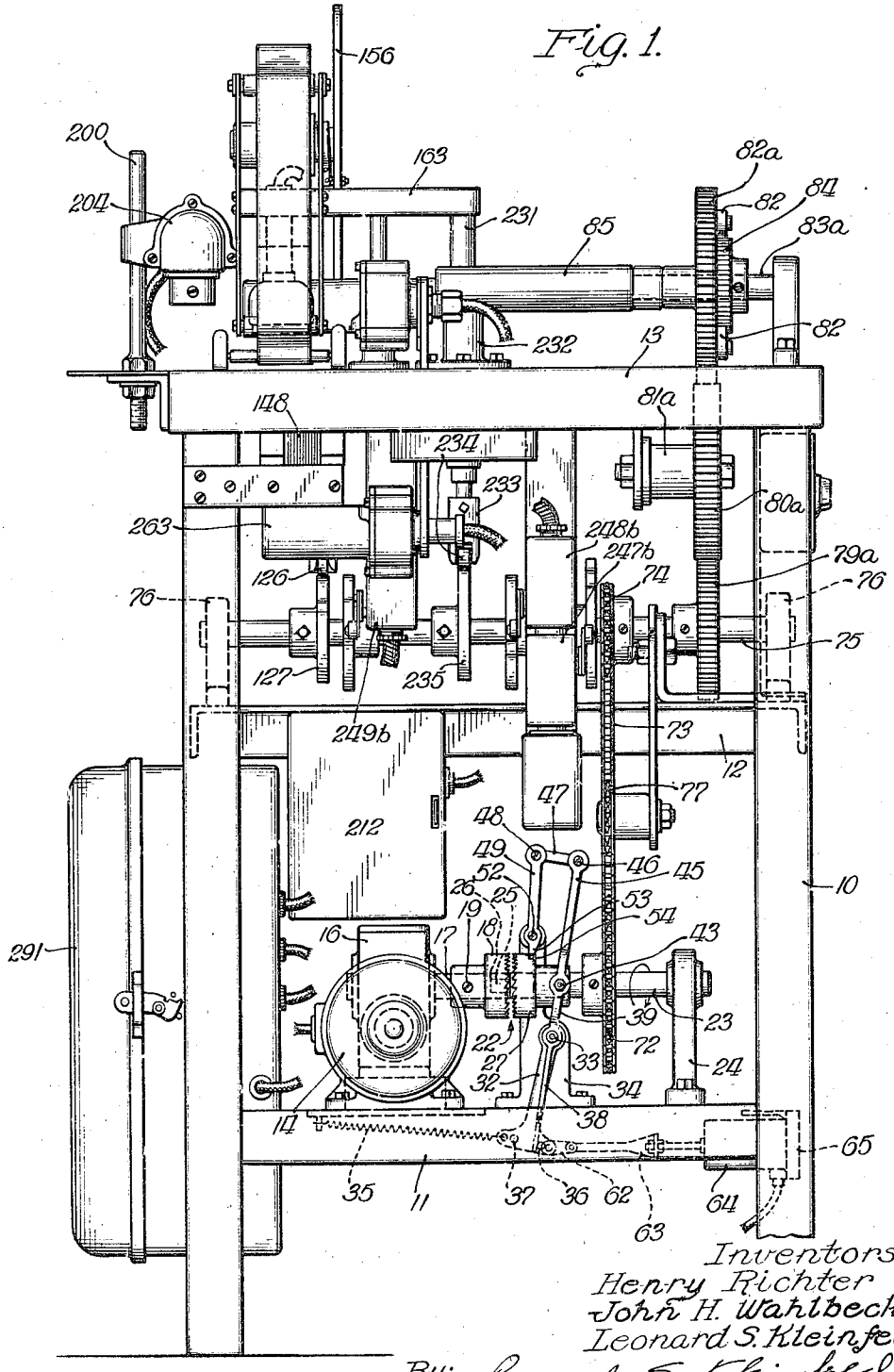
July 6, 1943. H. RICHTER ET AL 2,323,843

MACHINE FOR MARKING TEXTILE AND OTHER ARTICLES

Filed Dec. 4, 1939 7 Sheets-Sheet 1

Fig. 1.



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MACHINE FOR MARKING TEXTILE AND OTHER ARTICLES

Filed Dec. 4, 1939 7 Sheets-Sheet 2

Fig. 2.

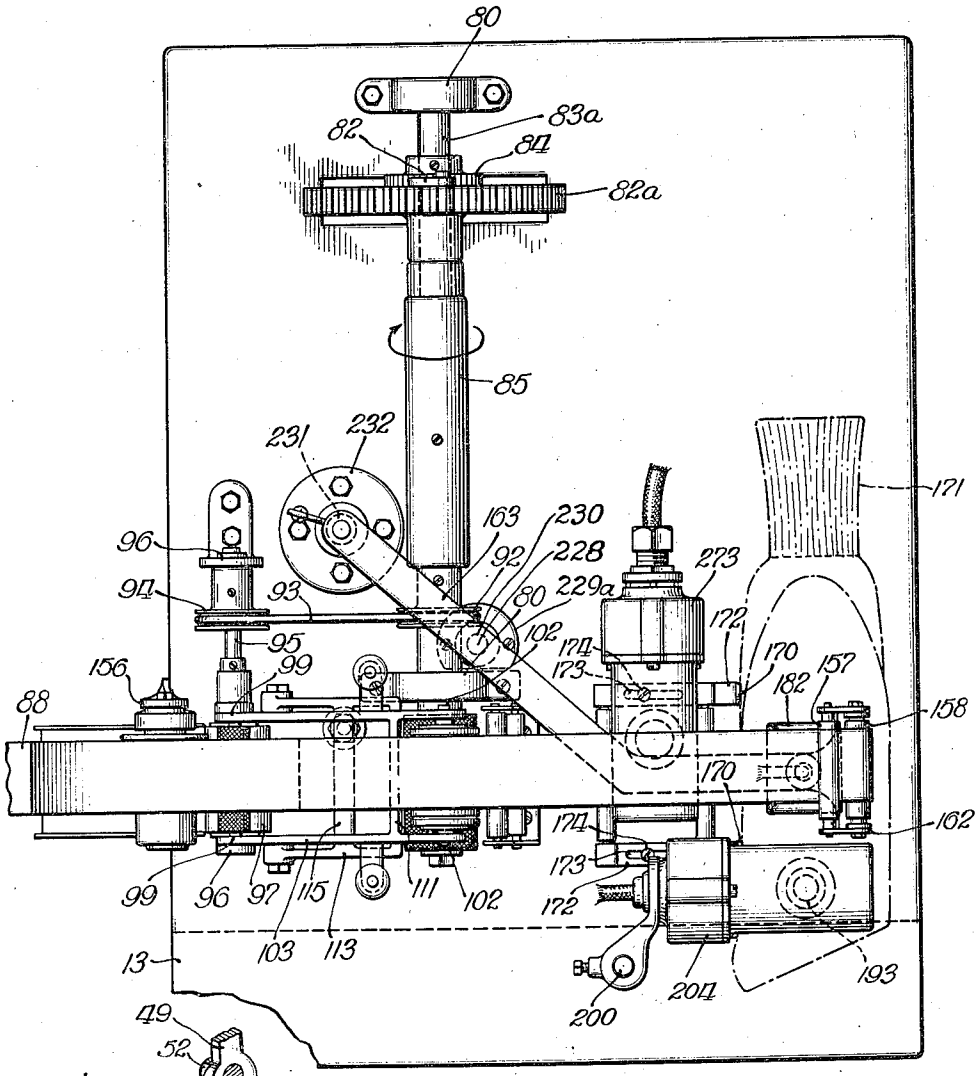


Fig. 11.

