June 24, 1952 J. J. ACKELL 2,601,356

APPARATUS FOR APPLYING DESIGNS TO SURFACES

Filed Nov. 7, 1946 2 SHEETS--SHEET 1

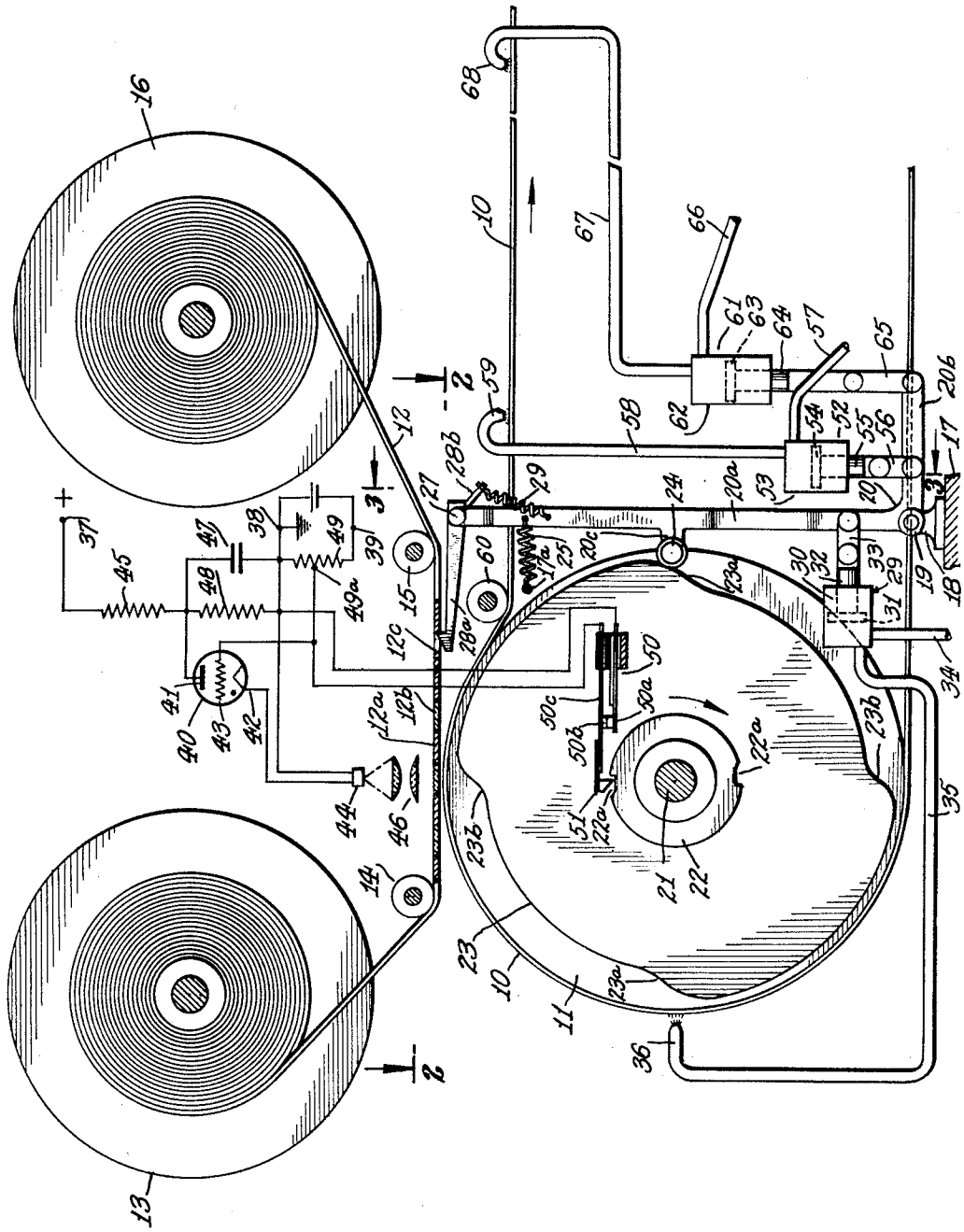


FIG. 1.

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Filed Nov. 7, 1946 2 SHEETS--SHEET 2

FIG.2.

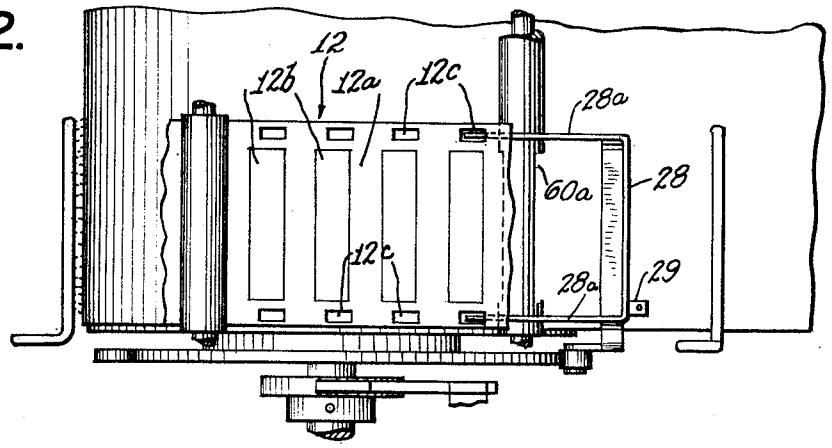


FIG.3.

