

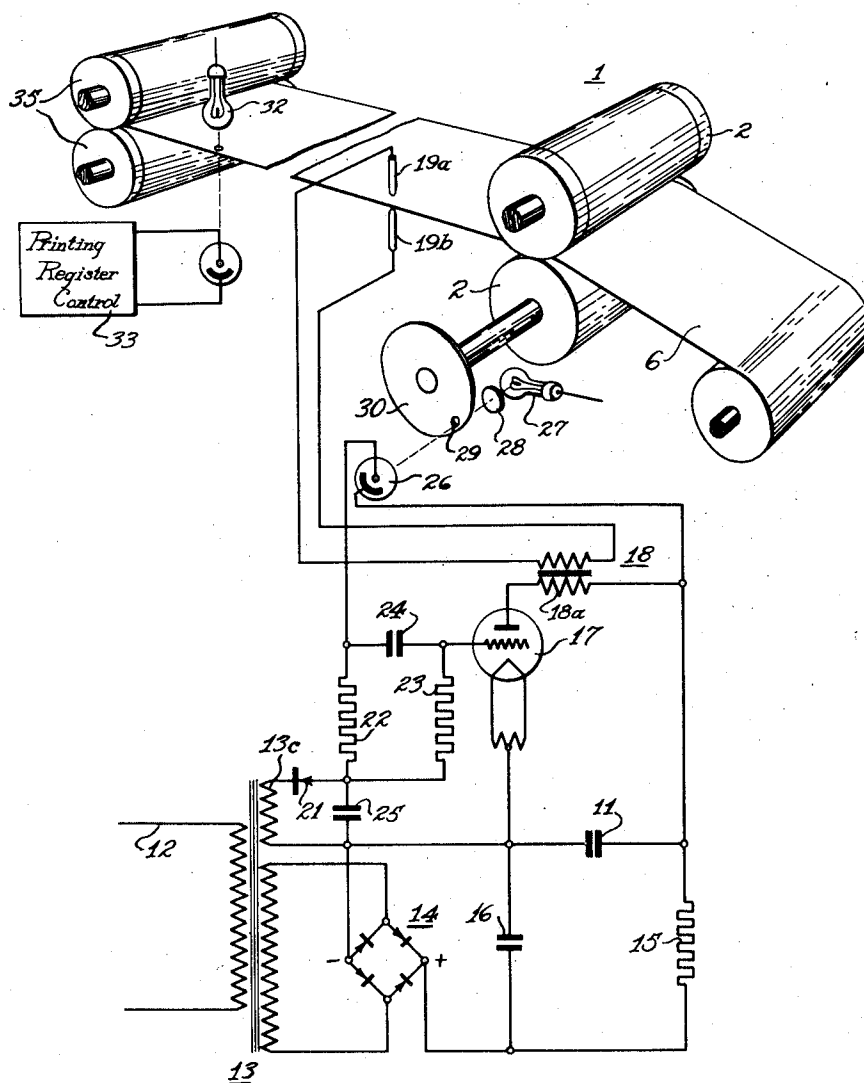
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REGISTER CONTROL OF COLOR PRINTING PRESSES

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WITNESSES:

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REGISTER CONTROL OF COLOR PRINTING PRESSES

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This invention relates to color printing presses, and particularly to a system involving means for and a method of procuring a mark or index to serve as a register mark for registering the several color impressions of a color printing press upon the stock to be imprinted.

One object of my invention is to provide a system for procuring a register mark on paper stock to be color printed to permit the registration of the several colors without requiring any additional printing equipment on the machine, and without interfering with the normal high speed operation of the press.

In the operation of multi-color printing presses, the first colored imprint is usually yellow. That color cannot be used successfully with present types of photo-tubes to provide a light reflection that will enable the tube to detect the presence or absence or location of a yellow printed index as a locating or register mark.

Since the problem of register control is to maintain the other color imprints in register with the first yellow imprint, the register mark must be available to locate the yellow imprint, or must be made available with the yellow imprint to locate the subsequent color imprints.

At the present time, a register mark can be made either by arranging a separate black printing roll ahead of the yellow printing roll, to print a black register mark; or such a register mark or index may be made by attaching a die to the yellow roll in such manner that the die will be operated to punch a hole in the paper when the yellow imprint is being made.

The provision of an additional printing roll to print the black register mark is undesirable because it would necessitate an additional section on the press. The second method, involving the use of a die to puncture the paper, is not practical with high speed presses.

I desire, therefore, to overcome both of these difficulties by providing a system that will obviate any necessity for additional equipment, and that will not interfere with the normal high speed operation of the press.

In order to form the register mark, I provide a condenser in which energy is stored until released by the yellow printing roll when it moves to a predetermined printing position. At that instant, a timing circuit, including a photo-electric cell controlled by a suitable disc on the printing roll, is energized to release the stored energy from the condenser to a transformer circuit. The transformer is then energized to generate a high voltage which is supplied to two

electrodes to form a spark gap to pass through the travelling paper that is being imprinted. The spark that is formed between the electrodes punctures the paper and forms a hole which then serves as a register mark to permit the registration of the subsequently applied color imprints.

A control system to form a register mark or index in a sheet of travelling paper that is being imprinted according to the principle of my invention, is illustrated in the accompanying diagram, in which a printing press 1 is shown provided with a series of color rolls for imprinting several color impressions upon a sheet or web of travelling paper 6, that is drawn through the presses in the proper direction to apply the color impressions in a desired sequence.

My invention is directed particularly to the system whereby the register mark or index is formed in the paper 6, and the printing mechanism is therefore illustrated only schematically, with the understanding that the register mark or index, having once been formed, will serve to control the application of the several color imprints according to other register control systems now known in the art.