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MACHINE FOR MARKING TEXTILE AND OTHER ARTICLES

Filed Dec. 4, 1939 7 Sheets-Sheet 3

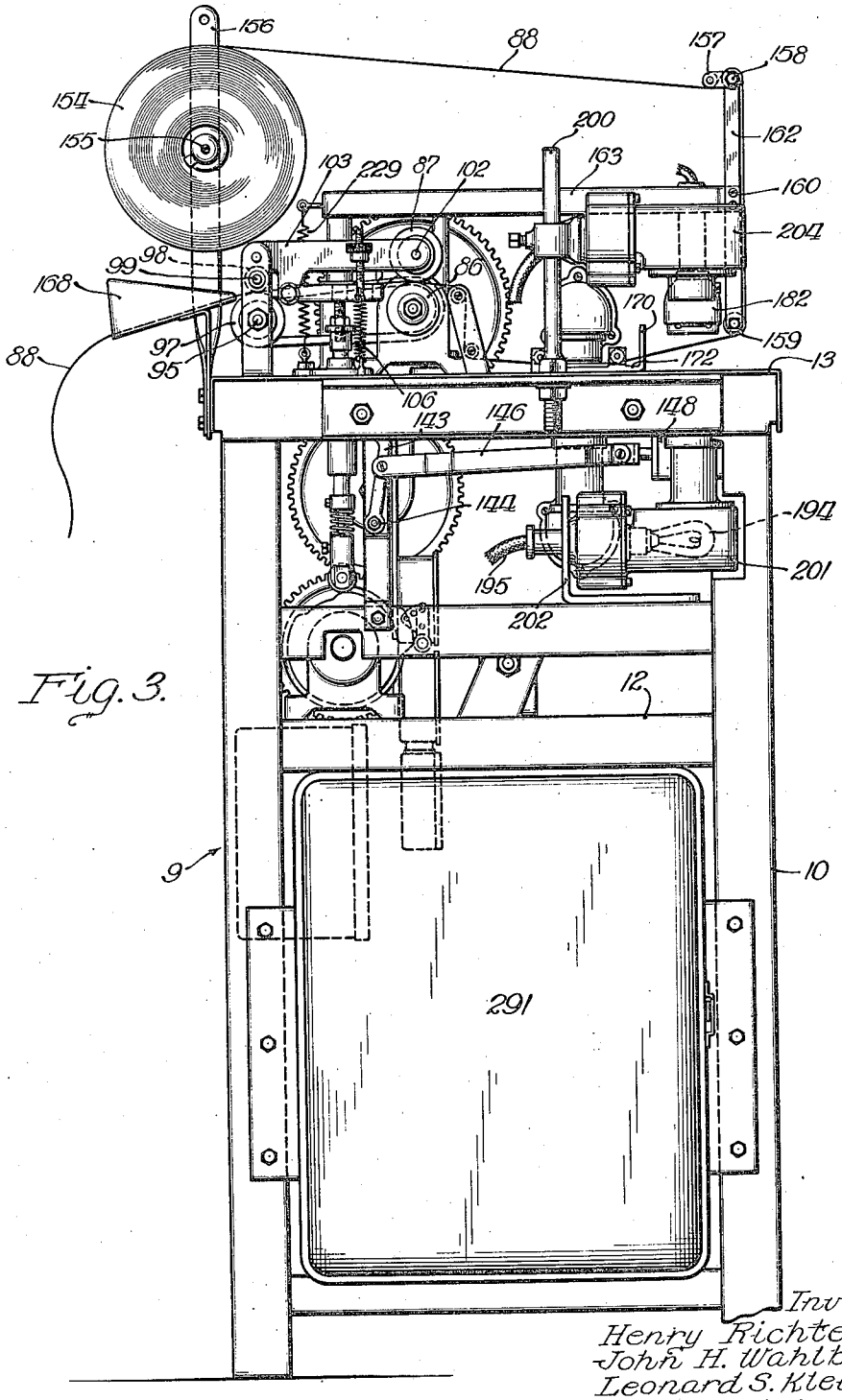


Fig. 3.

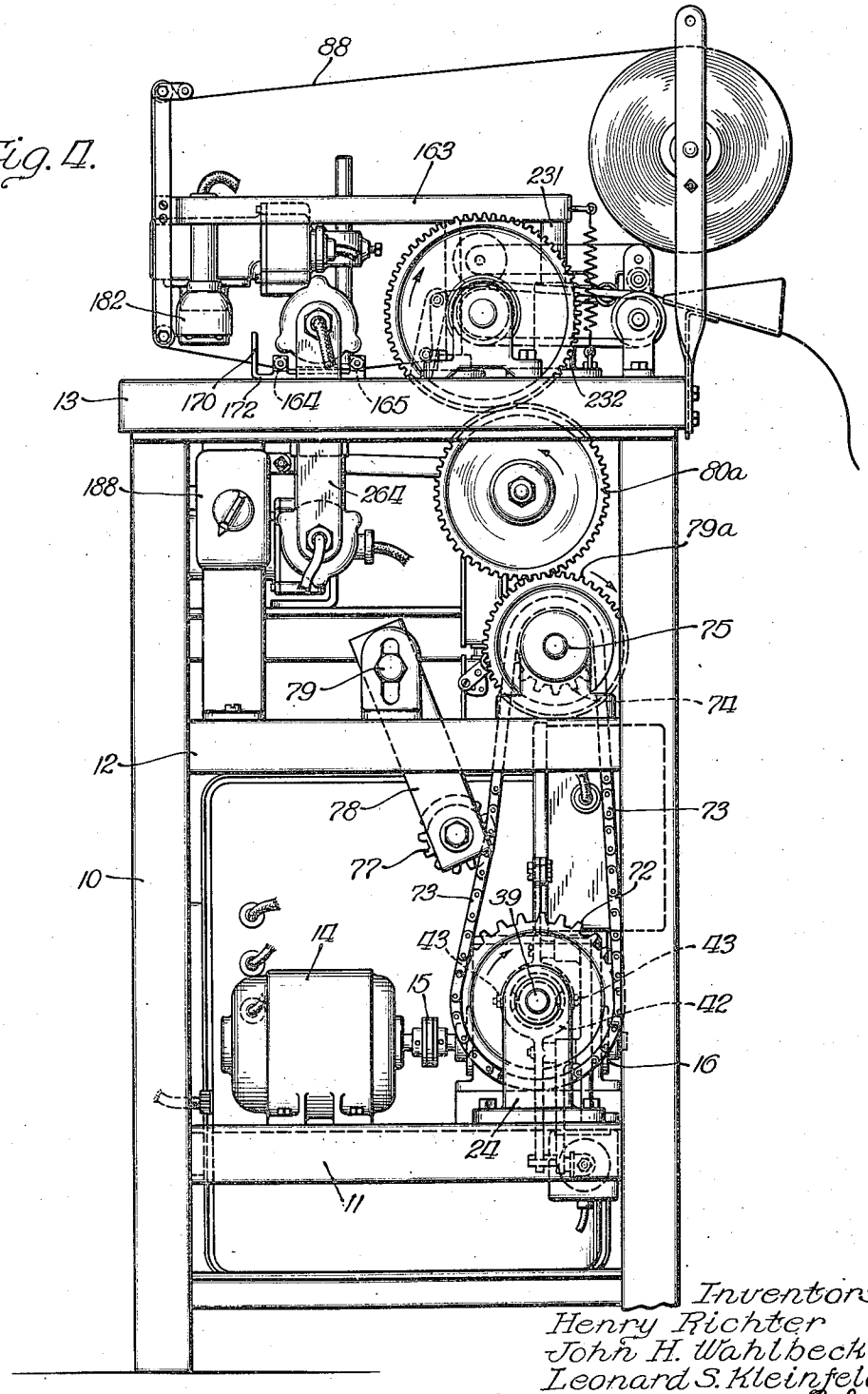
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MACHINE FOR MARKING TEXTILE AND OTHER ARTICLES

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Fig. 4.



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MACHINE FOR MARKING TEXTILE AND OTHER ARTICLES

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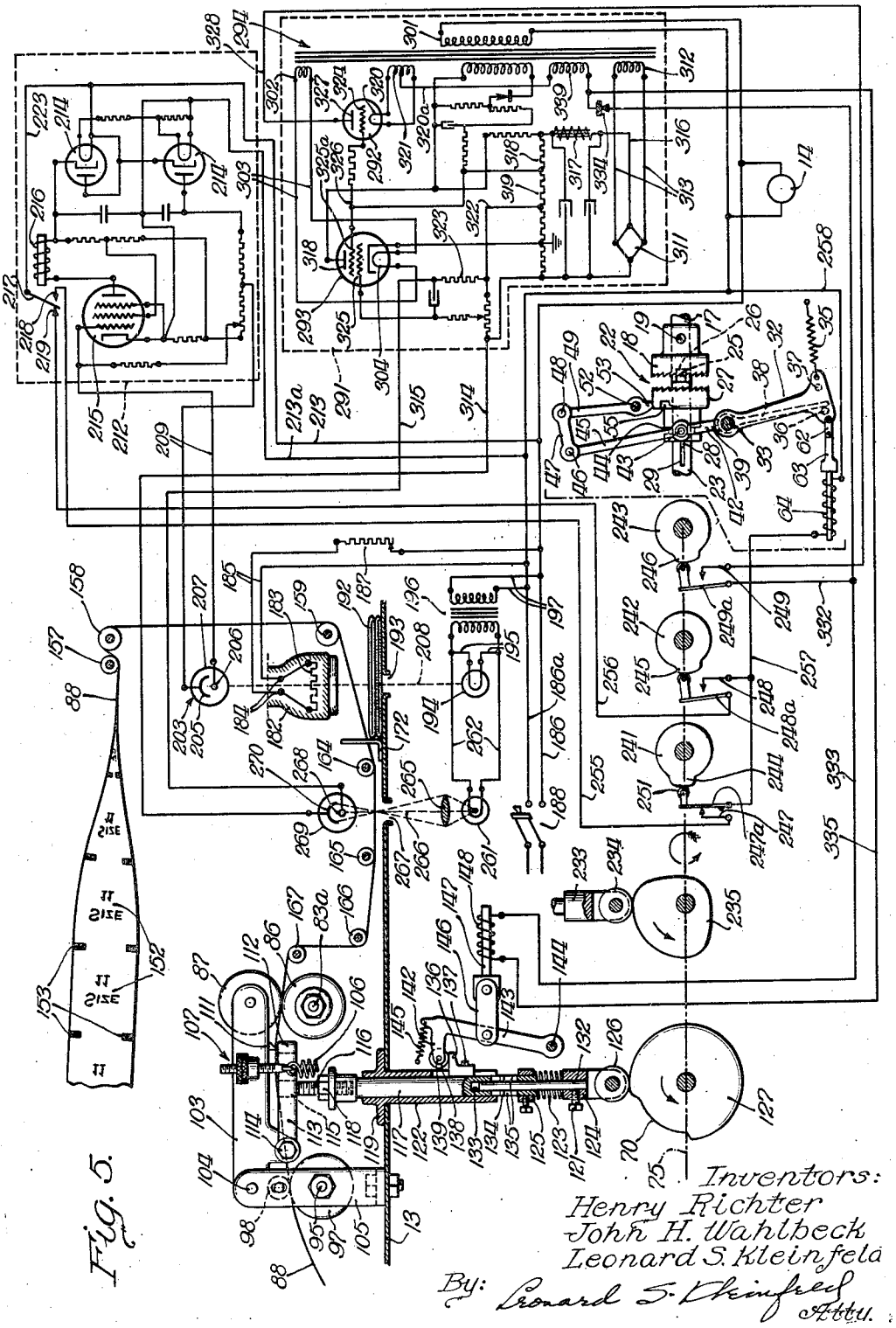