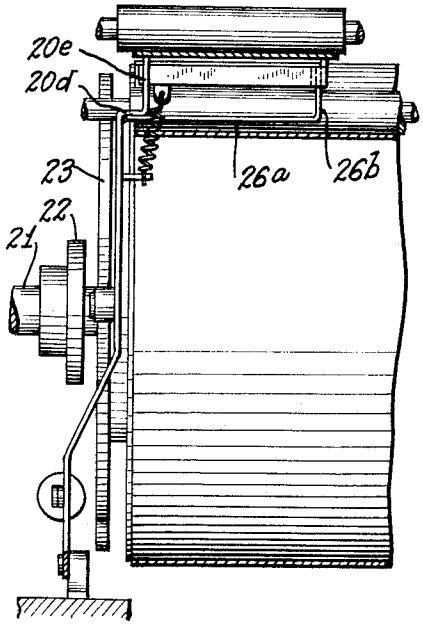


FIG.4.

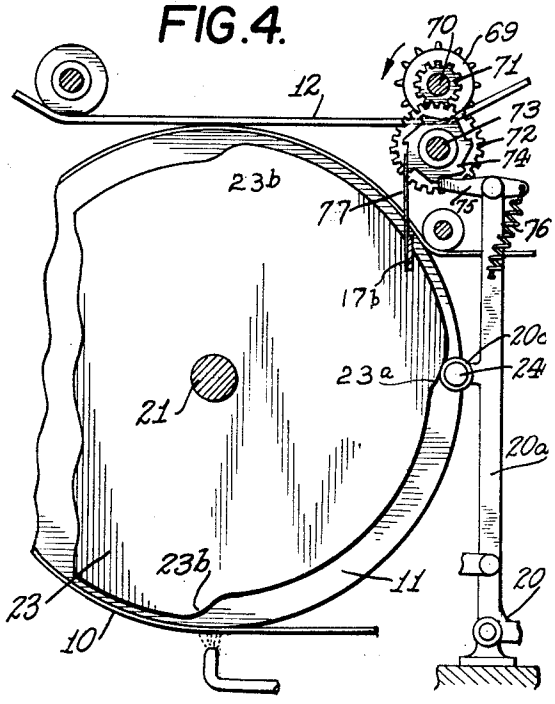
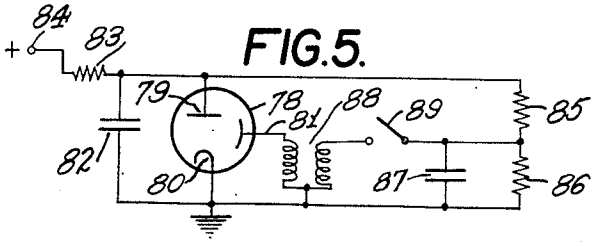


FIG.5.



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2,601,356

UNITED STATES PATENT OFFICE

2,601,356

APPARATUS FOR APPLYING DESIGNS TO SURFACES

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Application November 7, 1946, Serial No. 708,411

6 Claims. (Cl. 95—75)

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This invention relates to a method and apparatus for applying to surfaces a series of addresses, designs, or the like. It is especially applicable for applying addresses to an advancing paper web which is subsequently to be severed and folded to form individual copies of a newspaper or magazine.

In certain industries, such as the newspaper and magazine publishing industries, it is necessary to mail items frequently to the same series of addresses, and the addressing operation is a relatively expensive and slow one even with existing mechanical aids. Prior to the present invention, copies of the publications, after having been printed, severed and folded, have been rehandled in the mailing room in a separate operation in order to apply the necessary addresses.

One object of the present invention is to address copies of a publication automatically and rapidly. A feature of the invention is that this may be accomplished while the paper is in the form of a continuously-advancing, printed web, before the web is severed into individual copies. Alternatively, the addresses may first be applied to spaced areas of a paper web, the web thereafter being printed with the desired text in proper registration with said areas, and finally severed. While the addressing of publications by the teachings of the present invention is preferably accomplished while these publications are in web form, it is to be understood that the invention is not necessarily limited to such mode of operation. Thus in some cases it may be possible to address the publications after severing same.

The invention may have a number of other applications. For example, it may be used to address almost any type of item, such as letters, bills, wrappers, cards and the like. Furthermore, it may be used to apply designs other than addresses to surfaces. As used in the present application, the term "designs" is to be interpreted broadly, covering, in addition to addresses, data of various kinds. It may include, for example, printed material such as a series of inventory items, a series of pictures, patterns, trademarks, indicia, markings for coding, mail permits, or the like. Thus, for example, any combination of light and dark or otherwise contrasting regions may be considered to be a design as herein defined.

