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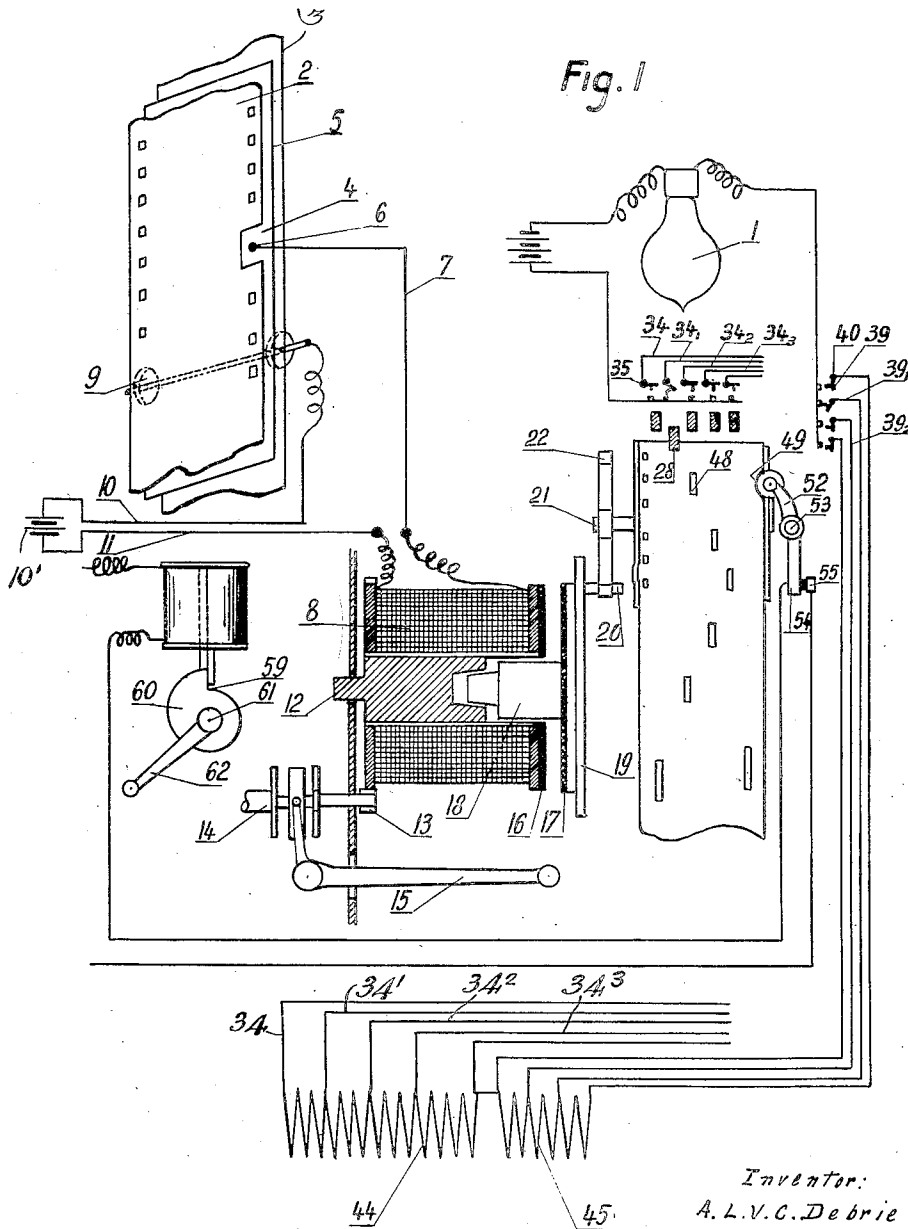
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A. L. V. C. DEBRIE

