April 2, 1940. J. A. PAASCHE 2,195,753

SURFACE TREATING APPARATUS

Filed July 28, 1937 3 Sheets-Sheet 1

Fig. 1

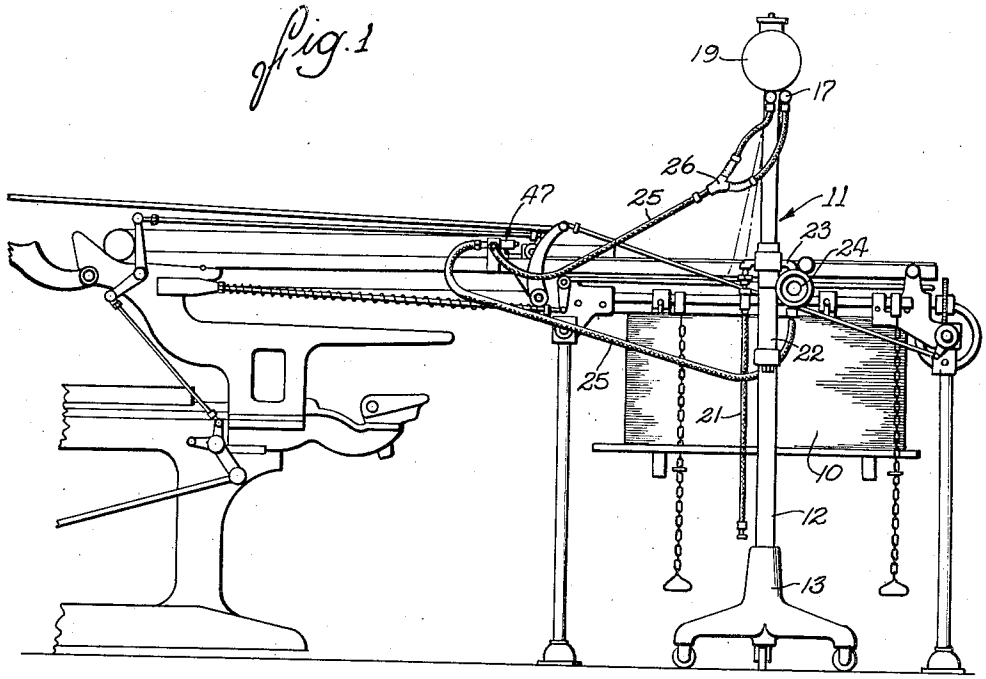
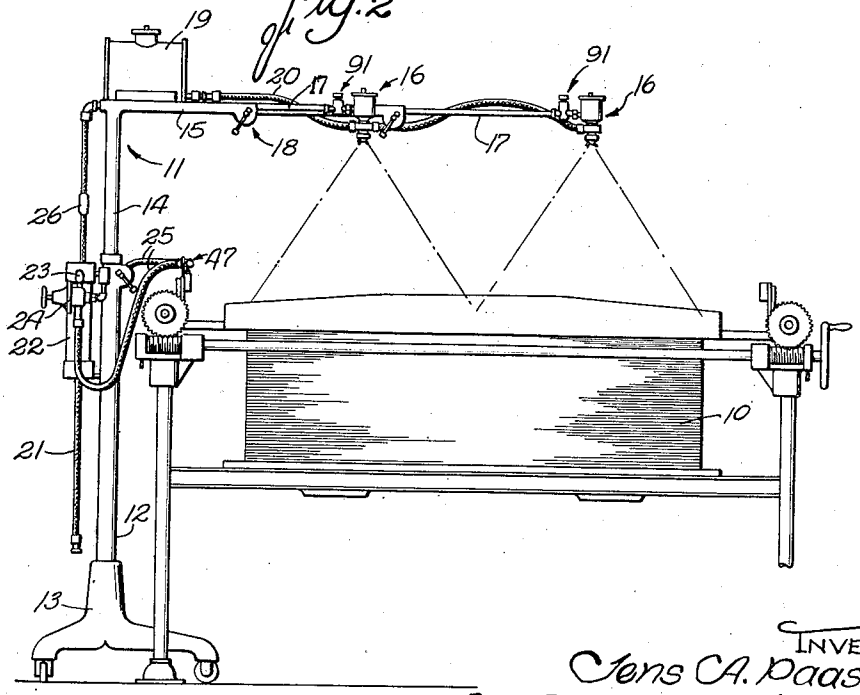


