes and the paper web 15 moves to refill the storage stand 28. During such movement of the web, it will turn the printing wheel 38 and be printed during its engagement with the printing type 65. As soon as the printing is completed, or shortly thereafter, the switch 45 will close momentarily, thereby closing the circuit of the solenoid 43. This will actuate the cylinder 42 to bring the roller 18 away from the printing wheel 38. The printing wheel being now free, will continue to rotate due to its momentum and assume its automatically-accomplished self-registering position. When the leading edge L of the web again closes the switch 32, the cycle is automatically repeated while the paper supply lasts.

The printed impressions 63 made on the web 15 in the set up shown in FIG. 1, will be on the inner surface of the wrapper on an article 30. This finds its uses when the web 15 is of transparent sheeting. By having the paper run around a bending roller 64 positioned 45 degrees across the web 15, for instance after it leaves the nipping rollers 25, 26 and before it comes to the cutting station, said web 15 will be inverted so that the printed impressions 63 will be on the outer surface of the wrapper. When the web leaves the roller 64 it will be in a plane which is parallel to that in which it approached said roller, but the direction of the web will be perpendicular to its direction before it came to such roller 64. Hence the cutting and wrapping stations shall be appropriately positioned to suit the oncoming web as shown in FIG. 2.

In order to have the printed area 63 in the same position on each wrapped parcel in any one run of the machine in which, of course, the parcels are identical, the following arrangements are made after mounting the web as shown in FIG. 1. To aid in setting forth such arrangements, let the letter T represent the leading edge of the printing type 65 which is carried on the periphery of the printing wheel 38. The letter P represents the plane of contact where printing takes place. T′ represents the leading edge of the printed area which is to be made next on the web 15. The distance (hereinafter called $k$) along the web, measured from T′ to P, equals the peripheral distance on the printing wheel 38 from T to P in counterclockwise direction which is the direction in which said printing wheel rotates when it is moved by the web. By actual measurement from a specimen wrapped article, determine the length S of the paper sheet required and the distance S′ from the leading edge of the printed area thereon to the leading edge L of such sheet. Adjustments of the positions of the micro-switch 32 and the plane of the cutting blade 27 are made so that the length of the paper in the storage stand 28, measured from the plane of the cutting blade to the position of said leading edge L of the paper web 15 when said switch 32 is closed and paper movement has stopped, is the length S of the required wrapping sheet and such positions shall assure that the article 30 shall meet such wrapping sheet in proper relation thereto as is determined from the sample package. The position of the roller 23, and also if necessary, the position of the roller 20, are adjusted along their respective tracks 24 and 31, so that the distance (hereinafter called K) along the web 15 measured from P to the plane of the blade 31 plus $k$, equals S′ plus a whole multiple of S. It is to be noted that S is also the distance between the center lines of successive printed areas 63 on the web 15. (The distances $k$ and K are not indicated on the drawing in order to attain clarity of the illustration which is shown.)

Said equation written in the designated symbols, is:

$$k+K=S'+MS$$

hence

$$K=S'+MS-k$$

where M stands for a whole number.

To set the machine for a run of a particular sized parcel 30, after a wrapped specimen package is measured to determine the lengths S, S′ and the position of the article 30 on the spread-out wrapper, arrange the type 65 on the printing wheel 38 so that the distance between the lines T and P is $k$. Arrange the microswitch 32 and the plane of the cutting blade 31, for the required length S of the wrapping sheet and for the proper engagement by the article 30 with the sheet in the storage stand 28 upon movement of said article for the wrapping operation. Adjust the rollers 23 and 21 as necessary so that the distance (K) measured along the paper from P to the plane of the blade 31, is MS plus S′ minus $k$. Thread the paper 15 coming off the supply roll 16, in the manner shown in FIG. 1, but have the leading edge L thereof in position where it closes the switch 32. Adjust the cam 46 to close the switch 45 when the printing is finished. Apply compressed air to the inlet ports A and apply power to the terminals 53, 54 a bit later to the motor (not shown) which drives the machine; such delay assuring that the clutch 47 will open before the motor starts running.

The circuit being powered and the switch 32 being closed, the clutch 47 will open instantly and the timers 37 and 48 will be "triggered." The consequent operations and the functioning of the apparatus shown, having been previously explained, needs no repeating here. The first few wrapping sheets, having no printed area 63 thereon, are discarded.

I recognize that because of momentum, the driven rollers 25, 25′, 25″ will not stop at the very instant that the clutch 47 opens, and that the paper will override some slight amount. This is not objectionable when the article wrapped is a comparatively large bale. However, when the article wrapped is of comparatively smaller

dimensions where the printed area position on the sheet cannot afford to be shifted, then the amount of override shall be included in the distance S when setting the micro-switch 32 and the cutting apparatus 27, to determine S. Therefore, in the appended claims, the distance S which is the length of the wrapping sheet, and the distance along the paper between the plane of the cutting blade 31 and the micro-switch's operating arm 70, when said switch is closed, shall be deemed to include the aforementioned override, though no specific mention thereof is made in the claims.

It is evident that the apparatus offered herein can be an attachment to existing wrapping machines and that in a machine made or used only for the wrapping of one size of parcels at all times, that the rollers 23 and 20 are in fixed position to attain the required condition defined by the equation hereinbefore set forth, and that in such instances, the switch 32 and the cutting apparatus 27, are fixed in position to attain the required S and the proper meeting of the parcel with its wrapping sheet.