POSITIVE FILMS PRINTING MACHINE

Filed June 16, 1922

2 Sheets-Sheet 1



Inventor:
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By.
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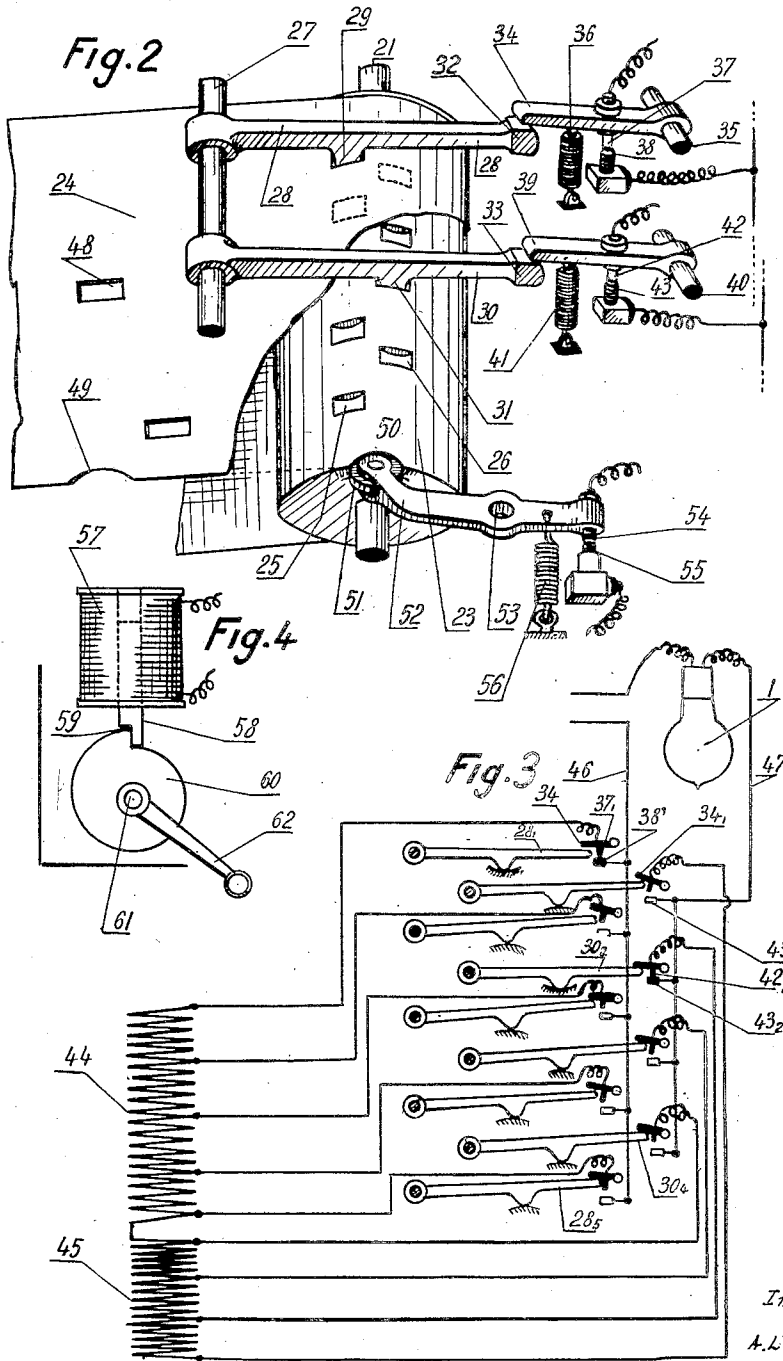
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UNITED STATES PATENT OFFICE.

ANDRÉ LÉON VICTOR CLÉMENT DEBRIE, OF PARIS, FRANCE.

POSITIVE-FILMS-PRINTING MACHINE.

Application filed June 16, 1922. Serial No. 563,829.

To all whom it may concern:

Be it known that I, ANDRÉ LÉON VICTOR CLÉMENT DEBRIE, citizen of the French Republic, residing 111 Rue Saint-Maur, Paris, France, have invented certain new and useful Positive-Films-Printing Machines, of which the following is a specification.

Known devices have been constructed for the printing of positive films wherein the brilliancy of the illuminant is regulated by automatic means according to the density of the negative film traveling before the lamp aperture, by the movement of a perforated band which travels over a set of spring contacts, each contact inserting a different resistance in the circuit of the printing lamp. The said band is moved forward by means of an electromagnet which is controlled by the travel of the negative film. In particular, said electromagnet may be energized each time that a notch in the edge of the negative film is caused to move before an electric contact in order to close a suitable circuit.

My invention relates to a device of this character wherein by means of various combinations of a given number of incoming and outgoing current contacts, I am enabled to obtain a great number of different luminous intensities by the use of a relatively limited number of contacts.

The following description, together with the accompanying drawings which are given by way of example, sets forth an embodiment of the invention as applied to a device wherein the forward motion of the perforated band is effected by means of notches formed in one edge of the negative film, and in this manner the device affords twenty different degrees of brilliancy by the use of nine contacts.

Fig. 1 is a general diagrammatic view of the mechanism for the variation of the brilliancy.

Fig. 2 is a perspective view of the arrangement of contacts wherein only two contact pieces are shown the remainder being here eliminated.

Fig. 3 is a general diagrammatic view of the electric circuits.

Fig. 4 shows the unclutching device.

A lamp 1 is disposed within a box provided with a suitable aperture for the beam of light, and in front of the lamp are caused to travel at the same time the negative film

2 and the positive film 3 to be printed, with the gelatine sides of the films facing each other. Notches 4 are formed in one edge of the film 2 corresponding to the points on the film at which the brilliancy of the light is to be changed; said films are separated by a metal plate 5 carrying a stud 6 which is connected by the wire 7 in the circuit of an electromagnet 8.

