# United States Patent

[11] 3,550,552


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[54] **TIMING CIRCUIT FOR OFFSET PREVENTION SPRAY EQUIPMENT**
**5 Claims, 8 Drawing Figs.**


[52] **U.S. Cl.** ..... **118/7,** 118/9, 118/302
[51] **Int. Cl.** ..... **B05c 5/00,** B05c 11/00
[50] **Field of Search** ..... 118/8, 302, 2, 46, 9, 7; 239/70



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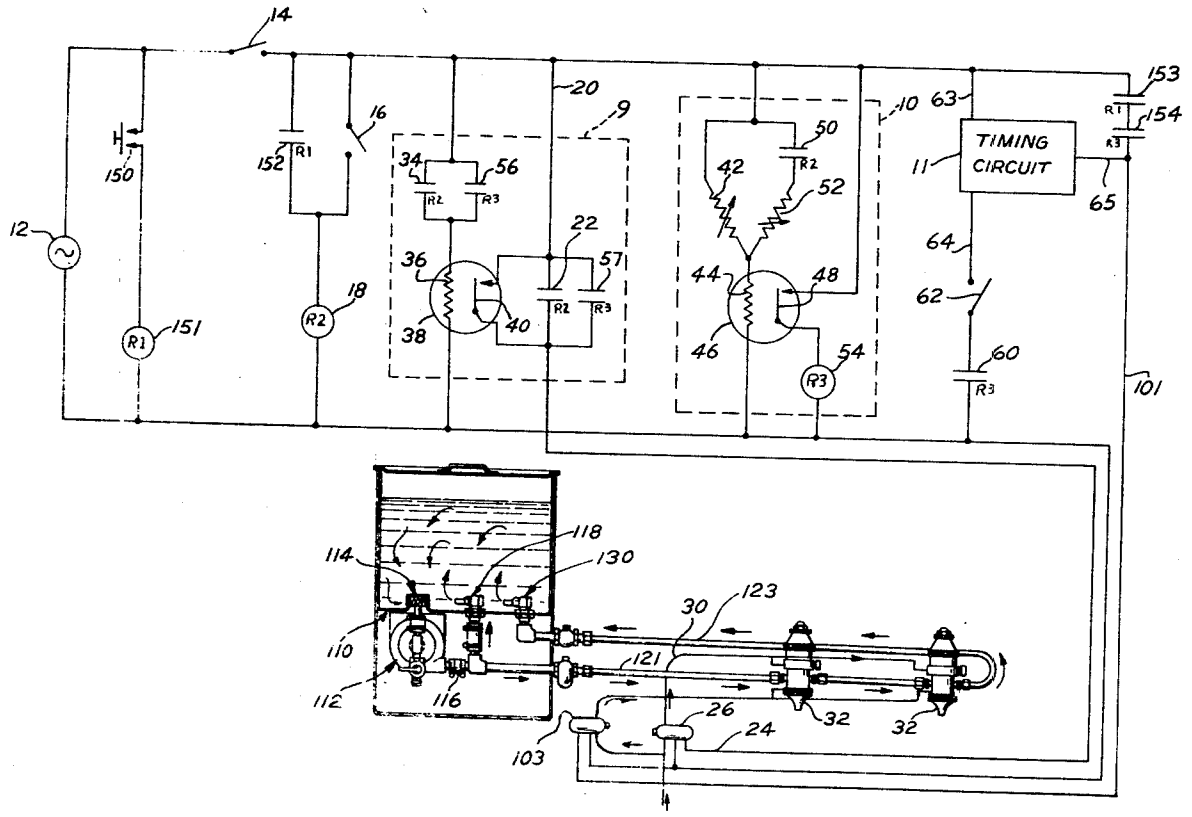
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*Attorney*—Molinare, Allegretti, Newitt & Witcoff



**ABSTRACT:** Apparatus for timing the operation of spray equipment which coats freshly printed sheets of paper coming off a printing press, the coating being applied to prevent the fresh ink from offsetting (transferring) to the back of the next sheet to be stacked at the output of the press. The spray guns are fed by input lines of compressed air and spraying material, the flow through each line being individually and precisely controlled in synchronism with the press by an electronic timing circuit. The timing and duration of the spray bursts are adjustable while the press is in operation to provide optimum performance.

