(12) UK Patent Application (19) GB (11) 2 154 892 A

(43) Application published 18 Sep 1985

(21) Application No 8424621

(22) Date of filing 28 Sep 1984

(30) Priority data
(31) 584050 (32) 27 Feb 1984 (33) US

(51) INT CL[4]
B01D 29/38 B41F 31/00

(52) Domestic classification
B1D 1513 1603 1607 1819 2002 2005 2106 2107 2108 2113 2305 NG
B6C 717 BS
U1S 1390 B1D B6C

(56) Documents cited
None

(58) Field of search
B1D
B1T

(71) Applicant
Molins Machine Company Inc (USA–New Jersey), Langston Division, 111 Woodcrest Road, Cherry Hill, New Jersey 08034, United Statess of America

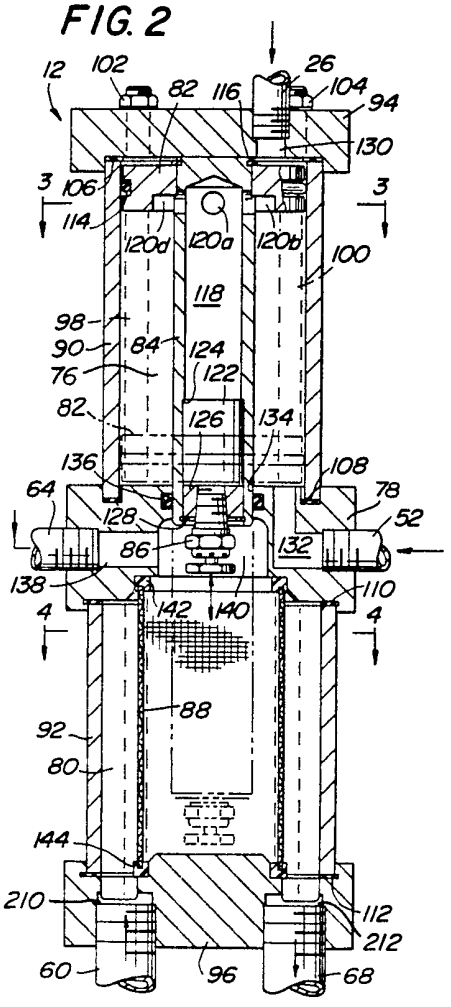
(72) Inventor
William F Buckminister

(74) Agent and/or Address for Service
C D Benziger,
Molins PLC, Group Patent Department, 2 Evelyn Street, London SE8 5DH

(54) Ink system with self-washing filter

(57) An ink distribution and filter system includes a self-washing filter comprising upper and lower cylinders and a piston 82 reciprocable between upper and lower positions in the upper cylinder. A filter screen 88 is mounted in the lower cylinder. When the screen needs cleaning, external valves supply wash liquid via inlet 130, causing the piston to descend and displace wash liquid from beneath the piston via orifices 120 and channel 118 to spray nozzle 86 to wash the screen 88. At the same time wash liquid is delivered through the screen via passage 138. When the piston and nozzle 86 have reached their lowest positions, wash liquid is fed to inlet 132 to raise the piston, and some of this liquid flows into orifices 120 to emerge under high pressure from nozzle 86 to wash the screen again as the nozzle rises.