Fig. 2



INVENTOR
Jens A. Paasche
By Parker, Carlson, Pitzner & Hubbard
ATTORNEYS

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fig. 3

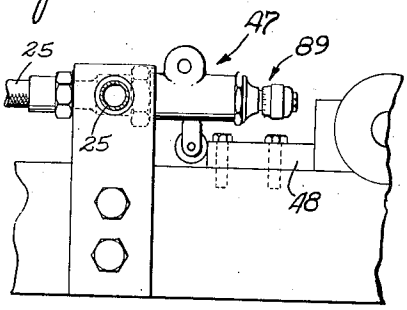


fig. 4

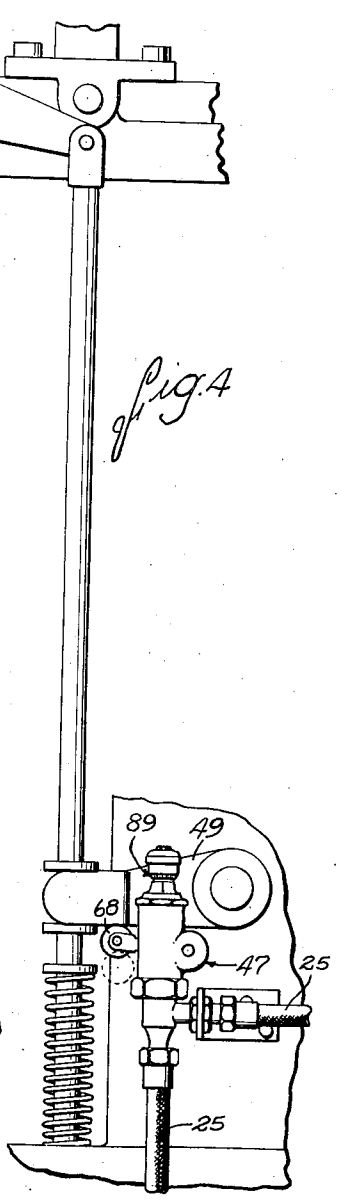


fig. 5

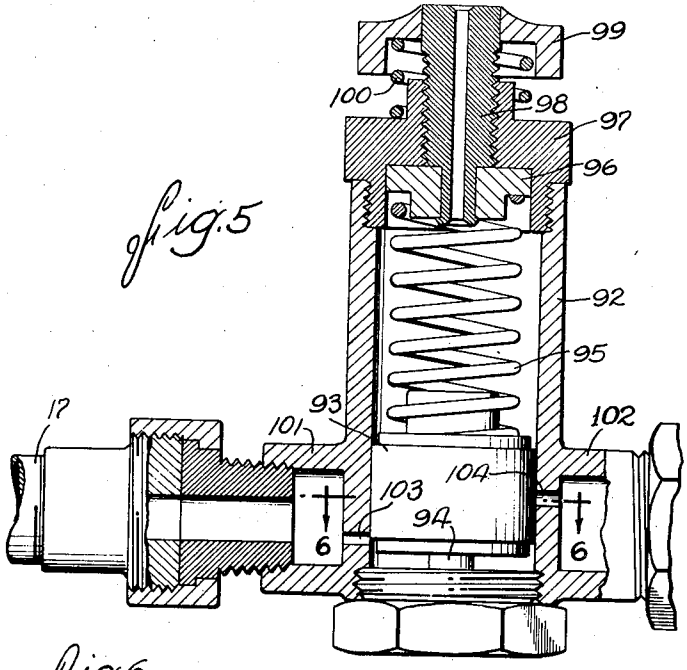
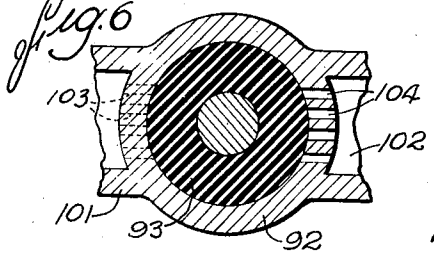