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SHEET 1 OF 2

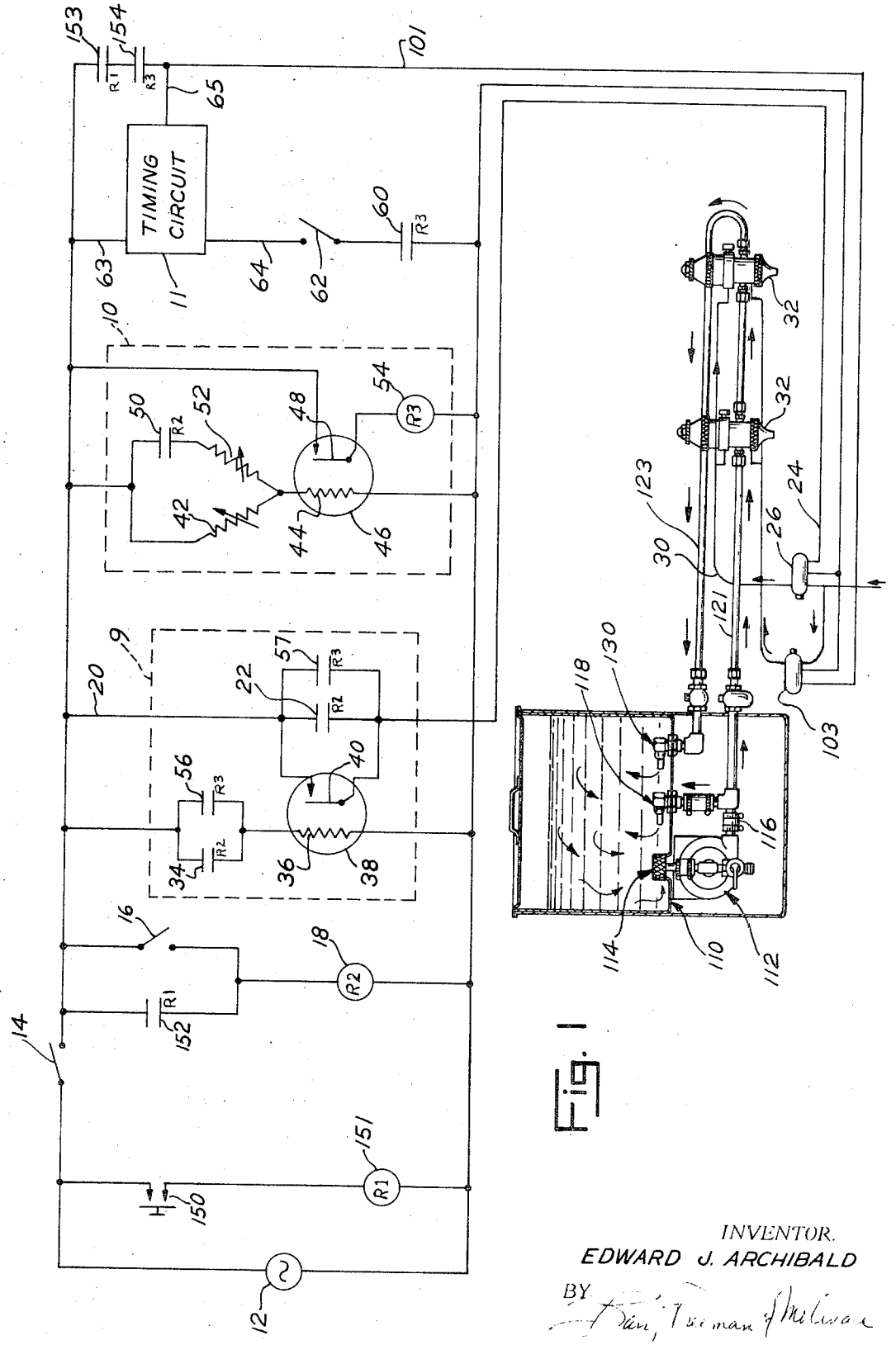



Fig. 1

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Fig. 2

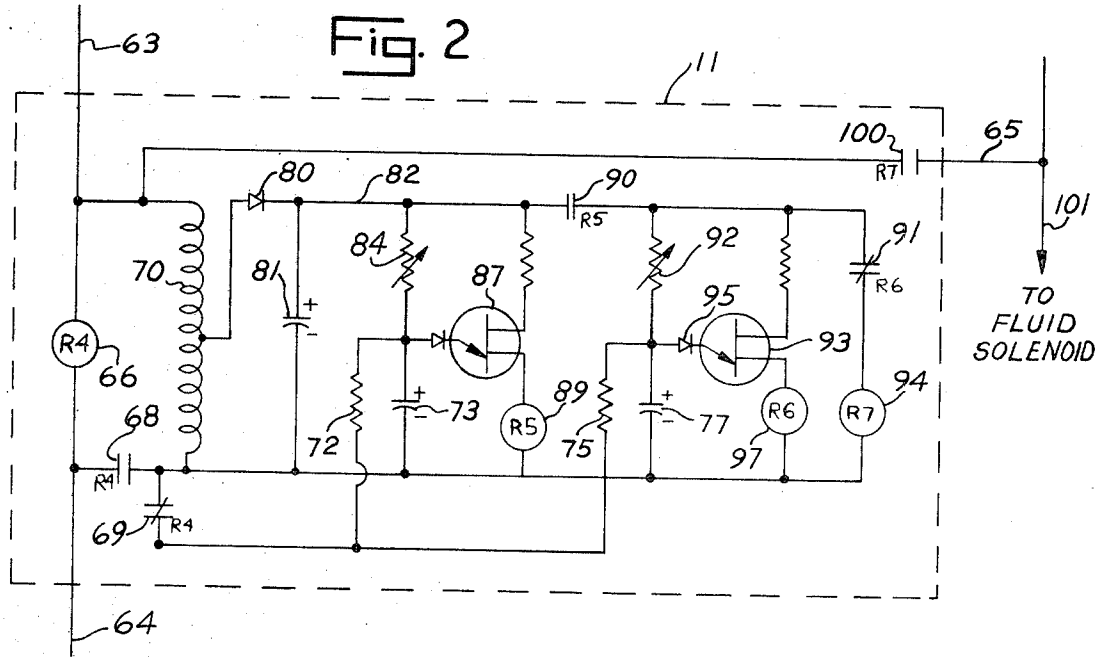



Fig. 3

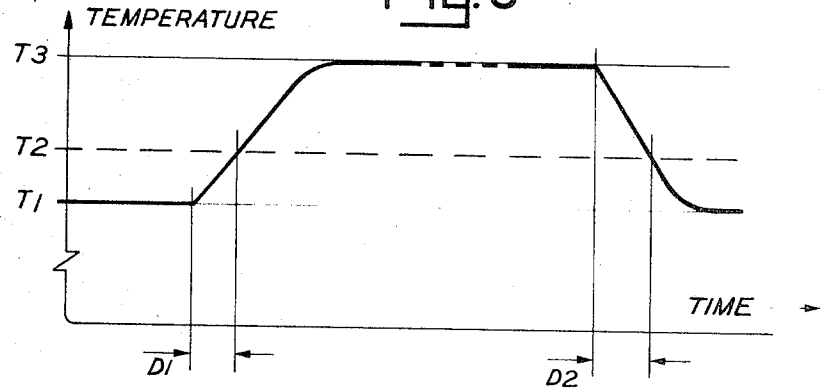



Fig. 4

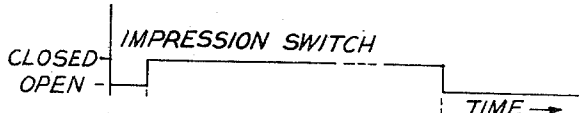



Fig. 5

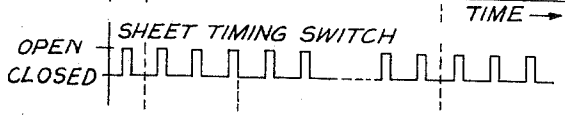



Fig. 6

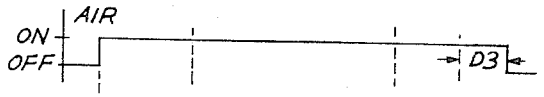



Fig. 7

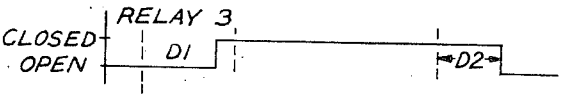
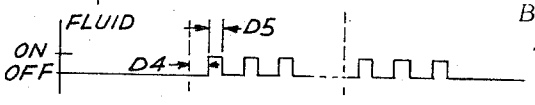



Fig. 8




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# TIMING CIRCUIT FOR OFFSET PREVENTION SPRAY EQUIPMENT

## BACKGROUND OF THE INVENTION

This invention relates generally to printing press systems and, more particularly, to an electronically timed spray system for preventing ink offset from freshly printed sheets.

As heretofore well known in the art of printing, the transfer or "offset" of ink from one freshly printed sheet to the back of the next sheet at the output of a press may be prevented by lightly spraying each freshly inked sheet as it comes from the press. The fine coating of starch, wax of the like on the surface of the freshly printed page serves to partially absorb ink that is still wet and to slightly space the sheets apart as they are piled so that air can circulate between the sheets to finish the drying process. The prevention of ink offset has been found particularly necessary in connection with modern high-speed printing presses, particularly when certain types of ink which do not dry quickly and certain types of paper which do not readily absorb the ink are used.