Fig. 5.

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MACHINE FOR MARKING TEXTILE AND OTHER ARTICLES

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Fig. 6.

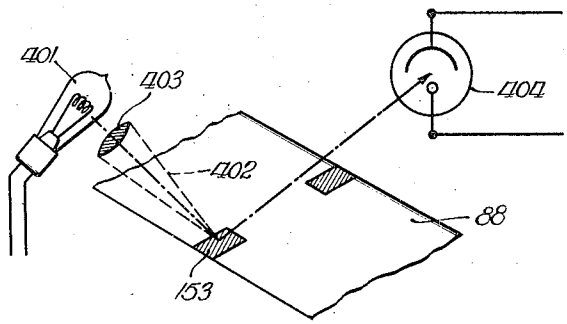


Fig. 7.

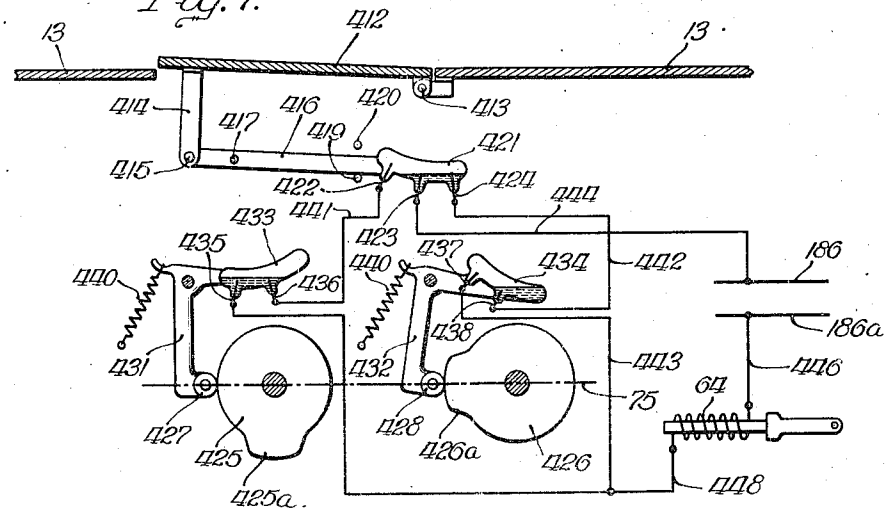
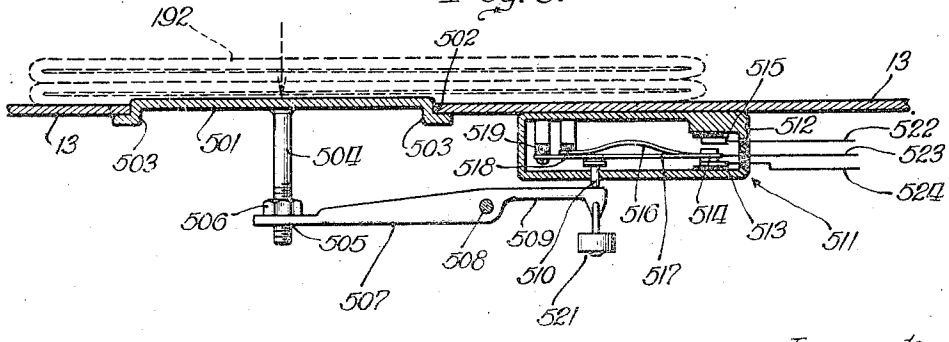


Fig. 8.



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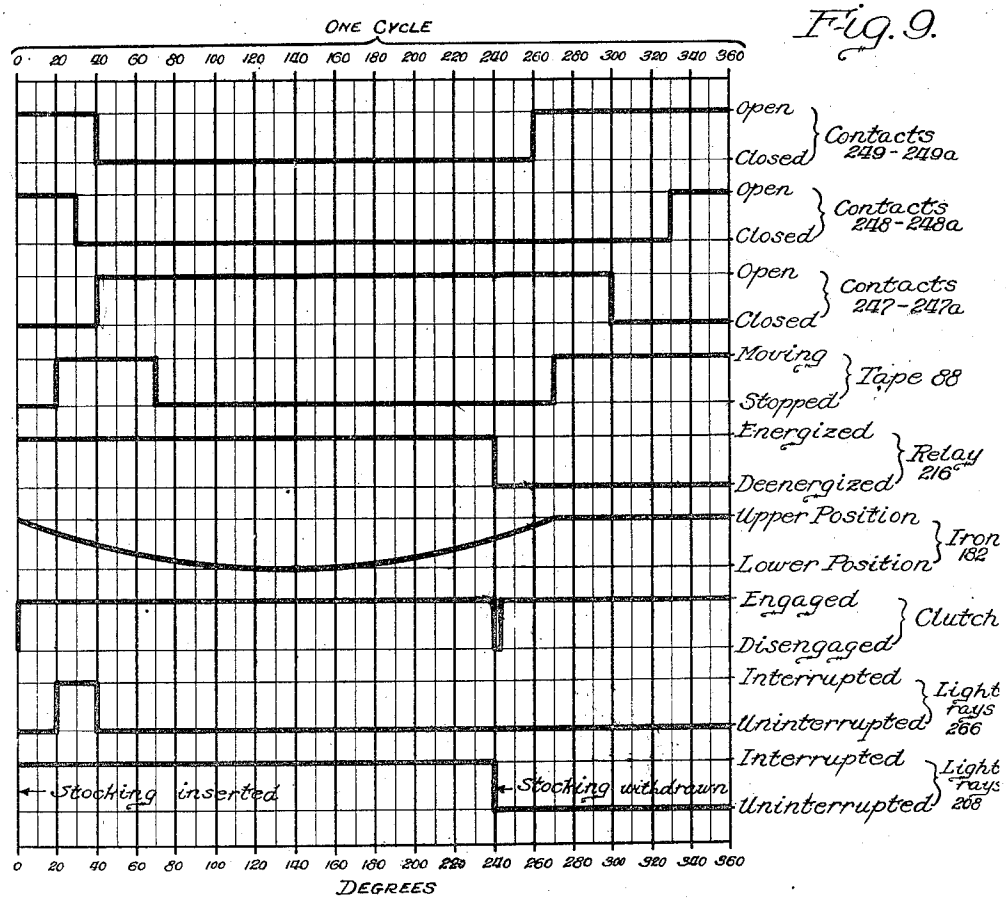
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MACHINE FOR MARKING TEXTILE AND OTHER ARTICLES

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Fig. 9.



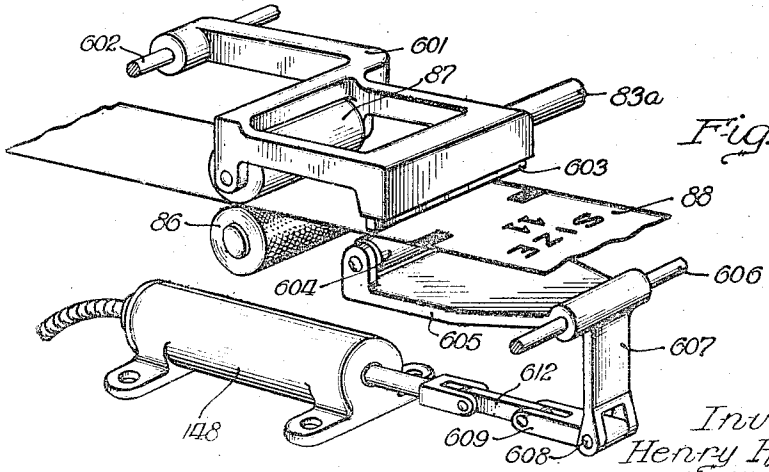


Fig. 10.