The system which I utilize to form the register mark or index consists briefly of means for storing energy, means for releasing the energy, means for transforming the energy to higher voltage, and means for forming a spark at such transformed high voltage energy to cause the spark to puncture the paper that is being imprinted at a given point with reference to the imprint.

The energy that is to be ultimately used to puncture the paper is initially stored in a condenser 11. Such energy is derived from an alternating-current circuit 12 as a source of energy, and is transformed through a suitable transformer 13, and then supplied through a rectifier bridge 14 to the storage condenser 11 through a limiting resistor 15. An auxiliary condenser 16 may be provided as shown, to smooth out any ripples in the rectified current.

When the energy stored in the storage condenser 11 is to be released, it will be released through an electronic discharge tube 17 to the primary winding of a step-up transformer 18, to raise the voltage to a value sufficiently high to form a spark across the short gap containing the paper to be printed.

The grid circuit of the tube 17 is normally biased to prevent the tube from conducting current from the storage condenser 11 to the circuit including the primary winding of the trans-

former 18. The bias circuit for the grid of tube 17 includes a secondary winding 13c, of the main transformer 13, and a small rectifier unit 21 connected between the cathode and the grid of tube 17 in such manner as to impress negative potential upon the grid. Two high resistance value resistors 22 and 23 and the condenser 24 are connected in the grid circuit to limit the grid current. A small condenser 25 is connected across the secondary winding 13c and the rectifier 21 to smoothen out the current impulses in the grid circuit.

In order to overcome the grid bias of tube 17, to permit that tube to conduct the energy from the storage condenser 11 to the spark gap transformer 18, a photo-cell 26 is disposed in a position to be affected by a ray of light from a lamp 27 through a lens 28 and a small opening or aperture 29 in a disc 30 that is mechanically connected to, or driven in synchronism with, the first set of printing rolls 2, that print the first or yellow color upon the paper.

When the photo-tube is energized by the ray of light passing through the hole in the disc 30, the photo-tube momentarily impresses positive potential upon the grid of the tube 17 and renders that tube conductive to release and to transmit the energy from the storage condenser 11 through the circuit including the primary winding 18a of the spark gap transformer 18. A high voltage is generated in the secondary winding of the spark gap transformer 18, and that voltage is sufficient to cause a spark between the electrodes 19a and 19b of the spark gap through which the travelling paper moves.

Thus, as soon as the photo-tube is energized, the energy from the condenser 11 is released to generate a spark in the spark gap, and to puncture the travelling paper to form a hole that would serve as a register mark or index for the color impressions. Since that mark is formed when the printing rolls for the yellow impression occupy a predetermined position, during the printing impression, the register mark so formed will always serve to indicate the position of the area to be imprinted.

By thus forming the register mark with equipment that is not mechanically connected to the printing press, no additional equipment is necessary on the printing press itself, and the speed of operation is not interfered with. The only mechanical connection to the press is the connection to the disc that controls the excitation of the photo-tube, and such an element is relatively small on the printing machine. The need for a separate printing roll, which would otherwise be necessary, is thus obviated.

Once the register mark has been formed on the paper, it may then be utilized to control one or more subsequent circuits indicated by the photo-tube 32 and associated equipment 33 to control the impressions of the subsequent colors by other color rolls 35, to establish proper registration in the color field that is to be printed.

My invention is therefore not limited to any specific type of printing press or to any specific arrangement, but may be variously modified without departing from the spirit and scope of the invention, as set forth in the appended claims.

I claim as my invention:

1. In a register control system, in combination, a machine for moving an article, in synchronism with the machine, from one position to another

position, electric spark producing means disposed to make a mark on the article each time a spark is produced, electronic discharge means for setting said spark producing means in operation each time the electronic discharge means operates, and means for causing the operation of the electronic discharge means each time a given element of the machine holds a given position in space.

2. In a system of control, in combination, a machine for synchronously actuating a piece of material, electric spark producing means disposed to mark the material each time a spark is produced, and a pair of electronic devices, one of said devices being caused to operate when a given element of the machine holds a given position in space and the other electronic device being caused to operate by the first electronic device, said spark producing means being interconnected with said electronic devices to produce a spark each time the second electronic device operates.

3. In a system of control, in combination, a machine disposed to operate a member, photo-electric means disposed to operate each time a given machine element holds a given position in space, electronic discharge means, controlled by said photo-electric means, adapted to become conducting each time a given machine element holds a given position in space, a condenser connected to discharge through said electronic discharge means each time said electronic discharge means becomes conducting, voltage amplifying means actuated by said condenser, and spark producing means actuated by said voltage amplifying means.

4. In a system of control, in combination, a machine for moving a piece of material in synchronism therewith, electric scanning means adapted to operate each time recurring points on the material hold a given position with reference to the scanning means, electric high-voltage producing means, controlled by said scanning means, adapted to produce a high voltage each time said scanning means becomes operative, and a pair of facing electrodes disposed on opposite sides of the material connected to be subjected to said high voltage whereby a spark discharge is produced through said material.

5. In a system of control, in combination, an electric discharge device having a control electrode and a pair of main electrodes, a transformer having primary and secondary windings, a condenser and the primary winding of said transformer being connected in series with the main electrodes, means for charging the condenser, a machine, having a plurality of elements, for synchronously moving material, means responsive to a given position in space of one of the elements of said machine adapted to so alter the grid potential to make the electric discharge device conducting whereby said condenser discharges through said discharge device thus causing a rapid current change in the primary winding of said transformer whereby a high potential appears at the terminals of the secondary windings each time the said given element of said machine holds a given position in space, and a pair of facing electrodes disposed on opposite sides of the material connected to the terminals of the secondary winding of said transformer and adapted to produce an electric spark through said material.

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