In order to assure complete coverage of each sheet, it is necessary that each burst of spray not start too late nor end too early. Excessive overspray at either the beginning or end of each sheet increases the degree of contamination in the surrounding air and also increases the collection of contaminants on the mechanical parts of the press. The collected antioffset material may also clog the blanket used in offset printing or tend to fill the type used in type printing.

In consequence, it has been the prior practice to mechanically synchronize the operation of the offset spray equipment with the operation of the press so that only a single burst of spray is produced for each sheet coming off the press. This has been accomplished by means of a cam-operated sheet timing valve for controlling the fluid pressure applied to the nozzles. The sheet timing valve is operated in response to the rotation of a cam mounted upon a press shaft which rotates once for each sheet being processed by the press.

Frequent adjustment of the timing cams employed in the prior art spray systems has proven to be necessary yet troublesome. The timing and duration of the spray burst must be adjusted as the speed of the press varies. In addition, changes in the size of the sheets being printed requires a new cam adjustment since the size of the sheets being printed changes quite frequently in most printing establishments; moreover, it is often necessary to vary the operating speed of the press to facilitate adjustments to the press (particularly in offset printing). These changes in the operation of the press facility require that the offset prevention spray system itself be frequently adjusted or that less than fully satisfactory operation of the spray system be endured.

## SUMMARY OF THE INVENTION

In a principal aspect, the present invention takes the form of an electronically timed spray system for preventing ink offset from a series of sheets freshly inked by a printing press. According to a first feature of the invention both the timing and duration of each spray burst may be adjusted while the press is in operation. Electrical time delay units insure that spraying is started only after the first sheet of the press has reached the position of the nozzles and terminates the spraying cycles only after the last sheet has reached the nozzles. A further delay unit is employed to provide an automatic continuation of compressed air pressure after the spraying of antioffset material has been completed, thereby "air-cleaning" the nozzles. Finally, timing circuitry provides for a manually actuated "wash cycle" in which air pressure is automatically supplied to the nozzles for predetermined periods of time both before and after fluid spraying. This manual wash cycle allows the spraying system to be conveniently cleaned without placing the press itself in operation.