The invention is most useful in connection with the application of a series of non-repeated designs, as distinguished from a series of repeated designs, which latter may be applied to surfaces by ordinary printing processes and ap-

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paratus. Provision in the present invention is made for adding new designs, or removing certain ones from the series to be applied.

A feature of one embodiment of the invention is that a light-sensitive substance is first applied to the areas where the addresses or other designs are desired, and light-projecting means including a source of light and light-shielding means are then employed to project onto these areas patterns of light conforming to the configurations of the designs. These areas are then developed so as to bring out the addresses or other designs.

A feature of one embodiment of the invention is that the light-shielding means may comprise a band which may, for example, be of plastic, having opaque portions and light-transmitting portions defining the designs. The light-shielding means may be in a variety of other forms. For example, it may comprise a series of segments linked to form a band, being readily detachable and attachable to one another. An important advantage of said embodiment of the apparatus of the present invention is the possibility of easily changing individual addresses in the series.

A further feature is that special control means may be provided for energizing the light source for only a brief interval while respective successive areas are in position. One of the advantages thereby obtained is a lessening of the heating effect by the light source, which effect might otherwise be sufficient to injure the band. A feature of one embodiment of the invention is that the duration of the intervals during which the light-projecting means is energized is irrespective of the velocity of the moving web or other object to which the design is being applied.

Another object of the invention is to produce clear, unblurred designs, but to allow the web to advance rapidly and continuously. In attaining this object, a feature of one embodiment of the invention is that means are provided for advancing the band or other light-shielding means intermittently in such a way that the projected patterns of light move in synchronism with the respective areas of the web while these areas are being illuminated. Another feature of one embodiment of the invention is that the spacing between the designs on the band may be considerably less than the spacing between the areas on the web or other object to which designs are to be applied. Since the band moves intermittently, it may consequently be considerably shorter than the web of newsprint or other material to which the address is to be applied.

The above-mentioned, as well as other objects

and features, together with the many advantages obtainable by the practice of the present invention, will be readily comprehended by persons skilled in the art by reference to the following detailed description taken in connection with the annexed drawings which respectively describe and illustrate a preferred embodiment of the invention, and wherein:

Fig. 1 is a schematic side elevational view of apparatus for applying a series of addresses to an advancing paper web, certain portions of the apparatus being shown in section.

Fig. 2 is a top plan view of such apparatus, showing details of the address band, certain parts being broken away for clarity of illustration.

Fig. 3 is an end view of such apparatus, as seen from the right of Fig. 1, chiefly in elevation and partly in section, certain parts being broken away.

Fig. 4 is a side elevational view illustrating a somewhat different embodiment of certain portions of such apparatus, featuring different means for advancing an address band.

Fig. 5 is a schematic circuit diagram of an alternative type of light source and control means therefor.

Reference is made to Figs. 1, 2 and 3, which illustrate very schematically one embodiment of the present invention. It may be assumed that the object is to apply a series of addresses to an advancing web 10 of newsprint at some point in the printing process, either before or after it is actually printed, but before it has been severed into individual sheets. A cylinder or roller 11 may be provided for guiding and advancing said web.

The apparatus is provided with light shielding means, which may comprise a band having a series of portions, sections, or segments spaced along the length thereof, each of which is partly opaque and partly light-transmitting so as to define an address. This band should be strong, flexible and preferably light in weight so as to have low inertia. It may be a continuous film such as that shown in the drawings and designated generally by the reference numeral 12, having certain opaque regions such as 12*a*, but provided with regions such as 12*b* in which it is partly opaque and partly transparent, the transparent regions defining the desired addresses. In this type of band, when desired, addresses could be eliminated from the mailing list by cutting the undesired portion from the band and cementing the resulting ends together. Addresses could be added by attaching film portions to an end of the band, or inserting same at intermediate portions in the band.

The light-shielding means need not, however, comprise a band of the above type. It may comprise a series of segments linked together by means permitting ready attachment and detachment so as to allow changes easily to be made, or a series of members or segments not linked together. The term "segments" as used in this application is to be understood as broad enough to be applied to portions of a continuous band, or individual elements linked into a belt, or a series of individual, separate elements.

As a further illustrative embodiment, the light-shielding means might comprise a series of separate segments and a band adapted to serve as a frame or holder for the segments. Thus the band could have a series of openings or transparent regions and means such as rims or flanges on three sides of the openings, adapted to hold the address-bearing segments in spaced-apart relation.

It is to be emphasized that the possibility of readily changing the address list is a great advantage, particularly in the daily newspaper publishing business where the subscription list may be changed every day.