FIG. 2



GB 2 154 892 A

FIG. 1

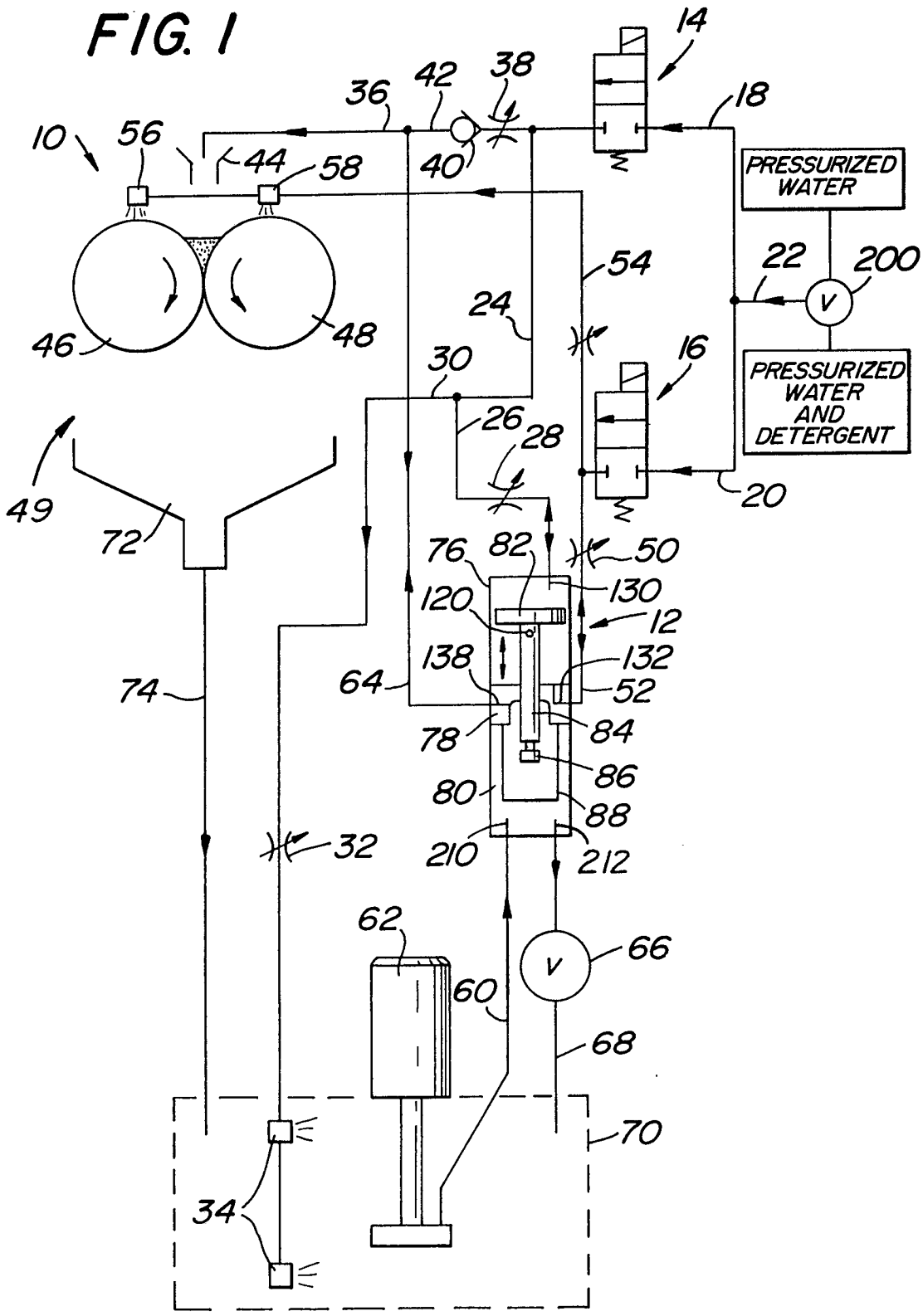

14
18
36
42
38
10
56
44
58
40
PRESSURIZED WATER
22
200
V
54
24
46
48
16
30
PRESSURIZED WATER AND DETERGENT
26
28
49
72
20
76
82
50
130
120
12
138
132
64
52
74
78
84
86
80
88
32
210
212
62
V
66
60
68
70
34