fig. 6



INVENTOR

Jens A. Paasche

By Parker, Carlson, Pitzner & Hubbard

ATTORNEYS

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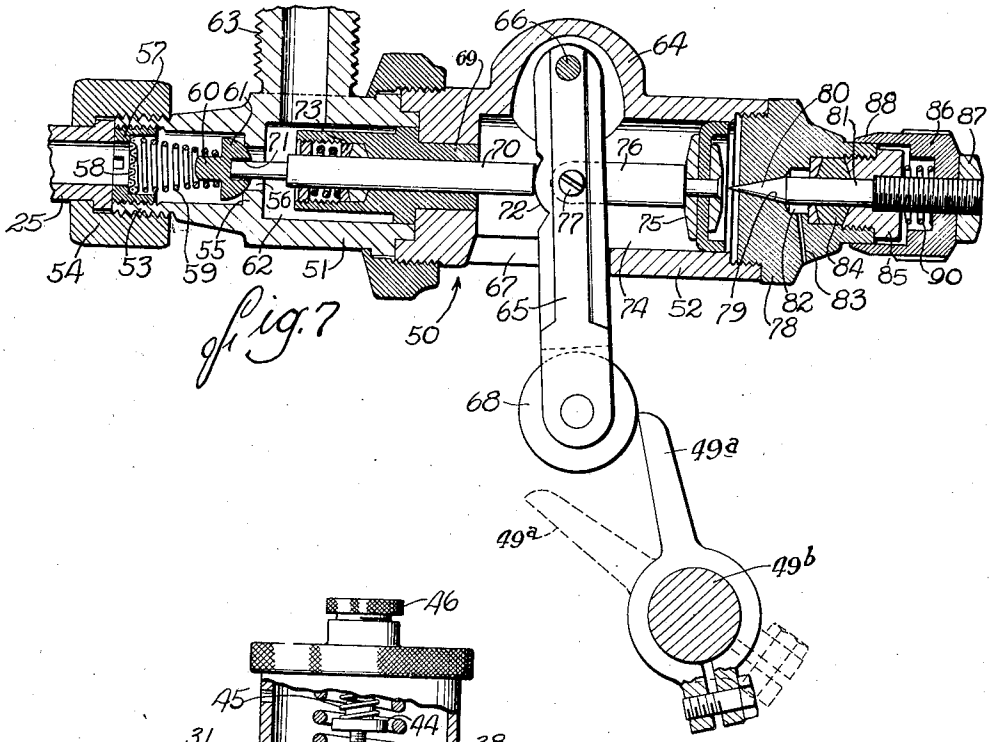


Fig. 7

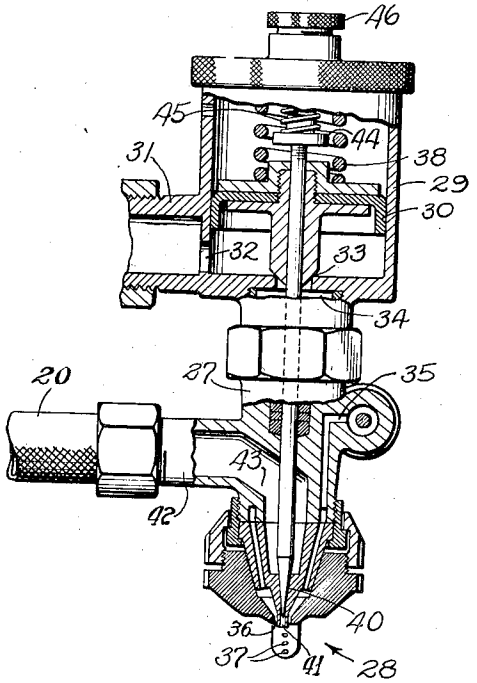


Fig. 8

INVENTOR
Jens A. Paasche
By Parker, Carlson, Pitzner & Hubbard
ATTORNEYS

Patented Apr. 2, 1940 2,195,753

UNITED STATES PATENT OFFICE

2,195,753

SURFACE TREATING APPARATUS

Jens A. Paasche, Wilmette, Ill.

Application July 28, 1937, Serial No. 156,153

10 Claims. (Cl. 91—45)

The invention relates generally to surface treating apparatus and more particularly to apparatus utilizing pressure fluid, usually compressed air, as its motive force.

By way of example, apparatus of this nature may be employed in practicing a process for preventing the offset of ink from the surface of a newly printed sheet to a sheet superimposed thereon. Such a process may consist generally in creating, by the action of pressure fluid, a finely divided spray of material and directing this spray toward a surface of a newly printed sheet, the sprayed material containing as its principal ingredients a solid base substance dissolved in a volatile carrier. During the passage of the created spray to the sheet surface, the carrier separates by volatilization or evaporation from the base substance and deposits on the surface scattered, substantially dry particles of said substance which act as spacers to prevent ink offset.