The band 12 may be carried by a reel 13 from which it is drawn and intermittently advanced by means to be described. After leaving the reel 13 the band 12 passes under a pair of rollers 14 and 15 which guide it in a generally parallel adjacent relationship to the paper web 10 in the region of the roller 11. After leaving the roller 15 the band 12 is wound upon a reel 16. This reel may be driven by a friction drive (not shown), or some other driving means which allows slipping, and the reel 13 may be provided with a friction retarding brake (not shown), in order to avoid slack in the band 12.

It will of course be understood that the apparatus will include certain elements such as additional means for supporting the band 12 and the web 10, not shown in the drawings because of the schematic nature.

The apparatus may be provided with a base 17 having an upstanding lug 18. Pivotally attached to the lug 18 at a point 19 is a bell crank lever 20 having an upstanding arm 20*a* and a horizontal arm 20*b*.

The roller 11 may be mounted on a shaft 21, appropriately journalled for rotation by means not shown in a portion of the base 17. Mounted on the shaft 21 are a pair of cams 22 and 23.

The upstanding arm 20*a* of the bell crank lever is provided with a horizontally extending portion 20*c* on which there is pivotally mounted a roller 24 for engaging the periphery of the cam 23. Yielding means are provided for urging the bell crank lever to pivot in a counter-clockwise direction about the point 19 so that the cam 23 is engaged by the roller 24 on the portion 20*c* of the bell crank lever. For example, there may be provided a spring 25, having its left-hand end secured to a portion of the base at 17*a* and its right-hand end secured to the arm 20*a*. The cam 23 is provided with sloping shoulders 23*a*, 23*a* and 23*b*, 23*b*. It may be seen that as the roller 11 rotates in a generally clockwise direction the bell crank lever will be caused to rock about the point 19.

The upstanding arm 20*a* of the bell crank lever is bent to form a horizontal portion 20*d* and an upstanding portion 20*e*. Attached to and extending horizontally from the portion 20*d* is an L-shaped member having horizontal and vertical portions 26*a* and 26*b*. Pivotally mounted in the upstanding portions 20*e* and 26*b* is a shaft 27, shown in Fig. 1. Mounted on the shaft 27 is a bracket 28 provided with pawl-like portions 28*a*, adapted to engage the slots 12*c* of the band 12. The bracket 28 is provided with a lug portion 28*b*; and a spring 29, secured to this lug portion and to the arm 20*a*, is provided for urging the bracket 28 to pivot in a clockwise direction with respect to the arm 20*a* so as to bring the pawl-like portions 28*a* into engagement with the slots 12*c*.

It may be seen that as the web 10 advances and the roller 11 rotates in clockwise direction, when a shoulder 23*a* of the cam 23 engages the roller 24, the bell crank lever will rock in a clockwise direction about the point 19, causing the pawls 28*a* to advance the band 12 toward the right. If the shoulders 23*a* are properly

shaped, the band 12 will intermittently advance at the same speed as does the web 10. The apparatus is provided with means, to be described, for projecting light through the band 12 onto the web 10. In some embodiments of the present invention it would be possible to have the band 12 positioned at a somewhat greater distance from the web 10, in the region where light is projected onto the web, than the distance shown in Fig. 1. Under such circumstances, it would be desired that instead of the band 12 moving at the same velocity as the web, the image of the address projected onto the web 10 should move at the same velocity as the web 10 in this region. The web 10 may be provided with spaced light-sensitive areas by some prior operation, or, as illustrated in the present embodiment, the apparatus may be provided with means for applying a light sensitive photographic material to areas where addresses are desired. The purpose of the means described above for advancing the band 12 at the same speed as the web 10 during exposure of the light-sensitive areas is to assure that there may be no blurring of the address. Blurring might be avoided by other means, such as by using a very short exposure. Instead of using a flashing lamp or tube, for obtaining short exposures, a shutter might be used. In the present example, the light source is energized for only a brief interval, being turned off during unused parts of the cycle. The purpose of this is to allow it to cool, and the interval when it is turned on is long enough so that blurring would occur if the previously described means were not provided for advancing the band 12 in synchronism with the web 10.

It should be noted that the advancing stroke of the pawls 28*a* is of such length as to advance the band 12 the proper distance so that successive address portions of the band are brought into position above the web 10 near the top of the roller 11. When the shoulders 23*b* of the cam 23 engage the roller 24, the bell crank lever is rocked by the spring 25 in a counterclockwise direction and the pawls 28*a* perform a reaching or recovery stroke.