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UNITED STATES PATENT OFFICE

2,323,843

MACHINE FOR MARKING TEXTILE AND OTHER ARTICLES

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Application December 4, 1939, Serial No. 307,458

14 Claims. (Cl. 41—1)

This invention has reference to the affixing of printed indicia to articles of various kinds, particularly textile articles and fabrics and the provision of means to facilitate the printing of such indicia by rendering the majority of the operations involved automatic, thereby lessening operator fatigue, increasing production and improving the quality of the work.

The invention will be described as particularly related to the printing of indicia on hosiery, although it will be apprehended that the machine and method are capable of performing the operation on other types of articles, textile or otherwise, to which printed indicia, e. g. a transfer label is to be applied.

Hosiery is presently largely identified as to brand name, size, quality, composition or other desired reading matter, by impressing the same on the surface thereof through the use of tape carrying such indicia in the form of transfers. Such tape is supplied to the hosiery manufacturer, by companies specializing in its manufacture, in the form of a relatively narrow roll of tissue paper of substantial length imprinted with the desired legend, for example, the size of the stocking. Such imprinting is done from engraved dies which deposit the printed matter on the tape in colored wax or other substance of low melting point, a plurality of such impressions being repeated at substantially equally spaced intervals throughout the length of the tape. Although the transfer manufacturer is able to space such impressions with little or no variation in distance between them, atmospheric conditions different from those obtaining at the time printing of the tape is performed will affect the tissue paper to vary such spacing. Even though such variation between a pair of transfers may be minute, the accumulation of such errors in a long section of tape comprising a large number of transfers, will throw the transfers out of register with the printing position on the machine used for imprinting the transfer, notwithstanding the tape may be fed thereto at as uniform a rate as possible.

Accordingly, it is one object of this invention to provide a machine which will automatically feed such tape to locate each transfer accurately at the stamping position independently of the feeding rollers and determined solely by the transfer itself then being moved to stamping position.

Most transfers used for hosiery are of the heat responsive type, i.e. a wax indicia is transferred from the tape to the fabric by a heated iron. Imprinting of the heat responsive transfer on the stocking is performed by placing the transfer between the iron and the stocking and then using the iron to press the tape and hence the transfer thereon against the stocking. The heat of the iron quickly melts the wax impression off the tape and on to the stocking in the desired position. A fresh transfer is used for each impression.

Heretofore such printing operation has been mainly performed manually by the use of an iron picked up by the operator after having manually drawn a fresh transfer from a roll into position. Such procedure is extremely slow and expensive. Furthermore, the transfer is not located in the same position on every stocking, resulting in non-uniform appearance of successive articles. Some semi-automatic machines for operating the iron are available, but these depend on manual positioning of the tape. These machines are likewise inefficient and lack the speed required in modern mill production.

Therefore a further object of the invention is the provision of positive means to automatically operate the iron upon the mere placing of the stocking in printing position.

A further object is the provision of a machine having means for accurately positioning the stocking with respect to the tape and iron.

Further objects are to obtain a machine which is compact, simple, rapid and foolproof in operation. Additional objects will be discerned as the description proceeds.

In the drawings:

Figure 1 is a front elevation of the complete machine;

Figure 2 is a plan view of the machine;

Figure 3 is a left side elevation of the machine;

Figure 4 is a right side elevation of the machine;

Figure 5 is a combined electrical and mechanical diagram to illustrate the functioning of the machine;

Figure 6 is a schematic representation of a modified form of the tape registering part of the machine;

Figure 7 is a partial combined electrical and mechanical diagram of a modified form of start-stop mechanism;

Figure 8 is a partial view of a further moifie form of start-stop mechanism;

Figure 9 is a timing diagram showing the relative operations of the various parts of the machine;

Figure 10 is a modified form of tape feeding device; and

Figure 11 is a detail of a portion of the clutch.

In some of the figures some inconsequential parts have been broken away for clarity.

The machine as disclosed herein is capable of two separate uses or of both combined. In some cases a machine embodying only automatic mechanism for initiating and terminating a cycle of operations may be more desirable on account of its simplicity of construction, and since manual registration of the tape may not be objectionable for certain classes of goods. In other cases where the fully automatic form of the machine is preferred both the automatic start and stop feature and the tape registration feature are employed. Accordingly, the description will be divided as to each to assist in a more complete understanding of the invention. These are: (1) Starting and stopping mechanism and (2) tape registering mechanism.

Starting and stopping mechanism—Construction

Referring to the Figures 1, 2 and 3, the frame 9 is comprised of four legs 10 supporting a lower shelf 11, an intermediate shelf 12, and a top 13, all rigidly fastened together by riveting, welding or other means. To suit the operator's height the legs 10 may be made adjustable (not shown) in any well known way.

Mounted on shelf 11 is an electric motor 14 which may be turned on or off by a suitable switch 188 (Figure 5). Motor 14, through coupling 15 drives the worm of a common type of worm and gear speed reducer 16. Input shaft 17 of the reducer has affixed thereto by means of set screw 19, the driving half 18 of toothed clutch 22. Shaft 23 is supported at one end in the journal 24 and at its other end by a pilot 25 taking into a mating hole 26 in shaft 17. The driven half 27 of clutch 22 has a sliding fit on the shaft 23 and is adapted to rotate the same by engagement of key 28 therein sliding in a slot 29 axially of shaft 23 (Figure 5).

The mechanism for engaging and disengaging clutch halves 18 and 27 comprises a rocker 32 free to swing on a fixed pivot 33 mounted in support 34 fastened to shelf 11. Said rocker 32 is normally urged clockwise as seen in Figure 1 by spring 35 attached to shelf 11. Rocker 32 is provided with pins 36 and 37 adapted to engage the tail 38 of a lever 39 pivoted also at 33.

Lever 39 divides near the shaft 29 into a circular yoke 42 surrounding the hub of clutch half 27, and diametrically opposed pins 43, 43 projecting inwardly from said yoke engage a circumferential groove 44 in the hub (Figure 5). The upper half of yoke 42 continues upwardly into an extension arm 45 pivotally connected at 46 to a link 47 which in turn is pivotally connected at 48 to a latch 49. Said latch 49 is pivoted at 52 on support 34 and terminates in a finger 53 adapted to engage radial notches 54 and 55 formed in the rear face 50 of clutch half 27 or to bear against the said face. Referring to Figure 11 it will be noted that notches 54 and 55 have the leading face slightly rounded at the outer corner, while the trailing face is square at the outer corner, all for a purpose to be described.

To the lower end of rocker 32 there is connected through link 62 the plunger 63 of a solenoid 64 affixed to shelf 11 by a bracket 65.

Fixed to the shaft 23 is a sprocket 72 connected by a roller chain 73 to sprocket 74 in turn fixed on cam shaft 75 journalled in bearings 76—76 mounted on shelf 12. An idler sprocket 77 rotatably supported on arm 78 is adjustable by bolt 79 to maintain tension of chain 73, all in a commonly known manner.

Also fixed to cam shaft 75 is the gear 79*a* which, through intermediate idler gear 80*a* journalled at 81*a* on the frame, drives gear 82*a* free to revolve on feed shaft 83*a* journalled at 80, 80. Pivoted on one face of gear 82*a* are the two diametrally opposite pawls 82, 82 urged by springs (not shown), in the usual way, into contact with a ratchet wheel 84 affixed to shaft 83*a*. Also affixed to shaft 83*a* is the cylindrical hand grip 85 for a purpose to be explained.

Fastened to the end of shaft 83*a* is lower tape feed roller 86 and superposed thereover idler tape feed roller 87. Roller 86 may be covered with rubber or other suitable frictional material, knurled, or serrated axially, to grip better the transfer tape 88 fed between said rollers. Affixed to shaft 83*a* is a grooved pulley 92, which, through belt 93 drives pulley 94 affixed to slack take up shaft 95. Said shaft 95 is journalled at one end on bracket 96 affixed to table 13 and has fixed thereto a take-up roller 97 having a superposed idler roller 98 loosely journalled at slotted holes 99, 99 in U-shaped support 105. Roller 98 is preferably of solid metal or is weighted in some convenient way to cause roller 97 to frictionally engage and feed tape 88. Idler roller 98 may also be covered with rubber, serrated or knurled, to increase the friction against the tape.

Roller 87 is journalled at 102—102 in a frame 103 swingable at one end at 104—104 on the U-shaped bracket 105 fastened to table 13. Frame 103 and hence roller 87 are urged downwardly by a spring 106 fixed to the table 13 at one end and to frame 103 at the other through the medium of an adjustable screw, nut and locknut 107, whereby pressure between the rollers 86 and 87 may be adjusted.