Widely varying conditions are encountered in practicing the process and the apparatus must, to be capable of substantially unlimited use, be readily adaptable to meet such conditions. For instance, the apparatus may be used in connection with a press which prints a continuous web of paper. Or it may be employed on a press for printing a succession of sheets. Again the press may print only portions of webs or sheets and it may be desirable to treat only the printed portions of such sheet or even sections of said portions by the offset preventing process. Moreover, the apparatus must be adaptable for synchronization with press operations or sheet movements and should, therefore, be instantly responsive to control manipulation without time lag or other operative factors which make synchronization difficult to obtain and maintain. It will be evident, therefore, that the apparatus must be capable of meeting widely varying conditions and that simplicity, ease and convenience of adjusting the apparatus for any condition are essential.

A general object of the invention, therefore, is to provide, in apparatus utilizing pressure fluid as its motive force, new and improved means for adjustably controlling said apparatus to meet widely varying conditions of operation.

Another object is to provide, in such apparatus, new and improved control means effective to produce instant operation of the apparatus in response to the actuation of a main control mechanism, even though said mechanism may be located at some remote point.

Another object is to provide new and improved apparatus and control means therefore adapted for operation entirely by pressure fluid, which embodies means for quickly and conveniently adjusting the apparatus and the control means to meet widely varying operating conditions, and in which the operation of the apparatus is instantly responsive to the control means.

More specifically stated, another object resides in the provision of a pressure fluid operated system which includes a device operative upon the admission of pressure fluid thereto and has a pressure fluid supply system communicating therewith controlled by means which is operable to connect the device with a source of pressure fluid and by means which maintains the pressure in the system substantially up to the device at approximately but slightly less than full pressure, whereby the device will be instantly responsive to control.

In conjunction with the foregoing, another object is to provide in apparatus embodying a plurality of devices, common means for connecting the devices with a source of pressure fluid and pressure maintaining means for each device individually adjustable to obtain synchronous operation of said devices.

A further object is to provide a new and improved pressure fluid actuated apparatus having a pressure fluid control means adapted to be opened by a suitable part of the mechanism with which the apparatus is associated to permit a flow of pressure fluid and means independent of said part for determining the duration of the open condition of the control means.

A further object of the invention is to provide in pressure fluid actuated apparatus, a pressure fluid responsive device and flow control means associated with the pressure fluid supply conduit immediately in advance of said device whereby to minimize the length of the pressure fluid passages which may bleed to atmosphere when the apparatus is not in operation.

Other objects and advantages will become apparent in the following description and from the accompanying drawings, in which:

Figure 1 is a somewhat diagrammatic side elevational view of the delivery end of a printing press having associated therewith apparatus embodying features of the invention.

Fig. 2 is a view of the same mechanism looking toward the delivery end of the press.

Fig. 3 is a fragmentary view showing the operative association between the control valve of the apparatus and a movable part of the press.

Fig. 4 illustrates another arrangement of the control valve with a movable press part.

Fig. 5 is a fragmentary view on an enlarged scale showing a form of pressure retaining check valve in axial cross section.

Fig. 6 is a transverse cross sectional view of the valve shown in Fig. 5 and is taken substantially along the line 6—6 of Fig. 5.

Fig. 7 is a view of the control valve in axial section on an enlarged scale.

Fig. 8 shows a spraying device in side elevation, parts thereof being broken away to illustrate the internal mechanism thereof.

While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawings and will herein describe in detail the preferred embodiment, but it is to be understood that I do not thereby intend to limit the invention to the specific form disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

For convenience in disclosing one form of the invention and an environment in which it may be employed, Figs. 1 and 2 illustrate the apparatus as being operatively associated with the delivery end of a printing press for the purpose of treating each sheet by the offset preventing process previously described. It should be understood, however, that the invention is readily susceptible of use in many other fields than the one herein specifically mentioned.

Figs. 1 and 2 show the delivery end of a commercially well-known type of flatbed press with extended delivery. Associated therewith, in a position to treat each one of a succession of sheets as they pass to or are received in the press delivery box (indicated at 10) is an offset preventing apparatus, generally designated 11, which embodies the invention. The apparatus, of course, may as well be associated with the press at any other suitable or convenient point along the path of travel of a newly printed sheet.

The apparatus in the present instance is of the portable type and generally includes the following arrangement of parts. An upright pedestal 12 is mounted on a portable base 13 and carries a vertically adjustable support 14 having at its upper end a transverse arm 15 arranged to extend cantilever fashion across the bed of the press or the delivery box. The horizontal arm 15 supports a spraying device 16, such as a spray gun or the like. The number of spraying devices provided in any apparatus are dependent upon the type of work being treated. Two such devices are illustrated in the present instance, although in some apparatus only a single device is necessary, while in other apparatus the type of work may require the use of more than two devices.