Various means may be used for the application of the light-sensitive substance to the web 10. In the present embodiment the apparatus is provided with a pump 29 having a cylinder 30, a piston 31 fitted therein, and a piston rod 32. Pivotally connected to the piston rod 32 and to the arm 29*a* is a link 33. Light-sensitive material may be supplied to the pump 29 through a pipe 34 provided with an appropriate ball check valve, not shown, and transmitted from the pump through a pipe 35, also provided with a suitable valve. The pipe 35 may be provided with a nozzle 36 for directing the light-sensitive material onto the web 10. It will be observed that the pump 29 performs its suction stroke when the shoulders 23*a* engage roller 24, and performs its pumping stroke when the shoulders 23*b* engage this roller. The relative positions of the shoulders 23*a* and 23*b*, the web 10, the nozzle 36, and the band 12 with its associated light-projecting means, are important for proper timing. It will be observed that there are two shoulders 23*b*, spaced 180° apart, and that when these shoulders engage the roller 24, light-sensitive material is applied to the web. The nozzle 36 may conveniently be placed opposite, or 180° from, the roller 24; for example, they both may lie in a horizontal plane passing through the axis of the shaft 21. It will then

follow that the positions of the shoulders 23*b* correspond to the positions at which light-sensitive material is applied to the web 10. The web should therefore be positioned on the roller 11 so that regions of the web where addresses are desired correspond to the positions of the shoulders 23*b*. When the roller has rotated 90° farther, the cam will be positioned approximately as shown in Fig. 1; that is, the shoulders 23*b* will lie in an approximately vertical plane. An area bearing light-sensitive material will therefore be at the top of the roller 11. The shoulders 23*a* may hence be conveniently placed opposite one another, and spaced 90° from the shoulders 23*b*. The slope of the shoulders 23*a* will control the rate at which the band is advanced, and this slope may be designed so that the band advances intermittently at the same rate as does the web or so that the image of the address projected onto the web advances at the same rate as does the web. Thus the motion of the band or the image is synchronized with the motion of the areas bearing light-sensitive material as they pass over the top of the roller 11. The pump 29 performs a recovery stroke while the band is being advanced. It will be understood that other suitable timing arrangements could be provided.

As previously mentioned, light-projecting means are provided for directing light through the band 12 so as to project images of the addresses onto the desired areas of the web 10, and means are provided for controlling said light-projecting means. In this connection the apparatus is provided with a source of unidirectional voltage, having a terminal 37 at a relatively high positive potential with respect to ground and a terminal 38 at zero or ground potential. There is provided a separate source of bias voltage having a terminal 39 at a negative potential. Its other terminal may conveniently be grounded, as at 38. Of course it is the relative values of the potentials at the terminals 37, 38 and 39 which is important, and if desired, instead of the aforementioned arrangement, the terminal 39 could be grounded, and the terminal 38 could be at a positive potential between ground and the positive potential of the terminal 37. The apparatus is also provided with a gas tube 40 having an anode 41, a cathode 42 and a control grid 43. There is provided a high wattage incandescent lamp 44 preferably of the concentrated filament type, and capable of reaching a high degree of brightness quickly and becoming dark quickly when power is shut off. This lamp is connected in series with the plate circuit of the tube 40, a resistor 45 and the power supply through the terminals 37 and 38. The lamp 44 is positioned over the band 12 in the region where this band passes over the top of the roller 11, and a condensing lens system 46 may be provided between the lamp and the band 12 for focusing and directing light from the lamp through the band 12 onto the web 10. The lens system may take a variety of forms, and, in some embodiments, may lie between the band 12 and the web 10. There are provided a capacitor 47 and a resistor 48 connected in parallel with each other and in parallel with the series combination of the lamp 44 and the tube 40. There is provided a resistor 49 between the ground terminal 38 and the negative potential terminal 39, and the grid 43 is connected to an intermediate point 49*a* of the resistor 49 so as normally to be maintained at a negative potential below that at which the tube 40 will fire. There is provided a switch means, gen-

erally indicated by the numeral 50, having a terminal 50a connected to the ground terminal 38, and a terminal 50b connected to the point 49a of the resistor 49. The terminal 50b is mounted on a portion 50c of the switch means 50 which may conveniently be of spring-like strip material, so mounted and stressed as to urge the left-hand end of the portion 50c downwardly. Mounted on the portion 50c is a follower 51, adapted to cooperate with the cam 22. This cam is provided with a pair of oppositely spaced indentations, 22a, which may conveniently be positioned so as to engage the follower 51 at the time when the light-sensitive areas of the web 10 reach the top of the roller 11. It is to be understood that the spring action of the member 50c causes the follower 51 to follow the periphery of the cam 22. It is also to be understood that in certain embodiments the member 50c may not be of spring material. Thus the action of gravity might be relied upon to pull the follower 51 downward, and the contact 50b toward the contact 50a.

The mode of operation of the control means for the light-projecting means may be explained as follows. In general, the present embodiment of this control means may be considered to operate in two steps, a step in which the capacitor 47 is charged by the power supply, and a step in which this capacitor is discharged through the lamp 44. The cam normally holds the follower 51 in an up position, thereby lifting the portion 50c of the switch means 50, and separating the contacts 50a and 50b.