Forming part of the frame 103 transversely thereof is a blade 111 adapted to abut a pad 112 at the free end of a U-shaped swingable arm 113 pivoted at 114—114 on the under side of the frame 103. An integral cross-bar 115 of arm 113 is engaged by the tip 116 of cylindrical slide 117. Tip 116 is adjustable vertically by being threaded into slide 117 and has a locknut 118. Slide 117 is freely slidable vertically in, and guided by, sleeve 122 mounted by means of a flange 119 in the table 13, but is constantly urged upwardly by coil spring 123 located between cam roller support 124 and collar 125 affixed to slide 117.

Said support 124 carries the cam roller 126 normally in contact with the periphery of setting cam 127 fixed to camshaft 75. Said support 124 is affixed by screw 121 at the lower end of a rod 132 slidable in a hole 133 centrally of slide 117 and is free to slide vertically therein. A pin 134 fastened through rod 132 and engaging slots 135 in the walls of slide 117 prevents rotation of rod 132 and support 124 while permitting vertical movement thereof.

A lug 136 fastened at 137 to slide 117 is normally engaged by a roller 138 pivoted at 139 on the outstanding leg 142 of latch 143. Latch 143 is pivoted at 144 on the frame of the machine and is normally urged counterclockwise (Figure 5) by spring 145 extending between latch 143 and the machine frame. A link 146 connects latch 143 to the plunger 147 of a solenoid 148 supported on the frame.

The transfer tape 88 usually employed is comprised of tissue paper printed with the required

indicia, as for example, the size of the stocking, and using a printing medium of wax or other suitable material of low melting point combined with coloring matter of the desired shade. By the use of engraved dies in the printing operation the indicia are deposited at regular intervals along the length of the tape as shown in Figure 5 at 152, 152 etc., but as explained heretofore variations in manufacture and atmospheric conditions may vary such spacing so that when the tape is ready for use the space intervals practically always differ from each other.

If the present invention is to be used only as to its "start" and "stop" features, then the tape is of the standard type bearing only the indicia desired to be printed on the articles. However, if the tape registering means to be described hereinafter are also employed then the tape is printed with register marks 153, 153, etc., one pair to each indicium, preferably along both margins, each pair thereof bearing a fixed relation to its associated indicium. Since the length of tissue between any selected indicium 152 and its associated pair of register marks 153, 153 is quite short. atmospheric or other causes will have no noticeable effect in varying the distance between them, at least insofar as proper functioning of this invention is concerned.

Printing of register marks 153, 153 is preferably done at the same time as the indicia 152 and for convenience, with the same substance. Since the deposition of such substance on the tissue tape is in the nature of embossing, there must be a register mark on each margin of the tape, otherwise the thickness of said marks, if on one margin only, would cause the roll of tape to build up on that margin and the tissue could not be rolled into a uniform cylinder. Of course it will be obvious from what follows that marks 153, 153 could consist of a narrow band entirely across the tape, but this would be more expensive in its consumption of printing substance.

Referring to Figures 3 and 5, the roll 154 of transfers is mounted freely on a spindle 155 supported on a post 156 mounted on table 13. The tape 88 thence passes downwardly over idling guide rollers 157, 158, 159 carried on a frame 162 supported at 160 on printing iron carrying arm 163; thence towards the rear of the machine under idling guide rollers 164, 165, 166; thence upward over idling guide roller 167; between feed rollers 86 and 87; between blade 111 and pad 112; thence between take-up rollers 97 and 98, and through a chute 168, supported on table 13, to a waste box (not shown).

On top of table 13 is a stocking locating gauge 172 (Figure 2) adjustable forward and backward by means of a pair of slotted holes 173 and screws 174. Idler rollers 164 and 165 are supported on 172. A pair of upstanding lugs 170 are adapted to be engaged by the stocking. The hosiery or other article 171 to be stamped is laid in position on table 13 and against lugs 170 as shown in Figure 5, to locate said article with respect to the indicium on the tape. There may also be provided other gauges (not shown) to locate the article to be stamped sidewise of the table and in proper relation to the tape.

Situate centrally over a selected indicium is the pressing iron 182, preferably of cast aluminum and with which is integrally incorporated the electrical heating element 183. The latter is preferably of the type in which the resistance wire is embedded in an insulating and heat resisting compound, e. g. magnesium oxide, contained in a metal sheath, so that by casting the aluminum integrally with the sheath excellent conduction of heat from the element to the body of the iron is obtained.

Terminals 184 of the element are connected by means of conductors 185 to the main current supply lines 186, 186a, one of said conductors having interposed therein a manually operated rheostat 187 by which current in the element 183 and hence temperature of the iron 182 is controlled depending on the weight of the goods being processed and the density of the transfer.

Iron 182 is carried in the forward extremity of arm 163 (Figure 4), the opposite end of which is supported on a slide 231 taking into a guide 232 fastened to the table 13. Transverse position of the arm 163 and its iron 182 is maintained by means of a guide post 228 carried in a support 229a fastened to the table top 13, the said post slidably engaging a hole 230 in the arm 163. Slide 231 terminates at its lower end in a U-member 233 (Figure 1) carrying cam roller 234 bearing on iron operating cam 235 affixed to shaft 75. Contact between cam 235 and follower 234 is maintained by means of the weight of the arm 163, iron 182 and other associated parts assisted by spring 229 affixed to the inner extremity of arm 163 and the table 13.

A main line switch 188 serves to disconnect the machine from its source of power. Said switch is preferably of the type including automatic protection to shut off the power in the event overload occurs in the mechanism.

As a common procedure imprinting of the transfer is done usually on only one of a pair of stockings, and frequently during, before or after a rider ticket or folded sticker is affixed over the ends of a pair by the operator, in accordance with common practice. The pair of stockings 192 is laid on table 13 against gauge 170—170 and against an end stop (not shown) if preferred.

At some convenient place under the area occupied by the stockings a hole 193 is pierced in table 13 (Figures 2 and 5). Located centrally below hole 193 is a low voltage incandescent lamp 194 of common type connected by conductors 195 to the terminals of the secondary side of voltage reducing transformer 196, which has its primary side connected by conductors 197 to mains 186, 186a. Lamp 194 is contained in protective housing 201 supported on bracket 202 mounted on the frame of the machine.

Positioned directly above lamp 194 is photoelectric cell 203 contained in housing 204 supported on rod 200 mounted in table 13. As seen in Figure 5, said cell 203 is of a common type, including a semi-cylindrical cathode 205 of base metal, e. g. silver, coated with a light sensitive surface, e. g. caesium oxide; and an anode 206 consisting of straight wire electrode mounted along the axis of the cathode. Both anode and cathode are sealed inside an evacuated glass bulb 207, sometimes filled with a suitable gas at a low pressure to improve its operation. The functioning of such cell is well known and calls for no further elaboration here, beyond mentioning that when light rays 208 from lamp 194 impinge on cathode 205 an additional current is generated in conductors 209 connected to said anode and cathode. Said conductors 209 form part of a relay circuit represented generally in dotted lines at 212, and consists of input conductors 213, 213a connected to main line 186, 186a, rectifying tubes 214, 214 to convert the alternating current of main lines 186, 186a to direct current to operate

the amplifier tube 215, and a magnetic relay 216. Said relay is provided with an armature 217, an inner contact 218 and an outer contact 219. Armature 217 is connected to one side of main line 186, by conductor 223 and lead 213, and is normally held against contact 219 by spring action.

Briefly, since the relay circuit 212 may take other preferred forms, the minute current generated in photoelectric cell 203 is amplified by tube 215 to operate magnetic relay 216, all for a purpose to be described later.

Affixed also to shaft 75 are timing cams 241 and 242, provided respectively with rises 244 and 245 respectively. Each cam has associated therewith a set of contact points 247 and 247*a*; 248 and 248*a* respectively, the movable contact point 247*a*, 248*a* in each case being provided with a roller 251 bearing on its respective cam. Said contact points are mounted in housing 247*b* and 248*b* (Figure 1) respectively fastened in any convenient manner to the machine frame.

Movable contact 247*a* is connected by conductor 255 to relay contact point 218, and movable contact 248*a* by conductor 256 to contact 219. Fixed contacts 247 and 248 are both connected by conductor 257 to one terminal of solenoid 64, the other terminal of said solenoid being connected by conductor 258 to one side of power mains 186*a*.

Tape registering mechanism—Construction

Also situate below the table 13 is a second incandescent lamp deriving current through conductors 262 from transformer 196. A housing 263 carried at 264 on the machine frame carries a convex lens 265 and said lamp 261. Said lens converges the light beam from lamp 261 to a pencil of rays 266 which passes through an opening 267 in table top 13, thence through transparent tape 88 and impinges on cathode 270 of photoelectric cell 269. 268 represents the cathode of said cell. A housing 273 mounted on table 13 protects and carries said cell 269.

A third timing cam 243 is also affixed to shaft 75 and is provided with a rise 246 and a pair of contact points 249 and 249*a*, the latter having a follower roller 251 bearing on said cam. A housing 249*b* mounts said contacts.

Inclosed in a cabinet 291 is a regulator unit comprising generally a grid glow tube 292, pentode amplifier tube 293 and transformer 294. Primary 301 of transformer 294 is connected to main line leads 186, 186*a*. Partial secondary winding 302 supplies lower voltage current through leads 303 to heater 304 of amplifier 293.