Upon said box are disposed two contact rollers 9 connected by a wire 10 to one pole of a low-voltage source of current 10' (e. g. 12 volts), the other pole being connected by a wire 11 to the electromagnet 8.

The said electromagnet 8 is mounted on the shaft 12 upon which it is in constant rotation, being actuated by the pinion 13 mounted on the shaft 14. A hand lever 15 is used with a suitable clutch in order to effect the rotation of the electro-magnet in either sense. The electro-magnet carries one of the two parts 16 of a toothed clutch whereof the other part 17 is secured to the core 18 adapted to be attracted by the electro-magnet. The clutch portion 17 is secured to a disc 19 carrying an arm 20. A shaft 21 extending from the casing has mounted thereon a Maltese cross, having for instance four arms 22 whereof the arms engage the arm 20. Upon the shaft 21 is mounted a drum 23 having disposed thereon the band 24 of any suitable insulating material, constituted for example by the waste portion of film, and adapted to be attached together so as to form an endless band.

The cylindrical drum 23 has disposed along one of its generatrices a certain number of recesses 25, five for example, having adjacent the same a certain number of recesses 26, four for example, which are also situated upon a common generatrix and are spaced apart by half the distance with reference to the first set. The periphery of the cylinder 23 thus carries four sets of nine recesses spaced apart by 90°, should the disc 19 rotate through a quarter of a revolution for each change of light.

Above the drum 23 are mounted two sets of levers all of which are pivoted to a common rod 27. The first set comprises five levers 28 each having at the lower end a boss 29 adapted to engage in one of the recesses of the set 25 situated below the said levers. The second set comprises four levers 30 each having at the lower end a boss 31 adapted

to engage in the recesses 26. Each of the levers 28 and 30 terminates in a fiber piece 32, 33. Fig. 2 shows only one lever 28 and one lever 30, the remainder being eliminated.

The end of each lever 28 will normally raise an arm 34 pivoted on the axle 35, drawn downwardly by a spring 36 and carrying a contact piece 37 opposite which is disposed a second contact piece 38. In like manner each lever 30 will normally raise an arm 39 pivoted on a rod 40 drawn downwardly by a spring 41 and carrying a contact piece 42 disposed opposite a second contact piece 43.

Each of the arms 34 is connected to one spiral section of the rheostat 44. The said spiral sections are for instance so disposed that each will correspond to 10 volts difference of potential, Fig. 3. In like manner, each arm 39 is connected to one spiral section of the rheostat 45, the said sections being so disposed that each will correspond for example to a difference of 2.5 volts.

One end of the printing lamp 1 is directly connected to the line current contact device, and a conductor 46 connects the said line current device with the various contacts 38 for the incoming current whilst the second lamp terminal is connected by the wire 47 to the various contacts 43 for the outgoing current.

The operation of the said device is as follows:

The drum 23 moves forward as above stated by one-fourth revolution at each passage of a notch 4 of the negative film 2 before the contact piece 6, and a set of recesses 25, 26 will always be situated below the levers 28, 30. The band 24 has a double set of perforations 48, whereof one set corresponds to a recess 25 and another set to a recess 26.

In normal conditions the levers 28 and 30 are held in the raised position; they will lift the arms 34 and 39 and will thus hold apart the contacts 37, 38 and 42, 43. When one set of perforations 48 passes under the levers, a lever 28 and a lever 30 will encounter a perforation and will drop into the corresponding recesses 25 and 26, drawing with them the corresponding levers 34, 39 and thereby making a contact 37, 38 and a contact 42, 43. In Fig. 3 the lever 28¹, 30² thus make a contact. The circuit of the lamp 1 then passes through the contact 37¹, 38¹, attains the rheostat 44, 45 and leaves in the different directions ending in the contacts 42, 43. But since only one of the latter is closed, that is the contact 42², 43², the circuit will be closed through the lever 30², thence proceeding to the second terminal of the lamp. This will give rise to a current of a certain value, corresponding in the particular case in question to the total number of spirals of the

rheostat 44 and to a single spiral of the rheostat 45.