While the contacts 50a and 50b are open, the grid 43 is held at a sufficiently great negative potential so that the gas tube 40 will not fire. This tube then functions as an open circuit, and the capacitor 47 is charged by the power supply through the resistor 45. The upper plate of the capacitor 47 will approach a potential determined by the voltage divider action of the resistors 45 and 48. When the indentations 22a engage the follower 51, the switch is allowed to close, which provides the grid 43 with a direct connection to ground, thereby raising it to ground potential, which causes the tube 40 to fire. The lamp 44 is then effectively connected across the capacitor 47, and the capacitor supplies a current pulse or surge of charge through the lamp 44, raising it to intense brightness. The tube 40 will be extinguished when the capacitor 47 has discharged to such an extent that its voltage will not support a discharge through the tube. Before the capacitor can charge sufficiently to fire the tube a second time, the cam 22 acts to open the switch 50, thereby preventing the tube from firing until the next appropriate time, when the roller has rotated 180° farther. It is inconsequential whether the cam 22 opens the switch 50 slightly before or slightly after the tube 40 is extinguished, since the grid cannot extinguish the tube while it is firing, nor can it initiate firing until the plate potential has built up to a point where firing may be initiated. The switch must, however, be opened before the potential on the upper plate of the capacitor has risen to such a point that firing may again occur.

Viewed differently, the control means for the lamp may be considered a relaxation oscillator, normally biased off, provided with switch means for triggering the oscillator to produce a current pulse when desired.

Means are also provided for applying a developing solution to the web 10. For this purpose there may be provided a pump 52 having a cylinder 53, fitted with a piston 54 to which is connected a piston rod 55. Pivotally connected to the piston rod 55 and to the horizontal arm 20b of the bell crank lever 20 is a link 56. Developing solution may be supplied to the pump 52 through a tube or pipe 57 provided with a check valve, not shown, and may be conducted from the pump through a pipe 58, also provided with a check valve, not shown. The pipe 58 may be provided with a nozzle 59 for directing developing solution onto the web 10. As a modification, a gaseous developer, instead of a liquid, may be used.

The apparatus may be provided with a guide roller 60 under which the web 10 passes as it leaves the roller 11. This roller 60 should be provided with a circumferentially indented region 60a corresponding to the path along which the address areas pass in order that these areas may not be damaged by this roller.

The rocking action of the bell crank lever 20 will cause the piston 54 to reciprocate within the cylinder 53, thereby causing the pump 52 to transmit developing solution to the nozzle 59, where it is sprayed onto the web 10. The nozzle 59 should be located at a suitable point such as a distance corresponding to approximately one-fourth the circumference of the roller 11 from the top of this roller, in order that when the pump 52 transmits developing solution onto the web 10, an address-area of this web will be underneath the nozzle 59.

Means of a similar nature to the pump 52 and associated elements may be provided for applying a fixing solution to the web 10. Thus, as shown in Fig. 1, there may be provided a pump 61 having a cylinder 62 fitted with a piston 63 having a piston rod 64. Connected to a portion of the piston rod 64 and to the horizontal arm 20b of the bell crank lever 20 is a link 65. Fixing solution may be supplied to the pump 61 through a pipe 66, provided with a check valve, not shown, and may be conducted from the pump through a pipe 67, also provided with a check valve, not shown. The pipe 67 may be provided with a nozzle 68 for spraying fixing solution onto the web 10. For proper timing the nozzle 68 should be placed at a position such that the fixing solution will reach the areas bearing the light-sensitive solution. For example, the nozzle 68 may be placed at a distance from the nozzle 59 corresponding to one-half the circumference of the roller 11, which may be the length of one newspaper. Instead of applying a fixing solution to the web, it may be possible to use, in connection with the pump 52, a combination developing and fixing solution. A still further possibility may be to use a light-sensitive material which is so chemically composed as to render fixing material unnecessary.

It is to be understood that a variety of modifications of the present invention are possible. Thus, for example, the band 12 may be advanced by somewhat different means such as those illustrated in Fig. 4. In this embodiment the slots 12c are engaged by a pair of toothed wheels 69, mounted on a shaft 70. This shaft also carries a gear 71. The gear 71 may be driven by a gear 72 mounted on a shaft 73. The shaft 73 also carries a ratchet wheel 74. There is provided on the upper end of the arm 20a a pawl 75 urged by a spring 76 to engage the ratchet wheel 74. There may be provided a check pawl 77 supported from a frame member 17b, adapted to engage the ratchet 79 and to prevent backward

motion thereof. It may be observed that when the shoulders 23*a* and 23*b* of the cam 23 engage the roller 24, and cause the bell crank lever 20 to rock on the point 19, the ratchet wheel 74 will be intermittently driven in a clockwise direction, which by the action of the gears 71 and 72 will result in driving the toothed wheels 69 in a counterclockwise direction, thereby intermittently advancing the band 12 as desired.