It is preferred that each device be supported by a separate horizontal arm 15 in such manner that the position of the device may be readily and conveniently adjusted. As shown, each horizontal arm is tubular to receive an elongated tube 17 which is connected with the pressure fluid intake side of the spraying device and forms a part of the conduit system for conducting pressure fluid thereto. Suitable clamping means, as indicated at 18, adjustably connects the tube 17 with its associated horizontal arm 15. The spraying devices are thus mounted for adjustment toward and away from the horizontal arms 15 and also for rotatable adjustment about the axes of the tubes 17 as a center.

Mounted on the support 14 and horizontal arms 15 is a supply tank 19 for material which feeds by gravity through a conduit 20 to the material intake side of each spray device. A pressure fluid conduit 21 is adapted to be connected to an adequate source of pressure fluid (not shown), and leads to a suitable oil and water separator 22. From the separator, the pressure fluid passes through a pipe connection 23 to a suitable pressure reducing and regulating valve 24. A conduit 25 leads from the pressure regulator to the tubes 17, the conduit being preferably branched (as indicated at 26) where more than one spraying device is included in the apparatus. The apparatus which has been thus generally described is more particularly disclosed in my copending applications Serial No. 84,139, filed June 8, 1936, and Serial No. 90,787, filed July 15, 1936.

A form of spraying device which has been found satisfactory for use in the present apparatus is illustrated in Fig. 8. Since this device per se forms no part of the present invention, but is more particularly illustrated and described in my Patent No. 2,059,706, issued November 3, 1936, and in my copending application Serial No. 97,185, filed August 21, 1936, it is believed that a brief description thereof will suffice. The device includes a barrel 27 having at its front end a spray creating and discharge nozzle 28. The rear end of the barrel is enlarged to form a cylinder 29 in which a piston assembly 30 is reciprocally disposed. A nipple 31 defines a pressure fluid intake port 32 located between the piston assembly and the forward end of the cylinder so that admission of pressure fluid will be effective to force the piston rearwardly in the cylinder away from the nozzle. The piston assembly includes a valve 33 for controlling the flow of pressure fluid from the cylinder forwardly through suitable passages 34, 35 in the barrel to pressure fluid discharge ports 36, 37 in the nozzle 28. The piston assembly is urged forwardly in the barrel by a spring 38 and is slidably related to the stem 39 of a needle valve 40 which operatively controls the flow of material from the material discharge port 41 in the nozzle.

Material is supplied to the nozzle through nipple 42 which communicates with a material passage 43 in the barrel. A head 44 on the needle valve stem provides a seat for a spring 45 arranged to urge the needle valve toward its seated position. The other end of the spring bears against a suitable tension adjusting nut 46 on the end of the cylinder. The head 44 is disposed for engagement by the piston assembly in the rearward movement of said assembly under the force of admitted pressure fluid, thereby to open the needle valve. The head, however, is normally spaced from the piston assembly to provide a slight lost motion relationship so that the pressure fluid valve opens immediately ahead of the opening of the material valve. The spraying device herein illustrated is, therefore, of the type in which complete operative control is obtained by connecting or disconnecting the device with the source of pressure fluid.

Means is provided for controlling the flow of pressure fluid through the system and, where more than one spraying device is used in the apparatus, the control means is preferably disposed to be common to all of the devices so that the devices may be synchronously operated. As shown in Figs. 1 and 2, the control means, generally designated 47, is interposed in the conduit 25 between the pressure regulating valve 24 and

the conduit branch 26. The control means 47 is adapted to be actuated by any suitably moving part of the mechanism with which the apparatus is used.

In the present embodiment, the control means is operatively associated with a part of the delivery mechanism of the printing press. Thus, in Fig. 3 the control means is located in the path of movement of a horizontally reciprocable block 48, while in Fig. 4 the control means is disposed for actuation by an oscillating arm 49. Both the block 48 and the arm 49 are parts of the feed delivery mechanism and have movements which are substantially coordinated with the movements of the sheets across the bed of the press and into the delivery box. It will be evident, however, that the control means may be associated with any movable part which is capable of intermittently actuating the control means in timed relation to sheet movements.