## BRIEF DESCRIPTION OF THE DRAWINGS

These and other features and objects of the invention may be more clearly understood through a study of the detailed description which follows. During the course of this description, reference will frequently be made to the attached drawings, in which:

FIG. 1 is an overall schematic drawing of an electronic timing circuit embodying the principles of the invention;

FIG. 2 is a detailed schematic drawing of the timing circuit 11 shown in block form in FIG. 1;

FIG. 3 is a graph illustrating the operation of the time delay relay device 46 shown in FIG. 1; and

FIGS. 4 through 8 are graphs which illustrate the operation of the circuit of FIG. 1.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred arrangement for controlling the operation of offset prevention spray equipment is shown in FIG. 1 of the drawings. The arrangement is powered from a source of alternating current energy 12. An ON-OFF switch 14, an "impression switch" 16, and a solenoid 18 of a relay R2 are connected in series across source 12. The impression switch 16 is normally open, being closed by the mechanical movement of some portion of the printing press when that press begins operation.

When both the ON-OFF switch 14 and the impression switch 16 are closed, the solenoid 18 of relay R2 is energized, closing contacts 22 to supply current via conductors 20 and 24 to a solenoid 26 which controls the flow of air through an air conduit 30 to the spray gun nozzles 32 in the offset spray equipment.

At the same time, in air-delay timing circuit 9, the contacts 34 of relay R2 close to energize the heater 36 of a time delay switch 38, the heater 36 and contacts 34 being connected in series with the switch 14 across the AC source 12. The current flowing through heater 36 eventually closes the contacts 40 of time delay switch 38 such that, when the relay contacts 22 again open, the contacts 40 must cool before the air control solenoid 26 is again deenergized.

When the ON-OFF switch 14 is first closed, a current flows through a variable potentiometer 42 and through a heater element 44 of a second time delay switch 46. The amount of "preheating" current which flows through heater 44 may be controlled by changing the setting of potentiometer 42. In general, the initial, preheating current is inadequate to cause the contacts 48 of time delay switch 46 to close. However, when the solenoid 18 of relay R2 is energized by the closure of impression switch 16, the contacts 50 of relay R2 close to apply an additional current to the heater 44 through a second potentiometer 52. After a predetermined time interval, the contacts 48 are heated to a sufficient degree that they close, energizing solenoid 54 of the relay R3.

When the solenoid 54 of relay R3 is energized, contacts 56 and 57 in the air-delay timing circuit 9 are also closed. As will be discussed in more detail in connection with the graph of FIG. 6, the air-delay timing circuit 9 provides for an automatic continuation of air pressure in airline 30 after liquid spraying is completed in order to "air clean" the nozzles 32.

The energization of solenoid 54 of relay R3 also closes contacts 60 to initiate operation of an electronic sheet spraying timing circuit 11. The timing circuit 11 is synchronized with the operation of the press by means of a cam-operated switch 62 connected between the contacts 60 and timing circuit 11 as shown in FIG. 1. The switch 62 is normally closed but opens briefly each time a sheet being printed passes a predetermined position in the running press. The switch 62 is operated by the rotation of cam 61 which is fitted to a shaft on the printing press which rotates once for each printed sheet.

The details of the timing circuit 11 are shown in FIG. 2 of the drawings, Note that, as shown in both FIGS. 1 and 2, the timing circuit 11 is provided with a pair of input conductors 63 and 64 and an output conductor 65. During normal operation,

the conductor 63 is connected to one terminal of the source 12 through the switch 14 while the conductor 64 is connected through the normally closed switch 62 and the contacts 60 to the other terminal of source 12. The solenoid 66 of relay R4 shown in FIG. 2 is therefore normally energized but is periodically deenergized by the opening of the cam-operated switch 62 seen in FIG. 1.