By thus combining each of the five incoming current contacts with each of the four outgoing current contacts, one will obtain twenty different intensities. For the combination wherein the current enters at the lever 28¹ and leaves at the lever 30⁴, none of the rheostat sections are inserted in the circuit of the lamp 1 and this will afford the maximum luminous intensity. It is necessary to add to the preceding device an arrange whereby the film shall be properly put in place at the start. For this purpose, the perforated band 24 has at one edge a notch 49. The drum 23 has at the end a recess 50 between the recesses 25 and 26. A horizontal roller 51 secured to the end of one arm of the lever 52 pivoted on the vertical axle 53 is situated adjacent the notch 50. The second arm of the lever 52 carries a contact piece 54 opposite which is disposed a second contact piece 55. A spring 56 secured to the lever 52 tends to bring the two contacts together. Normally the roller 51 bears upon the edge of the band 24 which separates it from the drum 23, separating the pieces 54, 55. At the start, since the notch 49 of the band is upon the recess 50, the roller 51 is no longer retained, and by the action of the spring 56 the two pieces 54, 55 will make contact and close a circuit containing an electro-magnet 57, termed starting electro-magnet, Fig. 4, whose armature 58 is provided with a notch 59. A cam 60 revoluble on an axle 61 is impelled by a spring (not shown) and is secured to the clutch device of the machine. The clutching action is performed when the armature 58 being no longer attracted will act upon the cam, compressing the spring. At the start, the armature 58 is attracted and the cam 60 is impelled by the spring and occupies the unclutching position. To provide for the starting it suffices to act upon a hand lever 62 secured to the cam 60, so as to compress the spring and to effect the clutching for starting the apparatus.

The negative film will move at a certain moment and the first notch 4 will pass before the contact 6, causing the drum 23 to rotate. The band 24 will travel forward; the notch 49 will no longer be upon the recess 50; the starting electro-magnet will be de-energized and the armature will drop so as to meet with the cam 60 and will hold it in the clutching position. The hand lever can now be released and the machine will continue to operate in an entirely automatic manner.

What I claim is—

1. A positive film printing machine comprising a casing, an electric lamp disposed therein an aperture in said casing before which the negative film and the positive film to be printed are caused to travel, an electro-

magnet whose armature is controlled by the motion of the negative film, a drum adapted to be actuated when the electro-magnet armature is attracted, a perforated band disposed upon said drum, a first set of spring contacts cooperating with said perforated band and connected to the incoming circuit, a second set of spring contacts cooperating with said perforated band and connected to one terminal of the lamp, a rheostat having two sections in series, one set of contacts being connected to one section, and the other set of contacts being connected to the other section, and means for combining any of the contacts of the first set with any of the contacts of the second set for inserting in the circuit of the lamp a different resistance for each combination.

2. A positive film printing machine comprising a casing, an electric lamp disposed therein, an aperture in said casing before which the negative film and the positive film to be printed are caused to travel an electromagnet whose armature is controlled by the motion of the negative film, a drum adapted to be actuated when the electromagnet armature is attracted, a perforated band disposed upon said drum, two sets of recesses in parallel position and in relative displacement upon the drum, a set of pivoted levers disposed above the first set of recesses, bosses on said levers adapted to cooperate with the said recesses, a second set of pivoted levers disposed above the second set of recesses, bosses on said levers adapted to cooperate with the said recesses, a set of arms being normally held in the raised position by one of the said levers, a contact piece carried by each of said arms; a second contact piece situated respectively opposite each of the first-mentioned contact pieces, the second contact pieces corresponding to the first set of levers being directly connected to the incoming current supply and those corresponding to the second set of levers being connected to one terminal of the lamp, and a rheostat whereof each spiral section is connected to

one of the first-mentioned contact pieces corresponding to either set of levers.

3. An positive film printing machine comprising a casing, an electric lamp disposed therein, an aperture in said casing before which the negative film and the positive film to be printed are caused to travel an electromagnet whose armature is controlled by the motion of the negative film, a drum adapted to be actuated when the electromagnet armature is attracted, a perforated band disposed upon said drum, two sets of spring contacts cooperating with said perforated band, a rheostat whereof each section is connected to one of the said spring contacts, and a hand-controlled clutching device for the drive of the apparatus.

4. A positive film printing machine comprising a casing, an electric lamp disposed therein, an aperture in said casing before which the negative film and the positive film to be printed upon are caused to travel an electromagnet whose armature is controlled by the motion of the negative film before the contact stud a drum adapted to be actuated when the electromagnet armature is attracted, a perforated band disposed upon said drum, two sets of spring contacts cooperating with said perforated band, a rheostat whereof each section is connected to one of the said spring contacts, a recess formed on the edge of said drum, a corresponding notch formed in the edge of said perforated band, a roller situated opposite said recess, a lever pivoted to one end of said roller, an electric contact which is adapted to be closed by the other end of said lever, a spring tending to close the said contact, an electromagnet connected in the circuit of said contact, a cam cooperating with the armature of said electromagnet, and a lever secured to said cam and adapted to disengage the same from said armature.

In witness whereof I have hereunto set my hand.

ANDRÉ LÉON VICTOR CLÉMENT DEBRIE.