This invention is capable of numerous forms and various applications without departing from the essential features herein disclosed. It is therefore intended and desired that the embodiments shown herein shall be deemed merely illustrative and not restrictive and that the patent shall cover all patentable novelty herein set forth; reference being had to the following claims rather than to the specific description herein to indicate the scope of this invention.

I claim:

1. In an apparatus for successively printing equi-spaced areas along a continuous web and for successively cutting off equal lengths from the leading edge of the web so that identical sheets are successively supplied on each of which a printed area is at a predetermined distance from the leading edge of the sheet cut off, the combination of a frame, a plurality of rollers to guide the web, journalled on the frame, a printing roller rotatably mounted on the frame, a rotatably mounted pressing roller positioned normally spaced from and opposite to said printing roller; said pressing roller being movable on the frame from a normal rest position towards the printing roller to have the web in contact with both said pressing and printing rollers for effecting an impressing by the printing roller on the web and then after such impression is made, is adapted to be moved back to its normal rest position, web cutting means fixed on the frame, including a movably mounted cutting blade normally in a rest position away from the path of the web, an element mounted on the frame to be met by the leading edge of the web, means for holding a continuous web which is to be threaded on said guide rollers and to extend between said pressing and printing rollers and thence to extend past the cutting blade and directed towards said element so that upon movement of said blade towards the web, said web will be cut across its entire width, first means to feed the web so that its leading edge will meet said element; the distance along the path of the web from the plane of the blade when said blade touches the path of the web, to said element, being the length of said sheet; the distance along the path of the web between said plane of the blade to where on the web the leading edge of the area to be printed next will be, being the length of said sheet multiplied by a whole number, plus said predetermined distance, a second means to operate the web feeding means, a third means to move the cutting blade across the path of the web and back again to normal rest position, a fourth means to move the pressing roller towards the printing roller and back again to normal rest position, timing means to control the operation of said second, third and fourth means so that the web feeding means is stopped while the cutting blade crosses the path of the web and so that the pressing and printing rollers are together while the web feeding means is operated, for them to engage the web and be driven by said web and make an impression thereon and means to operate said timing means, made operative by the movement of the leading edge of the web onto said element.

2. An apparatus as defined in claim 1, wherein the cutting means and said element are releasably movably mounted and their positions are independently adjustable on the frame.

3. An apparatus as defined in claim 2, including means for changing the distance the web need travel from said printing and pressing rollers to said cutting means.

4. An apparatus as defined in claim 2, wherein said guide rollers include three rollers over which the web passes in succession; the intermediate one of said three rollers being positioned in relation to the other two whereby the web is bent by said intermediate roller; such intermediate roller being movably mounted on the frame and releasably fixed thereon whereby when the position of said intermediate roller is changed, the length of the web between the outer two of said three rollers, is changed.

5. In an apparatus for successively printing equi-spaced areas along a continuous web and for successively cutting off equal lengths from the leading edge of the web so that identical sheets are successively supplied on each of which a printed area is at a predetermined distance from the leading edge of the sheet cut off, the combination of a frame, a plurality of rollers to guide the web journalled on the frame, a printing roller rotatably mounted on the frame, a rotatably mounted pressing roller positioned normally spaced from and opposite to the printing roller, said pressing roller being movable on the frame from a normal rest position towards the printing roller to have the web in contact with both said printing and pressing rollers for effecting an impression by the printing roller on the web and then after such impression is made, is adapted to be moved back to its normal rest position, web cutting means fixed on the frame, including a movably mounted cutting blade normally in a rest position away from the path of the web, a normally open switch fixed on the frame, having an operating element to be met by the leading edge of the web, which element when shifted will cause said switch to assume closed condition, means for holding a continuous web which is to be threaded on said guide rollers and to extend between said printing and pressing rollers and thence to extend past the cutting blade and directed towards said operating element so that upon movement of the blade towards the web, said web will be cut across its entire width, means to feed the web so that its leading edge shall intercept and move said operating element to bring said switch into closed condition, a powered shaft adapted to drive said web feeding means, an electrically-operable normally-closed clutch interposed in said shaft whereby when actuated, said clutch will assume open condition whereby said web feeding means will be halted, electrically-operable means adapted to control the movement of the blade, electrically-operable means adapted to control the movement of said pressing roller and a circuit including electrically actuated timing means arranged to operate said clutch and said plurality of electrically-operable means in a predetermined timed relation so that said clutch is operated to open while the cutting blade crosses the path of the web and so that the pressing roller presses the web against the printing roller while the web feeding means is operated for them to engage the web and be driven by said web to make an impression thereon; said switch being interposed in said circuit so that upon the closing of said switch, said circuit is made operative; the distance along the path of the web from the plane of the blade when said blade touches the path of the web, to said operating element of the switch, being the length of said sheet; the distance along the path of the web between said plane of the blade to where on the web the leading edge of the area to be printed next will be, being the length of said sheet multiplied by a whole number, plus said predetermined distance.

6. An appratus as defined in claim 5, wherein the cutting means and said switch are releasably movably mounted and their positions are independently adjustable on the frame.

7. An apparatus as defined in claim 6, including means for changing the distance the web need travel from said printing and pressing rollers to said cutting means.

8. An apparatus as defined in claim 6, wherein said guide rollers include three rollers over which the web passes in succession; the intermediate one of said three rollers being positioned in relation to the other two whereby the web is bent by said intermediate roller; such intermediate roller being movably mounted on the frame and releasably fixed thereon whereby when the position of said intermediate roller is changed, the length of the web between the other two of said three rollers, is changed.




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