Each time the switch 62 opens, the solenoid 66 of relay R4 is deenergized, opening contacts 68 and closing contacts 69. This removes the application of power to the input of an autotransformer 70 and connects a discharge resistor 72 across capacitor 73. Similarly, at this time, a discharge resistor 75 is connected across the capacitor 77. The resistors 72 and 75 have a sufficiently low resistance to allow the capacitors 73 and 77 to be completely discharged during the short time interval when solenoid 66 is deenergized. Thus, when solenoid 66 is again energized and power is applied to the autotransformer 70 by way of the now closed contacts 68, the capacitors 73 and 77 are initially discharged.

The low voltage appearing at the output of autotransformer 70 is rectified and filtered by the combination of diode 80 and filter capacitor 81 to supply a positive voltage to conductor 82 which powers the remainder of the electronic timing circuit 11. With a positive supply voltage applied to conductor 82, capacitor 73 begins to be charged through the potentiometer 84. Eventually, the voltage across capacitor 73 reaches a sufficient magnitude to break down a diode 86 and thereby cause the unijunction transistor 87 to "fire," energizing the solenoid 89 of relay R5.

With solenoid 89 energized, the contacts 90 are closed, immediately energizing the solenoid 94 of relay R7 through the normally closed contacts 91 and causing capacitor 77 to begin to charge positively through the potentiometer 92. As before, the voltage across capacitor 77 eventually reaches a sufficient level to break down diode 95 and to fire the unijunction transistor 93, thereby energizing solenoid 97 of relay R6. This opens the contacts 91 and again deenergizes the solenoid 94 of relay R7.

During the time solenoid 94 of relay R7 is energized, the contacts 100 of relay R7 are closed to supply power via the output conductor 65 from timing circuit 11 and via conductor 101 to the piston air control solenoid 103 which in turn controls the emission of fluid from nozzles 32.

In FIG. 2, the reference numeral 110 has been employed to designate a suitably supported reservoir tank which holds water (or other solvent) and antioffset particles (such as starch, dextrin, or the like) in suspension. A circulating pump 112 driven by electric motor or the like is employed to agitate and thereby keep the solution in constant suspension.

The solution within the tank is drawn through a filter screen 114 into the pump and injected under pressure into an outlet pipe 116. The pump 112 runs continuously and solution is reintroduced into the tank through a nozzle 118.

The fluid circulates along conduit 121 through the spray guns 32 and back through a return line 123 which terminates in a second nozzle 130 within the tank 110. The spray gun atomizers 32 may be of conventional design.

The operation of the offset spray control circuit as discussed thus far may be better understood through a consideration of FIGS. 3 through 8 of the drawings.

The operation of the spray cycle delay timer circuit 10 is illustrated in FIG. 3 of the drawings. When the ON-OFF switch 14 (shown in FIG. 1) is closed, an initial preheating current flows through the potentiometer 42 and the heater element 44 of the time delay switch as has been explained. The contacts 48 of the time delay switch 46 eventually reach a stable temperature level T1 as shown in FIG. 3. When the impression switch 16 (seen in FIG. 1) is closed, closing the contacts 50 and applying an additional current through the potentiometer 52 to the heating element 44 of time delay switch 46, the temperature of contacts 48 rises toward temperature level T3 as shown in FIG. 3. As soon as the temperature of contacts 48 exceeds the threshold temperature level T2, however, the contacts 48 close to energize the solenoid 54 of relay R3. This initial delay interval between the time when the impression switch 16 is first closed and the time when relay R3 is operated is designated interval D1 in FIGS. 3 and 7 of the drawings.

The duration of this delay interval D1 may be adjusted by varying the settings of potentiometers 42 and 43 in the delay circuit 10. A decrease in the resistance of potentiometer 42 causes an increase in the preheating current applied to heater 44, thereby increasing the initial steady state temperature level T1 to a value more nearly equal to the temperature level T2. This, of course, reduces the magnitude of the temperature change necessary in order to close the contacts 48 and hence reduces the duration of delay interval D1. (Alternatively, the delay interval D1 may be reduced by reducing the resistance of potentiometer 52. This causes the contacts 48 to be heated at a faster rate and shortens the delay interval D1.)