Necessary direct current operating voltage for photocell 269 is derived from rectifier 311 connected across partial secondary winding 312 of transformer 294 by means of leads 313. Output conductor 314 of rectifier 311 is connected direct to cathode 270, and conductor 315, reactance 317, resistances 318 and 319, conductor 322, resistance 323 and conductor 315 form the circuit connecting the other output terminal of rectifier 311 to the anode 268. The current impulses generated in cell 269 control the grid 325 of amplifier 293.

Rectifier 311 may be of any type for converting alternating to direct current but the one shown is of the well-known bridge circuit type comprising a plurality of oxidized copper washers clamped together to supply rectified potential.

Reactance 317 allows direct current to be supplied to plate 318 of tube 293.

Grid glow tube 292 serves as a quick-acting non-mechanical relay to utilize the minute frequent impulses emanating from phototube 269, after they have been amplified by tube 293, to operate an external machine control circuit to be described.

Filament 320 of grid glow tube 292 derives alternating lower voltage current from secondary winding 321 of transformer 294. The grid 324 receives controlling impulses from grid 325*a* of amplifier 293 through conductor 326 and plate 327 is connected by lead 328 to contact 249.

Contact 249*a* is connected through conductor 332 to conductor 333 which connects one terminal of solenoid 148 to one side of rectifier 334. The other terminal of the solenoid 148 is connected through lead 335 to the other side of rectifier 334. This rectifier will tend to smooth out the alternating current ripple caused by the rectified alternating current voltage in the load circuit comprising the solenoid if the reactance of the load, i. e. solenoid 148, is sufficiently high and the load current is low.

It will be noted that grid glow tube 292 is in a series circuit comprising solenoid 148, secondary winding 339 of transformer 294, conductor 320*a* and contacts 249, 249*a*, so that said tube is connected to function as a relay to open and close said circuit.

Operation

Assuming that main line switch 188 is closed, then motor 14 is rotating clutch half 18, light sources 194 and 261 are illuminated, and shaft 75 and its related cams and sets of contacts are as shown in Figure 5.

The operator then places a stocking or a pair thereof on table top 13 and against stops 170, these having been adjusted so that that portion of the stocking on which imprinting of the transfer is desired is located under the iron 182. The placing of the stocking in that position interrupts light rays 208 which have theretofore been impinging on cathode 205 of phototube 203. Relay 216 is thereby energized and draws its armature 217 against contact 218 to close a circuit as follows: power main 186, line 213, line 223, armature 217, contact 218, line 255, contacts 247*a* and 247, line 257, solenoid 64, line 258 to the other main 186*a*, whereupon solenoid 64 actuates its plunger 63 to move rocker 32 against action of its spring 35. Rocker 32 moves until pin 37 strikes arm 38 which pivots on 33 to engage non-rotating sliding clutch half 27 with rotating half 18. By use of the pin 37 the rocker 32 is not permitted to pick up lever 38 until plunger 63 has gained sufficient momentum to engage clutch 22 positively, the weight of rocker 32 yielding a hammer-blow action. At the moment arm 45 is moving clockwise to engage the clutch the lever 49 is being moved likewise through link 47 about 52 to withdraw latch 53 from notch 54 (Figure 11).

Upon withdrawal of latch 53 from said notch and movement of clutch half 27 into engagement, the flat side of latch 53 bears against surface 50 of said clutch half 27 and maintains the clutch in engagement even though solenoid 64 is deenergized. It is undesirable and unnecessary to permit current to flow through said solenoid during the time that the clutch is desired in engagement and accordingly cam 241 has, immediately after clutch engagement, rotated to move its rise 244 away from roller 251 and permit contacts 247 and 247*a* to open and deenergize the solenoid 64.

Shaft 23 is thereupon driven from the motor

and begins its rotation. Cam 235 permits plunger 231 to lower the iron 182 against the transfer 152 just brought into position thereunder and to press the transfer on the stocking, the heat of the iron melting the wax to form the printed impression.

As the iron is lowering to printing position tape 88 is moving to bring the transfer to be used under the iron in the following manner; when the machine is at rest solenoid 148 is deenergized and latch 143 has its roller 138 engaged with lug 136 by spring 145. Plunger 117 is therefore restrained in its lower position against spring 123, bail 112 is out of contact with the tape 88 between it and blade 111 and feed rollers 86 and 87 are gripping the tape. Rotation of roller 86, initiated when the clutch was engaged, is feeding the tape towards the rear of the machine.

Just prior to the surface of the iron 182 touching the tape, cam 243 allows contacts 249 and 249a to close to form a circuit as follows: secondary coil 339, conductor 335, solenoid 148, line 333, contacts 249 and 249a, plate 327 of grid glow tube 292, anode 324, cathode 320, coil 321, conductor 320a to secondary 339, so that current from transformer 294 will energize solenoid 148 if tube 292 can carry current to complete the circuit just outlined. The setting up of the aforesaid circut will create a space charge in the tube. However, at this time one of the register marks 153 has moved to intercept the pencil of light rays 266 so that they no longer impinge on cathode 270 of phototube 269. Accordingly, this interruption of light will, through the circuit comprising photocell 269, conductors 314 and 315 and amplifier 293, influence grid 324 to break down the field in grid glow tube 292 so that it will carry current to complete the circuit aforesaid. Hence solenoid 148 operates its plunger 147 to unlatch plunger 117 which moves upward rapidly under urging of spring 123, with a trigger motion to raise bail 112 against blade 111, the tape being pinched therebetween, and to simultaneously move frame 103 and its mounted idler 87 away from feed roller 86 so that the tape stops moving instantaneously and a fresh transfer is in place under the iron to receive the impression.

The stocking may be withdrawn at any time after the actual printing operation is completed. But it may be desired at this time to affix a gummed rider ticket to the pair of hose, or perform some other labelling operation manually, even while the stockings are still intercepting light rays 208. So the machine continues to rotate until latch 53 can drop into slot 55 whereupon spring 35 immediately disengages the clutch, while latch 53 striking the flat wall of notch 55 stops rotation of the driven half 27 and the machine parts rotated therethrough. Overrun of the machine due to the momentum of the parts thereof is thus prevented, and the shaft 75 is positively stopped at a point shortly before its final position of rest. Notches 54 and 55 in clutch half 27 are provided with their leading corners rounded as shown in Figure 11, to facilitate engagement of latch 53 therewith. Now the stockings may be withdrawn so that light rays 208 are permitted again to impinge on phototube 203, deenergizing relay 216 which allows its armature 217 to return against contact 219 to complete a circuit as follows: line 186, line 213, line 223, armature 217, contact 219, line 256, now-closed contacts 248, 248a, line 257 solenoid 64, line 258 to line 186a, so that the clutch is again engaged.

Before the next cycle the tape must be stepped to position the next transfer under the iron. At this time the marker 153 is still intercepting the rays 266 and the tape must therefore be stopped to clear the said marker out of the path of said rays in preparation for the next cycle. Shaft 75 in its rotation has now brought depression 70 of cam 127 under roller 126 which, together with its plunger 117 is moved downward under influence of spring 106 urging frame 103, blade 111 and bail 112, the latter two members being in contact as stated. Rollers 86 and 87 are brought into tape-feeding contact and further movement downward of roller 126, plunger 117 and their associated parts releases the clamping action of bail 112 and blade 111 on the tape so that feeding of the tape commences. As soon as lug 136 passes below roller 138 spring 145 reengages latch 143 with said lug 136 to maintain plunger 117 in its lower position for the next cycle. Cam 127 continues to rotate to move roller 126 on to the high surface thereof which compresses spring 123 between 124 and 125 to store up energy in the spring for the succeeding trigger action. Just before lug 136 and latch 143 are reset cam 243 opens contacts 249 and 249a to de-energize the solenoid 148 and open the grid glow tube circuit. It is advisable to maintain the grid glow tube dark when not needed for the tape spacing operation.

From the foregoing it will be noted that the impulse impressed on the grid glow tube circuit by passage of the marker 153 through the light pencil 266 is effective to operate the solenoid 148 to stop the tape movement. Even though such impulse is quite transient, the relay action of the glow tube is maintained to perform the mechanical tape controlling action—even if the marker 153 has overtraveled and its interceptive action on the light rays has terminated.

Grid glow tubes are frequently used where it is desired to prolong the effect of an electric impulse, i. e., a current impulse will serve to ignite the tube which continues to glow to operate a solenoid which requires a period of time for its operation in excess of the duration of the impulse.

After completion of the tape spacing the cam 242 opens its contacts 248 and 248a to break the circuit previously established, whereupon solenoid 64 is deenergized and spring 35 returns rocker 32 to its right hand position to disengage the clutch, hammer blow disengaging action being provided by pin 36. As soon as the teeth of the clutch halves clear each other, the opposite rotation of extension 45 moves latch 49 counterclockwise to put finger 53 into slot 55 (Figure 11) and positively stop clutch half 27 and its associated parts to prevent overrun and consequent mis-timing of the mechanism. All parts, other than the motor, are now at rest and prepared for the next cycle.