Referring particularly to Fig. 7, the preferred form of control means is illustrated as comprising an elongated barrel, generally designated 50, consisting, for convenience in construction and assembly, of a front barrel section 51 and a rear barrel section 52. The front section at its outer end has an axial nipple 53 to which the conduit 25 is connected as by a gland 54. Intermediate its ends, the front section has an internal annular shoulder 55 defining a port 56. Internally the nipple is screw threaded to receive a nut 57 having an internal shoulder providing a seat for a screen 58, or the like, and for one end of a spring 59. The other end of the spring is seated about a projection 60 on a valve 61 to hold the valve normally in closed relation to the port 56. Inwardly beyond the port, the front section has a chamber 62 in communication with a nipple 63 to which is connected the section of the conduit 25 leading to the spraying devices.

The rear section 52 has a hollow boss 64 at one side thereof and an elongated actuator 65 is internally pivoted, as at 66, to said boss to extend diametrically across the interior of the rear section and through a slot 67 on the side of the section opposite the boss. The outer end of the actuator carries a suitable antifriction roller 68. Secured to the front end of the rear section, and extending therefrom partly into the chamber 62 of the front section is a bearing member 69 for a valve operator 70. At its front end, the valve operator loosely passes through the port 56 and enters a suitable recess 71 in the valve 61. The rear end of the valve operator abuts against a rounded surface 72 on the actuator 65 and the longitudinal dimension of the operator is such that, when the valve is seated, the spring 59 holds the actuator substantially at the rear end of the slot 67. Preferably, the bearing 69 carries a packing assembly 73 encircling the valve operator.

The control means 47 in the present embodiment includes means for adjustably determining the duration of the open condition of the valve 61 after it has once been moved to its open position by manipulation of the actuator 65. Thus, the rear end of the rear section 52 is finished as a cylinder 74 to receive a piston assembly 75, including a piston rod 76 which is pivotally connected, as at 77, to the actuator 65. A cap fitting 78 screw threadedly engages the rear end of the rear section. Axially, the cap is bored to provide a tapered valve seat 79 terminating in a port which communicates with the cylinder 74 behind the piston, and a needle valve 80 having a valve stem 81 is cooperatively associated with said valve seat. Rearwardly of the valve seat, the bore is enlarged to provide a chamber 82 and a vent 83 therefrom communicates with atmosphere. Beyond the chamber 82, the bore is again enlarged to receive a packing assembly 84, and the end of the bore is internally screw threaded to receive a nut 85.

The valve stem extends through the chamber 82, the packing assembly 84, and the nut 85, and the outer end portion thereof is screw-threaded for engagement with the nut 85. Preferably the screw threads are of a character which permits adjustment of the valve with micrometer-like precision. Beyond the nut 85 the valve stem carries a finger piece 86 screw-threaded thereon and held in place by such means as a lock nut 87. The finger piece may have a flange 88 enclosing the nut 85 and encircling a reduced end portion of the cap 78. Complementary indexing characters, indicated at 89 (Fig. 3) may be provided on the flange and cap. If desired, a spring 90 may be interposed between the end of the nut 85 and the finger piece 86 as a means for maintaining the relationship of the parts.

In describing the operation of the control means, it will be presumed that this mechanism is in the idle position thereof as shown in Fig. 7. When the actuator 65 is moved by a part of the machine, such as the block 48 (Fig. 3) or the arm 49 (Fig. 4), the control valve 61 is moved to open position by the valve operator 70. A third type of operator for the control means is shown in Fig. 7 as comprising a cam 49^a adjustably mounted on a shaft 49^b for intermittent movement into engagement with and past the actuator 65 as indicated in broken outline.

In the opening movement of the valve 61, the piston assembly 75 is drawn away from the cap 78 and the return movement of the valve to closed position may be accurately timed by means of a micrometer setting of the needle valve 80 which controls the escape of air from the space behind the piston. If the needle valve is entirely closed, as shown in Fig. 7, the control valve 61 will remain open, since the force of the spring 59 is insufficient to expel the air trapped behind the piston. The valve may, therefore, be caused to remain open almost indefinitely. By adjustment of the needle valve 80, which may be by substantially infinitesimal increments, the rapidity with which the trapped air may escape may be accurately controlled. When the needle valve 80 is wide open, the spring 59 will be effective to close the control valve 61 with substantially a snap action. It is, therefore, possible to effect an accurate timing of the duration of the open condition of the control valve 61. Hence, if the apparatus is used in the prevention of ink offset, the control valve may be adjusted to effect a delivery of a continuous spray of treating material, or it may be set to cause the apparatus to discharge small quantities of treating material with great rapidity. The requirements of widely varying conditions may be easily and conveniently met by apparatus embodying a control system of this nature.