By adjusting the delay interval D1, a precise automatic delay may be provided before spraying begins such that the first spray burst occurs only when the first sheet off the press has reached the position of the spray gun nozzles 32. It should be noted that the delay interval D1 also insures that air is applied to the nozzles 32 for substantial period of time before the piston air solenoid 103 is opened.

As discussed in conjunction with FIG. 1, the timing circuit 11 is energized only after the relay R3 is closed. The piston air solenoid 103 itself, however, is opened only after the delay period D4 indicated in FIG. 8 has elapsed. The duration of the brief delay period D4 immediately preceding the beginning of actual spraying is also adjustable by varying the resistance of potentiometer 84 in the electronic timing circuit 11 shown in detail in FIG. 2 of the drawings. Potentiometer 84 controls the rate at which capacitor 73 is charged and hence controls the time when relays R5 and R7 are first energized.

The duration of each spray burst, indicated by the interval D5 in FIG. 8, is also controllable. Spraying is terminated when the charge on capacitor 77 reaches a value sufficient to fire unijunction transistor 93 which opens contacts 91 and 100. The rate at which capacitor 77 charges is controllable by varying the resistance of potentiometer 92. Thus, potentiometer 92 provides a means for varying the spray burst duration D5.

It is important to note that the timing of the offset prevention spraying equipment may be adjusted even while the press is running. Thus, while the press is in operation, adjustments may be made to the starting time (controlled by time interval D4) and duration (D5) of each spray burst such that precisely the right amount of spraying occurs at precisely the right time.

As may be seen by a comparison of FIGS. 4 and 8 of the drawings, fluid spraying continues during the interval D2 after the impression switch is opened. The impression switch 16 is arranged such that it opens as the last sheet in a printing run passes a predetermined point in the press. In order that ink offset not occur on the last few sheets produced by a printing run, however it is desirable that the spraying cycles be terminated only after the last sheet comes off the press. This is accomplished by the spraying cycle timing circuit 10 shown in FIG. 1.

As illustrated in FIG. 3, the timing circuit 10 may be adjusted to vary the delay interval D2 between the opening of the impression switch 16 and the opening of relay 3. While the press is in normal operation, the time delay switch contacts 48 reach a steady-state temperature level T3. Before contacts 48 can again open, however, they must cool to a level below the threshold temperature T2. The delay interval D2 can accordingly be decreased by decreasing the temperature level T3 toward temperature level T2 (that is, by decreasing the sum of the currents flowing through potentiometers 42 and 52). Alternatively, interval D2 can be shortened by increasing the rate at which the contacts 48 cool (that is, by increasing the resistance of potentiometer 42). In practice, it has been found possible to adjust both the intervals D1 and D2 to accommodate a wide variety of different delays such as are encountered in different spray equipment installations.

At the end of delay interval D2 when relay 3 opens, no more fluid spraying takes place. Air spraying does continue, however, throughout the delay interval D3 produced by the air spraying delay circuit 9. The heater 36 of time delay switch 38 remains continuously energized until relay 3 open. The air solenoid 26 thus continues to be energized through the contacts 40 until those contacts cool. In the circuit shown in FIG. 1, the delay interval D3 is fixed. It could, of course, be made adjustable if necessary by providing a variable potentiometer in series with the heater 36. A precise duration for the delay period D3 is normally unnecessary, however, since that delay is used solely to "airclean" the nozzles by providing an automatic continuation of air pressure after spraying is completed.