From the foregoing description it will be apparent that the proper postioning of each successive transfer under the iron is directly controlled by a marker 153 in accurate relation with that particular transfer. Accordingly, if there are minute variations in spacing between successive transfers these are not allowed to accumulate to throw the transfers out of register as would be the case if the tape were fed continuously under the iron, or if the tape were allowed to feed a predetermined amount solely by

intermittent rotation of the feed rollers 86 and 87.

The apparatus is so arranged that should difficulty develop with the tape register mechanism, it may be taken out of action. The tape will then be fed the distance between successive transfers by means of feed rollers 86 and 87, which can be operated continuously in contact and the rotation imparted to them upon each cycle of the machine will give reasonably close feeding. Obviously the circumference and speed of rotation of feed roller 86 must bear a specific relationship to the distance between successive transfers. However, under this method of operation the errors in transfer spacing in the tape itself will accumulate. When this occurs the operator can grip handle 85 (Figure 2) and rotate the feed roller 86 to re-register a particular transfer under the iron. Such manual re-setting will rotate ratchet wheel 84 with respect to pawls 82, obviating the necessity of rotating gear 82*a* and its associated driving parts back to the clutch, while rotation of gear 82*a* in normal operation will carry with it pawls 82 to drive ratchet wheel 84 and shaft 83*a* for feeding the tape.

It will be noted that iron 182 and its associated parts are adapted to be operated downwardly only by their weight and action of the spring 229, so that should the operator accidently permit her hand to come under the iron, the spring will yield and no injury will result to her hand or to the machine.

To assist in a proper understanding of the machine cycle Figure 9 shows in schematic form the relative movements of the various parts of the system, and in view of the designations thereon and the preceding description further amplification is deemed unnecessary.

Modifications—I

Under some circumstances it may be found necessary to use a tape 88 more or less opaque so that transmission of light from source 261 to photocell 269 is inhibited. In such event reflected light may be availed of and the apparatus modified as shown schematically in Figure 6.

In this instance the marker 153 will be printed with an ink having a substantially lower coefficient of reflection than the paper of the tape 88, and the light source 401 will be positioned so as to furnish a scanning pencil of light rays 402 through focusing lens 403 to impinge on marker 153 or on the tape proper. Rays 402 will be reflected off marker 153 or the tape 88 depending on the position of the tape during feeding or at rest. The quantity of light so reflected will be more or less depending to whether tape 88 acts as a reflector or marker 153 so serves. Inasmuch as the photocell 404, now positioned to receive the reflected rays 402 is sensitive to fluctuations in intensity of illumination (as well as to light or the total absence of it, as in the principal embodiment of the invention) it will respond to the variable quantity of illumination reflected from marker 153 or tape 88, and control the tape feeding mechanism as already described.

It will be obvious that the market 153 may, if desired, have a higher co-efficient of reflection than tape 88, but the result will be the same, namely a variation in the intensity of the light striking the photocell 404. In this case, however, slight changes in the electrical regulator 291 will be required.

II

The mechanism for initiating a cycle of operations may be modified by substituting for the photocell 203 and light source 194 a mechanical device operated by the weight of the stocking or pair of stockings being laid on the table 13.

Figure 7 illustrates such an arrangement in which 412 designates a treadle let into an opening in table 13 and hinged at 413 to the underside of the table. Said treadle is preferably of a size sufficient to be contacted by the stocking as it is placed in position to receive the printed transfer and is so poised as to be operable downwardly by the mere weight of the stockings. For this purpose it is provided on its under side with a fixed projecting arm 414 pivoted at 415 to the shorter arm of a lever 416 pivoted on the machine frame at 417. Stop pins 419 and 420 mounted in the machine frame limit movement of lever 416. The longer arm of the lever fixedly carries a mercury switch 421 consisting of a closed container, usually of glass, of generally cylindrical shape in which the axis is curved, i. e. like a segment of a torus, having closed ends and provided with contants 422, 423 and 424 moulded into the glass tube and projecting thereinto. A pool of mercury is sealed into the glass tube, as shown by dotted lines, said mercury being adapted to take a position immersing contacts 423 and 424 or 422 and 423, depending upon whether the switch 421 is rocked downward or upward.

In the modification being described the shaft 75 fixedly carries timing cams 425 and 426, said cams being provided with projections 425*a* and 426*a* adapted to co-operate respectively with follower rollers 427 and 428 respectively pivoted on one arm of bell crank levers 431 and 432. The other arm of each said lever fixedly supports mercury switches 433 and 434 similar in construction to switch 421 but each provided with two terminals 435 and 436, 437 and 438. Springs 440 extending from the machine frame urge rollers 427 and 428 into contact with their cams 425 and 426.

Conductor 441 connects terminals 422 and 436; conductor 443 connects terminals 437 and 435; conductor 444 connects terminal 423 to power line 186; conductor 446 connects the other power line 186*a* to one terminal of solenoid 64, the other terminal being connected through conductor 448 to conductor 443.

In the stopped position of the machine the parts are as shown in Figure 7. The weight of the lever arm and the parts associated therewith to the right of pivot 417 counteracts the weight of the parts on the other side thereof so that treadle 412 is poised normally as shown, i. e. with its unhinged end slightly above the table top 13.

When a stocking is laid on treadle 412, the same rotates on its hinge under the weight of the stocking to move projection 414 downward which rotates lever 416 counter-clockwise to tilt switch 421 to its other position. The mercury flows in the tube to immerse terminals 422 and 423 whereupon a circuit is completed as follows: power line 186, conductor 444, terminal 423, terminal 422, conductor 441, terminal 436, mercury in switch 433, terminal 435, conductor 443, conductor 448, solenoid 64, conductor 446 to power line 186*a*, whereupon solenoid 64 is energized to operate clutch 22 as described hereinbefore to initiate operation of the machine.

After imprinting of the transfer, the machine

comes to its intermediate rest position which may occur before or after the stocking is withdrawn from under the iron 182 for the purpose described before, the operation being as follows:

By the time imprinting of the stocking has been completed cam projection 425a has rotated to rock lever 431 and to tilt switch 433 to its opposite position to break the circuit previously formed through the mercury pool therein. Thereupon the circuit to the solenoid previously formed through that switch is broken to disengage the clutch and bring the machine to its intermediate stopped position, i. e. with latch 53 in notch 55. Such intermediate stopping is provided to obviate repetition of the cycle which would happen as long as the stockings were left on the treadle 412. If this were permitted to occur and the stocking, after the one impression, had been slightly dislodged from the position occupied during the printing operation, a second printing would blur the first and the transfer made illegible. Such blurred impression is removable only by a special solvent rubbed on by hand, and the stocking would have to be reboarded, adding to the expense of production.

Before projection 425a has operated its switch 433, projection 426a has rotated to a position to allow lever 432 under urging of its spring 440 to tilt switch 434 to its opposite position, whereupon the mercury pool prepares a circuit as follows: power line 186, conductor 444, terminal 423, terminal 424, conductor 442, terminal 438, mercury pool, terminal 437, conductor 443, conductor 446, solenoid 64, conductor 446 to line 186a. Now, when the stocking is removed, treadle 412 rises, switch 421 tilts to the position shown, closing the circuit just prepared to energize solenoid 64 and reengage the clutch 22. The machine then operates until cam projection 426a moves switch 434 to open the circuit previously formed between terminals 437 and 438, de-energizing the solenoid, disengaging the clutch and stopping the machine at its final resting position, with latch 53 in notch 54.

Two principal advantages are inherent in the mercury switch. First, it is extremely light so that the circuit closing mechanism associated with the treadle 412 may be made light enough to respond rapidly to the light weight of even a fine pair of stockings, and second, a large current may be handled without arcing, as in this case, where a heavy solenoid 64 is supplied with power without the necessity of an intermediate relay.

III

A further modification of the mechanism for utilizing the light weight of a stocking to close the electrical circuit controlling the clutch actuation is shown in Figure 8. A platform 501 is let into an opening 502 in the table top 13 and guided for vertical movement therein by downturned edges 503. A projection 504 extending downward from platform 501 is threaded at 505 and locked by a nut 506 into the longer arm of rocker 507 pivoted to the machine frame at 508. The shorter arm 509 is adapted to operate a button 510 forming part of a microswitch 511, the construction of which will now be described.

A casing 512 is mounted to the table top 13 in any suitable manner, and contains a lower fixed contact 513, a movable contact 514 and an upper fixed contact 515, the contacts 513 and 514 being normally closed. Said movable contact is carried on the free end of flat springs 516 and 517 which are joined at said contact 514. Spring 517 is substantially flat while spring 516 is provided with a hump as shown between its points of attachment at 514 and 518 where it is fixed to the casing 512. The end of spring 517 adjacent 518 is fixed to the casing 512 at 519, but as will be seen spring 517 is slightly longer than spring 516. The shape, relative lengths and positioning of springs 516 and 517 set up an action opposing each other so that when spring 517 is dislodged from its position of equilibrium with respect to spring 516, i. e. moved off center, the contacts 514, 515 close with a snap action. However, the principal advantages of this construction reside in the slight movement necessary to close the switch, i. e. approximately $\frac{1}{1000}$ of an inch and in the slight pressure required, approximately 14 ounces, to close the contacts and their release when pressure drops to approximately 10 ounces. Accordingly the light weight of a pair of stockings acting through lever 507 will actuate the switch. Furthermore, due to the slight movement required to actuate the switch, platform 501 will lie practically flush with table top 13 so that the stockings lie flat when the platform moves downward.