Under many conditions, it is necessary that the apparatus be operated in substantially exact synchronism with the movement of a sheet being treated. If the control valve and the spraying device, or other fluid pressure actuated part of the apparatus, are joined by a conduit of any ap-

preciable length, it usually follows that the pressure fluid remaining in the conduit, after the control valve has closed, will escape or bleed to atmosphere. Hence, when the control valve is again open, the device will not respond until the pressure in the conduit has built up to substantially full line pressure. If the apparatus embodies an adjustment for varying conditions of operation, the responsiveness of the device will differ for each adjustment. This is because less pressure fluid will bleed to atmosphere when the control valve is operated rapidly than when the valve is operated slowly. Moreover, if a plurality of devices are used, the several devices usually will not respond to the opening of the control valve with the same rapidity.

The present apparatus includes means for meeting these difficulties in a simple and efficient manner and for permitting the apparatus to be adjusted so that the device will respond almost instantly to the opening or closing movements of the control valve regardless of the rapidity of operation of the valve. This means is also effective to enable several devices to be synchronized for simultaneous response to the opening and closing movements of the control valve.

Referring to Figs. 2, 5 and 6, this means as illustrated is in the form of a check valve 91 which is interposed in the pressure fluid supply conduit immediately ahead of each spraying device. As shown in Fig. 2, the check valves are connected immediately between the tube 17 and the intake nipple of the spray gun. The check valve may be of any suitable type capable of closing a conduit at a predetermined minimum pressure and of opening the conduit when that pressure is exceeded. Herein the valve is shown as comprising a casing 92 having a cylindrical bore in which a piston 93 is slidably mounted. Spacing means 94 are provided for holding the piston away from one end of the casing and a spring 95 bears against the opposite side of the piston. The other end of the spring is seated upon a head 96 slidably mounted in a casing cap 97. A stem 98 is fixed to the head and has screw threaded engagement with the cap, a finger piece 99 being provided for convenient manipulation of the stem and head. To prevent looseness, a spring 100 is preferably interposed between the finger piece and the cap. Adjustment of the head 96 relative to the casing is effective to vary the tension imposed on the spring 95 by the piston 93.

Inlet and outlet nipples 101 and 102, respectively, preferably extend from opposite sides of the end of the casing toward which the piston 93 is normally urged. The nipple 101 is adapted to be suitably connected with the tube 17 and the nipple 102 to the intake nipple 31 of the spray gun. Ports 103 in the casing wall provide communication between the nipple 101 and the space between the piston 93 and the end of the casing, and opposed ports 104, spaced a greater distance from the end of the casing than the ports 103, establish communication between the interior of the casing and the nipple 102 after the piston 93 has moved in the casing a sufficient distance to uncover the ports 104. The piston 93 is preferably formed of rubber or similar material and serves not only as a piston but as a valve for controlling the flow of pressure fluid through the device. By this construction, the piston 93 may be adjusted to remain in the closed position thereof, as shown in Fig. 5, until the force of the pressure fluid exceeds the holding tension imposed on the piston by the spring 95.

In operation, the check valve will retain pressure fluid in the system between the check valve and the control valve whenever the control valve is closed. If the check valve, therefore, is adjusted so that it will close whenever the pressure falls slightly below full line pressure, substantially full line pressure will be trapped in the entire system with the exception only of the relatively small and short passages between the check valve and the discharge nozzle of the spray gun. Hence, only a comparatively short portion of the system can bleed to atmosphere and no material delay in the responsiveness of the device results therefrom. As an example of an operative adjustment of the apparatus, if the pressure regulating valve is set to hold full line pressure (by which is meant the normal operative pressure of the system) at substantially thirty pounds, the check valve will be adjusted to close at approximately twenty-five to twenty-seven pounds. Under these conditions, when the control valve is opened, there is no appreciable time delay before the check valve opens and operation of the spraying device is initiated. This result will obtain regardless of the rapidity of the cyclic operations of the control valve, and it is readily possible to synchronize the operation of the apparatus with machine or sheet movements, which synchronization will not be materially disturbed by varying the adjustment of the control valve or other parts of the apparatus. Moreover, the control valve may be operatively associated with any part of the printing press or other machine with which the apparatus is used, since the distance between the control valve and the pressure fluid actuated device is immaterial in the present system.