In accordance with a further important feature of the present invention, provision is made for a manually actuated "wash cycle" in which air pressure is automatically supplied to the nozzles for predetermined periods both before and after spraying. This wash cycle is initiated by depressing the pushbutton indicated at 150 in FIG. 1. The closure of switch 150 energizes the solenoid 151 of the relay R1 which closes contacts 152, energizing solenoid 18 of relay R2. The energization of solenoid 18 immediately applies an energizing current through contacts 22 and via conductor 24 to the air solenoid 26. After the delay interval D1, relay 3 is actuated to close contacts 154, thus energizing the piston air control solenoid 103 via conductor 101.

As soon as the pushbutton 150 is released, relay R1 is deactivated, deenergizing the piston air control solenoid 103. As before, however, air is not terminated until the delay interval D3 (produced by timing circuit 9) has elapsed.

In operation, the arrangement for producing a manually actuated wash cycle enables the entire spraying apparatus to be cleaned without actually running the press. If desired, the solution in tank 110 can be replaced by a suitable solvent or cleaner during the manually actuated wash cycle.

It is to be understood that the embodiment of the invention which has been described is merely illustrative of one application of the principles of the invention. Numerous modifications may be made to this embodiment without departing from the true spirit and scope of this invention.

I claim:

1. An electrically timed offset prevention spray system for preventing ink offset from a series of sheets freshly inked by a printing press, said system comprising, in combination:
- at least one atomizing nozzle connected to a source of compressed air and to a reservoir of offset prevention material;
- a first electrically responsive valve for controlling the flow of air through said nozzle;
- a second electrically responsive valve for controlling the flow of offset prevention material through said nozzle;
- means for applying a first control signal to said first valve to open said first valve;
- a first timing device actuated by said first control signal for preventing said second valve from opening until a first minimum delay interval has elapsed following the opening of said first valve; and
- a second timing device for maintaining said first control signal until a second minimum delay interval has elapsed following the closing of said second valve.

2. An offset prevention spraying system as set forth in claim 1 including means for repetitiously opening and closing said second valve in synchronism with said press, said last-named means being placed in operation by said first timing device at the conclusion of said first minimum delay interval.

3. Apparatus as set forth in claim 1 wherein said means for applying said first control signal to said first valve comprises a sensing circuit coupled to said press for energizing said first valve when the first sheet in said series of sheets is being processed by said press.

4. In a printing press system provided with spraying nozzles for coating freshly printed surfaces with ink offset preventing material, improved means for timing the operation of said spraying apparatus which comprises, in combination;
- a source of compressed air and a reservoir of offset preventing material coupled to said spraying nozzles;
- a first electrically operated valve for controlling the flow of compressed air through said nozzles,
- a second electrically operated valve for controlling the flow of offset preventing material through said nozzles;
- means coupled to said press for producing an electrical synchronizing signal each time a sheet to be sprayed is processed by some portion of said printing press;
- a first electronic timer responsive to said synchronizing signal for initiating an electrical control signal after a first time interval has elapsed following the occurence of said synchronizing signal, said first timer including means for varying the duration of said first time interval;
- electrically actuated mean for opening said first valve as soon as said press is in operation and prior to the end of said first time interval;
- a second electronic timer for terminating said control signal after a second time interval has elapsed following the termination of said first interval, said second electronic timer including means for varying the duration of said second interval; and
- means coupling said second valve to said first and second timers, said second valve being opened in direct response to said control signal.

5. An electrically timed offset prevention spray system for preventing ink offset from a series of sheets freshly inked by a printing press, said system comprising, in combination;
- at least one atomizing nozzle connected to a source of compressed air and to a reservoir of offset prevention material;
- a first electrically responsive valve for controlling the flow of air through said nozzle;
- a second electrically responsive valve for controlling flow of offset prevention material through said nozzle,
- means for applying a first control signal to said first valve to open said first valve;
- a first timing device actuated by said first control signal for preventing said second valve from opening until the first minimum delay interval has elapsed following the opening of said first valve;
- a second timing device for maintaining said first control signal until a second minimum delay interval has elapsed following the closing of said second valve; and
- manually operable means for actuating said first valve such that said system may be cleaned without operation of said press.