It is to be observed that in the embodiment shown in Fig. 4 the band 12 will be advanced when the shoulders 23*b* engage the roller 24, as distinguished from the embodiment shown in Fig. 1 when the band was advanced upon engagement of the roller 24 by the shoulders 23*a*. Since the timing is somewhat different, it will be necessary to take this factor into account in the design of the other cooperating elements. For example, assuming that a pump for transmitting light-sensitive material is driven by the arm 20*a* in a manner similar to that shown in Fig. 1, it will be necessary to place the nozzle at a different position, such as at the bottom of the roller 11, as shown in Fig. 4, in order that the light-sensitive areas will reach the top of the roller at the time the band is advanced. A cam provided for the purpose of turning the lamp on and off, such as the cam 22 in Fig. 1, should be arranged with the indentations corresponding to the positions of the shoulders 23*a*, in order that the light may be turned on at the time the light-sensitive areas are at the top of the roller 11.

Assuming that means for pumping developing solution onto the web 10 are provided in connection with the embodiment shown in Fig. 4 similar to those shown in Fig. 1, the position of the nozzle should, in Fig. 4, be located at a distance to the right of the top of the roller 11 equal to approximately one-half the circumference of the roller 11 in order that the timing may be proper. A nozzle for delivering a fixing solution might be located a similar distance beyond the nozzle which delivers developing solution. Still other embodiments could be incorporated in the present invention. For example, instead of applying the solutions by pumps and nozzles, it would be possible to apply same by rollers, appropriately positioned and actuated, or other means. Instead of using cams as timing means, gears, for example, could be used.

An arc lamp with a resistor connected in parallel with it might be substituted for the incandescent lamp 44. The resistor would provide a current path even when the arc is extinguished, thereby preventing the cathode 42 of the tube 40 from being at a floating potential.

Instead of using a gaseous discharge tube and an associated electronic circuit for controlling the light source, a simple electric switch may in some embodiments be sufficient. Also, instead of turning the lamp on and off intermittently, shutter means may be used. While in the present embodiment it has been assumed that the chief means for preventing blurring of the address is the means for advancing the band in synchronism with the web, if the lamp is energized for a brief enough interval, there will be virtually no displacement of the web during this interval, and hence there will be no blurring. It might in this case be unnecessary that the band be advanced at the same rate as the web. The light-sensitive material should in this case be quite fast-acting, and the light projecting means should be provided with a lamp capable of giving extraordinarily intense illumination.

Instead of using an incandescent lamp as the light source, and the control circuit shown in Fig. 1 for turning same on and off, it is possible to use a flash tube, such as for example type R–4330 of Sylvania Electric Products, Inc., which is a special gaseous discharge tube capable of delivering a brilliant flash of light with a duration of only approximately 200 micro-seconds. In Fig. 5 there is shown such a tube 78 connected in an appropriate control circuit. This tube has an anode 79, a cathode 80 and a control grid 81. A capacitor 82 is connected in parallel with the tube 78 and in series with a resistor 83. There is provided a source of high-voltage unidirectional power having a positive terminal 84 to which is connected the resistor 83, and a negative or ground terminal to which is connected the cathode 80 of tube 78. A pair of resistors 85 and 86 are connected in series with one another and in parallel with the tube 78. A capacitor 87 is connected in parallel with the resistor 86. There is provided a transformer 88, the secondary winding of which is connected between ground and the control grid 81 of the tube 78. One end of the primary of the transformer 88 is grounded. There is provided a switch 89, which corresponds to the switch 50 of Fig. 1, arranged so as to be capable of connecting the other end of the primary to the upper plate of the capacitor 87. It may be assumed that the windings of the transformer 88 are so arranged that when the upper terminal of the primary is driven positive, the upper terminal of the secondary is likewise driven positive. In the present illustration it may be assumed that the circuit of Fig. 5 is substituted for the electrical apparatus shown in Fig. 1. The tube 78 will, in a sense, serve both as a light source and as a control tube. The switch 89 of Fig. 5 will be connected to the follower 51 so that when the follower is in its down position, the switch is closed. The band 12 may be operated quite close to the web 10 and the lens system eliminated, because of the fact that the flash tube is a rather extended light source. The control circuit and tube shown in Fig. 5 are not claimed to be novel per se. The combination of such means with other components of the apparatus as herein described is, however, novel.

The circuit of Fig. 5 will operate as follows: The switch 89 may be assumed initially in its normal position, open. The nature of the tube 78 is such that even with a very high potential difference between its plate and cathode, firing can be initiated only by driving the control grid strongly positive. Initially there may be assumed to be no conduction through the tube 78 between its plate and cathode. The capacitor 82 will be charged from the power supply through the resistor 83. The capacitor 87 will be charged to a potential determined by the voltage divider action of the resistors 85 and 86. When the follower 51 drops downward and the switch 89 is thereby closed, the upper terminal of the primary, and hence of the secondary, of the transformer 88 will be driven strongly positive. The characteristics of the tube 78 are such that under these circumstances it fires with a brilliant flash, and the capacitor 82 is thus discharged through the tube. The plate potential will very quickly drop below that

necessary to sustain the discharge through the tube, and the tube will be extinguished.