Furthermore, where a plurality of devices 16 are employed, accurate synchronization thereof for simultaneous operation may be readily effected by individually adjusting each check valve so that all of the check valves open at once in response to the opening of the control valve. A further advantage resulting from the invention is that the entire apparatus is actuated and controlled solely by pressure fluid, thus eliminating mechanical linkages or electrical devices and control circuits which must, in many instances, be specially designed for each installation. Apparatus embodying the present invention is practically universal in its adaptability to different types of machines.

While in the present instance a spraying device embodying a self-contained actuator has been shown and described, it is not essential that this type of device be used. It does have the advantage, however, of increasing the responsiveness of the apparatus.

I claim as my invention:

1. In a system of the character described, the combination of a spray device adapted to be actuated by pressure fluid, a conduit for supplying pressure fluid to said spray device, means for controlling the flow of fluid to said spray device, and separate adjustable dashpot means associated with the control means for automatically determining the duration of actuation of said spray device after said control means has been operated to open said conduit.

2. Apparatus adapted to be associated with a printing press for treating a surface of a newly printed sheet to prevent offset comprising the combination of a pressure fluid operated spray

device for discharging treating material toward said surface, a pressure fluid supply system connected thereto, a valve in said system including an operator adapted to be associated with the press for actuation to valve open position by a moving part, and dashpot means independent of the moving part for maintaining said valve in open position for a predetermined period.

3. Apparatus for applying material to articles by a spraying process which includes the combination of a spray device having a pneumatic operator associated therewith for controlling actuation of said device, means for conducting pressure fluid to said device and operator, manipulable valve means in the conducting means located at a point remote from said device and operable to open and close the conducting means, and a pressure responsive valve in said conducting means substantially adjacent to said operator including means for urging said valve closed against a pressure slightly less than the full pressure of the pressure fluid delivered by said conducting means.

4. In apparatus for applying material to an article by a spraying process, the combination of a plurality of spray devices, pressure fluid conducting means communicating with said devices and including means for controlling the flow of pressure fluid simultaneously to each of said devices, pressure responsive means located substantially adjacent to each device and associated with the fluid conducting means connected with each device for automatically preventing pressure fluid flow at a predetermined minimum pressure, and adjusting means on each pressure responsive means for synchronizing said spray devices for simultaneous operation.

5. In apparatus of the character described, the combination of a plurality of spray guns, pressure fluid conduits communicating with said guns and with a source of pressure fluid, a flow control valve common to said conduits for admitting pressure fluid simultaneously to said guns, and a normally closed check valve in each gun conduit substantially adjacent to each gun movable to open position by the force of the pressure fluid admitted upon opening of the control valve.

6. A flow control system for apparatus adapted to apply material to a surface by a spraying operation having, in combination, a spray creating and delivering device, a fluid pressure supply conduit connected therewith, a control valve in said conduit, and a normally closed check valve in said conduit substantially adjacent to said device, said check valve being adjusted to follow automatically the opening and closing movements of said control valve.

7. In apparatus for delivering a stream of offset preventing material to a surface of a newly printed sheet, the combination of pressure fluid actuated means for creating and directing a material stream, a conduit for pressure fluid connected with said means, a conduit control valve operable to time the actuation of said means with sheet movements, and a normally closed pressure responsive check valve in said conduit closely adjacent to said means for maintaining substantially full line pressure in said conduit up to said check valve.

8. In apparatus for delivering a stream of material in finely divided condition, the combination of means for creating such a stream, a pressure fluid supply line having therein means responsive to the force of pressure fluid for actuating the stream creating means, and means for insuring substantially instant operation of the force responsive means as a supply of pressure fluid is actively connected to said line including a check valve interposed in said line immediately ahead of said stream creating means to maintain fluid under pressure in the line ahead of said flow control valve and minimize the length of the line which may bleed to atmosphere when said stream creating means is inoperative.

9. In pressure fluid actuated apparatus for discharging in timed relation a spray of material toward the surface of an article moving relatively thereto, said apparatus being adapted for operative association with a movable part of a mechanism by which such relative movement is effected, the combination of a pressure fluid system, control means therefor operable by said part to open said system to pressure fluid flow, and dashpot means independent of said part for determining the duration of the open condition of said system.

10. In a pressure fluid control system for spray means adapted to be correlated with the operation of printing press mechanisms to apply offset preventing material to a surface of a printed sheet in timed relation to the movements of a sheet from said mechanisms, the combination of a pressure fluid responsive spraying device connected with a source of pressure fluid, and control means for pressure fluid flow adapted for actuation by the press mechanism with which said system is associated, including adjustable valve means acting independently of the press mechanism for variably delaying the closing movement of said control means.

JENS A. PAASCHE.