After removal of the stocking a counterweight 521 restores the lever 507 and platform 501 to normal position and the switch opens. 522, 523 and 524 represent the leads from the switch which would be analogous to leads 422, 423 and 424 of switch 421 of Figure 7, the circuit and mechanism for Figure 8 being the same as for Figure 7 except where distinctions have been pointed out.

It will be understood that in both modifications II and III the tape registering mechanism operates exactly as in the principal embodiment of this invention.

IV

Referring now to Figure 10, there is shown a modified tape feeding mechanism in which, where applicable, like reference numerals are used as in the main embodiment described in connection with Figure 5.

Idling feed roller 87 is situate directly above feed roller 86 and in tape feeding relation therewith. Roller 87 is rotatably carried in a floating frame 601 pivoted at 602 on the machine frame in any suitable manner and is also provided with a blade 603 fixedly mounted in said frame 601 transversely of the tape 88 as shown. Said blade 603 is preferably of rubber or similar frictional material.

Directly below said blade 603 is a roller 604 rotatably carried on one arm of bell crank lever 605 pivoted suitably at 606 in the machine frame. The downward extending arm 607 of lever 605 is pivotally connected at 608 to link 609 which in turn is linked by member 612 to the plunger of solenoid 148.

Operation is somewhat similar to the trigger mechanism described in connection with Figure 5, but the principal advantage of the embodiment of Figure 10 lies in its simplicity. However, it is not as rapid and positive in operation as the former.

Upon energizing solenoid 148 by the circuit completed through regulator 291 bell crank lever 605 is rocked clockwise to carry roller 604 against the tape 88 and thence pinch the tape between said roller and blade 603 to stop the travel of said tape within accurate limits. Simultaneously frame 601 is lifted with blade 603 to carry roll-

er 87 out of feeding relation with roller 86 and hence free of tape 88.

Upon de-energization of solenoid 143 the weight of frame 601 and lever 605 restore the parts to tape feeding relation.

We claim:

1. In combination in a machine for stamping an article by transfer thereto of one impression from a medium bearing a plurality of impressions, a power source; a main shaft; means to connect and disconnect said power source to and from said shaft including a clutch, a solenoid, a photoelectric cell, a light source arranged normally to illuminate said cell, a control circuit interposed between said cell and solenoid, said circuit including timing means on said main shaft; a table to receive the article in a position to interrupt the light rays impinging on the cell and initiate a cycle of operations of the machine; a stamping member positioned in impression transferring position; and mechanism associated with said shaft to move said member to transfer an impression to the article then in stamping position during the cycle.

2. In combination in a device for marking articles by operating upon sheet material bearing a plurality of wax or other like impressions; a member to transfer said impressions singly from said material to an article; a power source; mechanism to actuate said member; a clutch for interconnecting said source and mechanism; means actuated by the placing of an article in transfer position to initiate operation of said clutch; and second means to arrest the movement of said mechanism after completion of a single transferring operation independently of the initiating means.

3. In combination in a device for stamping articles by operating upon sheet material bearing a plurality of wax or other like impressions; a member to stamp said impressions singly by transferring the same from said sheet material to an article; a power source; mechanism to actuate said member; a clutch for interconnecting said source and mechanism; means actuated by the placing of an article in stamping position to initiate operation of said clutch; and second means to arrest the movement of said mechanism after completion of a single stamping operation independently of the initiating means.

4. In combination in a device for stamping articles by transferring thereto a wax or other like impression carried on sheet material, a stamping member; mechanism to operate said member through a stamping cycle, comprising a power source, a driven shaft, a clutch therebetween, cam means on said shaft, and a connection between said means and said member; and second means controlled by the placing of an article in stamping position to to engage said clutch and connect said power source with said shaft, and third means to disengage said clutch upon completion of a stamping cycle independently of said second means.

5. In combination in a device for marking articles by operating upon sheet material bearing a plurality of wax or other like impressions; a table for receiving in predetermined position the article to be marked; a stamping member to transfer a single said impression to said article; means to feed said sheet material between the article and the member; a power source; mechanism to actuate said member; a clutch for interconnecting said source and mechanism; means actuated by the placing of an article in marking position to initiate operation of said clutch; and second means to arrest the movement of said mechanism after completion of a single marking operation independently of the initiating means.

6. In combination in a device for marking articles by operating upon sheet material bearing a plurality of wax or other like impressions; a stamping member operable to stamp one of said impressions upon an article; means including two normally opened control circuits to operate said member from rest position to stamping position; and second means, under the control of the article to be stamped, to initiate operation of said first mentioned means, including a movable platform to receive the article in stamping position thereon, a switch comprising a shiftable mercury pool to close one of said control circuits upon the deposition of said article on said platform and to close the other said circuit upon removal of said article from said platform, and mechanism connecting said platform with said switch.

7. In combination in a device for marking articles by operating upon sheet material bearing a plurality of wax or other like impressions; a stamping member operable to stamp one of said impressions upon an article; means including two normally opened control circuits to operate said member from rest position to stamping position; and second means, under the control of the article to be stamped, to initiate operation of said first mentioned means, including a movable platform to receive the article in stamping position thereon actuable merely by the weight of the article upon said platform.

8. In combination in an apparatus for imprinting articles by transferring to an article a transfer from sheet material bearing a plurality of such transfers comprised of wax or other transferable substances; a member operable to imprint a transfer; mechanism to operate said member from rest position to imprinting position, comprising a power source, a clutch, a driven shaft, and a cam on said shaft; means interconnecting said cam and member; and second means controlled by the placing of an article in imprinting position to initiate operation of said clutch to connect said power source to said shaft to move said member through a single imprinting cycle from rest to imprinting position and back, and third means to disengage said clutch independently of said second means.

9. Apparatus as in claim 8 in which said mechanism comprises a pawl associated with said driving means in power-transmitting cooperation with a ratchet wheel associated with said feeding means, and a member to vary the angular relation of said pawl and ratchet wheel.

10. In combination in an apparatus for imprinting articles by transferring to an article a transfer from sheet material bearing a plurality of such transfers comprised of wax or other transferable substance and bearing a plurality of register marks, one individual to each transfer and in predetermined relation thereto; means for feeding said material to locate said transfers singly and successively in imprinting position, said means including a photoelectric cell, a source of light rays adapted to impinge on said cell, focusing means to direct said rays across the path of travel of said marks; an electrical circuit including said cell; mechanism under the control of said circuit for arresting movement of the material at a position determined by the interruption of said rays by one of said marks

to locate the transfer associated with said mark accurately in imprinting position.

11. In combination in an apparatus for imprinting articles by transferring to an article a transfer from sheet material bearing a plurality of such transfers comprised of wax or other transferable substance and bearing a plurality of register marks, one individual to each transfer and in predetermined relation thereto; means for feeding said material to locate said transfers singly and successively in imprinting position, including rollers normally in material feeding relation; and means including an electrical circuit, a photoelectric cell therein and a source producing a light pencil impinging on said cell, said pencil being interruptable in intensity or direction by said marks to terminate the feeding relation of said rollers and arrest movement of the material.

12. In combination in an apparatus for imprinting articles by transferring to an article a transfer from sheet material bearing a plurality of such transfers comprised of wax or other transferable substance and bearing a plurality of register marks, one individual to each transfer and in predetermined relation thereto; an imprinting member; means to feed said material to locate said transfers singly in imprinting position; a light source; means to direct rays from said source across the path of travel of said marks; a photoelectric cell to receive said rays; and mechanism associated with said feeding means and under the control of said cell to arrest movement of the material upon interruption of said rays by a mark whereby the transfer individual to said mark is located in imprinting position.

13. In combination in a machine for imprinting articles by transferring to an article a transfer; a web of paper or the like bearing a plurality of transfers and a plurality of register marks, one individual to each transfer and in predetermined relation thereto; imprinting mechanism; means under the control of an article being placed in imprinting position to initiate a cycle of operation of said mechanism; and second means under the control of said marks acting singly and successively to feed the web to locate each transfer singly and successively in imprinting position.

14. In combination in an apparatus for imprinting articles by transferring to an article a transfer from a web bearing a plurality of such transfers comprised of wax or other transferable substance, said web also bearing a plurality of register marks, one individual to each transfer and in predetermined relation thereto; stamping mechanism; means including a photoelectric cell, light source and control circuit therefor actuated by the placing of an article in stamping position to operate said stamping mechanism; and second means including feed rollers, a photoelectric cell, light source and control circuit therefor actuated by said register marks to feed said web to position said transfers singly and successively in stamping position.

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