It may be possible to utilize the teachings of the present invention to alter the whole method of circulation fulfillment in a publishing system. The address film may be profitably used for record keeping phases of circulation operations with very substantial savings in filing space and other expense. The film may be provided with coding features, such as spaced light and dark spots, adapted to actuate photoelectric control devices adapted for sorting out expired subscriptions. By way of specific example, in case it is desired to remove expired subscriptions, such a film could be passed between a light source and a light-sensitive element adapted to ring a bell when a portion of the film passes having the particular combination of code spots which corresponds to the expiration date being sorted The film could be stopped and that address removed.

Another method of sorting expirations with the use of the film herein described is to pass the film between a light source means and a viewing screen, thereby projecting images of the addresses on the screen. If the address carries a code indicating the expiration date, the operator can then sort out the appropriate addresses.

In addressing operations, the band 12 may with considerable advantage carry, in addition to the address, a mailing permit.

The apparatus also may be used to perform billings and other bookkeeping functions.

Instead of projecting visible light onto the paper web the apparatus and method herein described could employ other types of radiant energy, in combination with a substance sensitive to such energy.

While an illustrative form of the invention has been disclosed in considerable detail, it will be understood that various changes may be made in the construction and arrangement of the several parts without departing from the general principles and scope of the invention as defined by the appended claims.

I claim:

1. Apparatus for applying a series of addresses to spaced-apart address-receiving areas of a continuously and rapidly advancing paper web in the course of printing a publication on said web, said apparatus including roller means engaging said web, said roller means rotating in synchronism with the motion of said web, a cam driven by said roller means, a main actuating member having a follower portion engaging said cam, an electric lamp, a band having a plurality of segments, each of said segments being contrastingly opaque and transparent at various portions thereof so as to define an address, means including a guide for said band and a ratchet for interposing successive segments of said band between said lamp and said areas of said web to direct images of successive addresses onto successive said areas of said web at an exposure station, said ratchet being driven by said main actuating member, an intermittently-acting applicator opposed to said paper web at a station prior to said exposure station for applying light-sensitive material to said spaced areas of said web, said applicator being intermittently actuated by said main actuating member.

2. Apparatus as in claim 1 in which said ratchet intermittently advances said band at the same speed as that of said web.

3. Apparatus as in claim 2 comprising a control for said lamp actuated by said roller means for turning said lamp on or off, whereby said areas are exposed to light for only brief intervals.

4. Apparatus for applying a series of addresses to address-receiving areas spaced apart along the length of a paper web advancing continuously at high speed in the course of printing a publication on publication-receiving portions of said web between said address-receiving areas, said individual publication-receiving portions of said web extending a greater distance along the length of said web than said address-receiving areas, said apparatus comprising a drive for continuously advancing said web at relatively high speed, roller means engaging said advancing web and rotating in synchronism with the motion of same, cam means driven by said roller means, an applicator intermittently actuated by said cam means for applying light sensitive material to said spaced-apart address-receiving areas, a band having relatively opaque and relatively transparent segments defining addresses, guide means for guiding said band in a generally parallel relationship to said web, a light source adapted for directing light through said band onto said web, and an intermittent drive actuated by said roller means for intermittently advancing said band at approximately the same rate as said web.

5. In apparatus for applying a series of addresses to a continuously and rapidly advancing paper web which is to be severed into separate copies of a publication, said web having a plurality of spaced address-receiving portions bearing light-sensitive material separated by longer unsensitized portions of said web, in combination, web-advancing means comprising a continuous drive and guiding rollers for continuously advancing said web at high speed past an exposure station, a continuous address-band having address-defining portions, each of said address-defining portions having relatively opaque and relatively transparent parts so as to define an address, means including a light source for directing light along a path through said band onto successive ones of said address-receiving portions of said web at said exposure station, an intermittent drive for stopping and intermittently advancing said band through said light path, said band having perforated portions extending along the length thereof and said intermittent drive having a driving member adapted to extend through the perforations in said band so as to engage said band with a positive driving action, said intermittent drive for said band being driven by said web-advancing means and being adapted to stop and advance said band in such a timed relationship relative to the advance of said web as to present successive ones of said address-defining portions of said band in said light path when successive ones of said address-receiving portions of said web pass said exposure station.

6. In apparatus for applying a series of addresses to a continuously and rapidly advancing paper web, said web having a plurality of spaced, light-sensitive, address-receiving portions separated by longer unsensitized portions, in combination, a main actuating device having a movable member engaging said advancing web so as to cause the speed of advance of said web to be directly related to the speed of movement of said actuating device, an address-band having a plurality of segments, each of said segments being

contrastingly opaque and transparent at various portions thereof so as to define an address, means including an electric lamp for directing light along a path through said band onto said web at an exposure station, a guide for said band, and an intermittent drive for alternately stopping and advancing said band, said intermittent drive for said band being driven and timed by said main actuating device, said intermittent drive being adapted intermittently to advance said address-defining segments of said band in such a timed relationship relative to the advance of said web as to direct images from successive ones of said segments onto successive said address-receiving areas of said web as said areas continuously advance past said exposure station.

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