FIG. 2

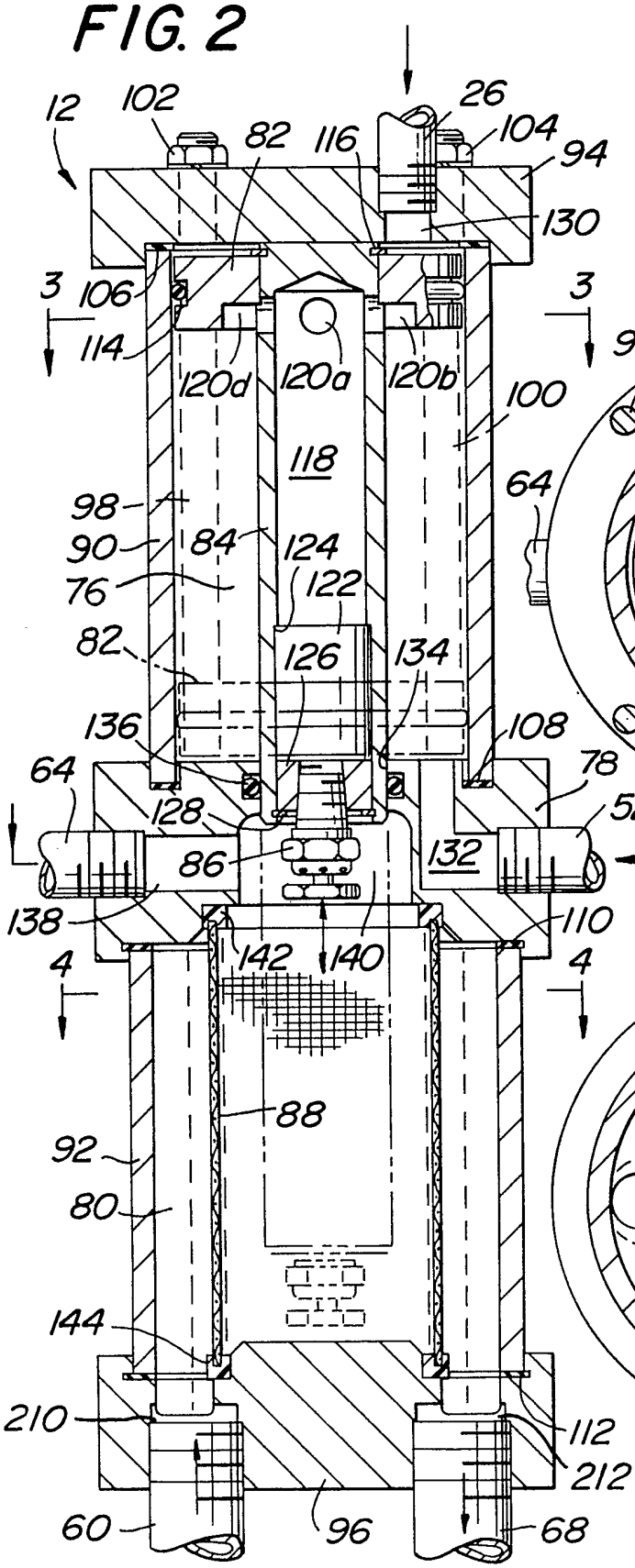
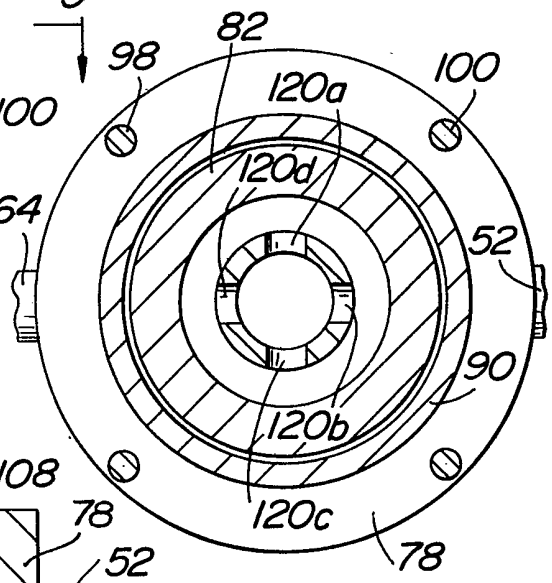


FIG. 3



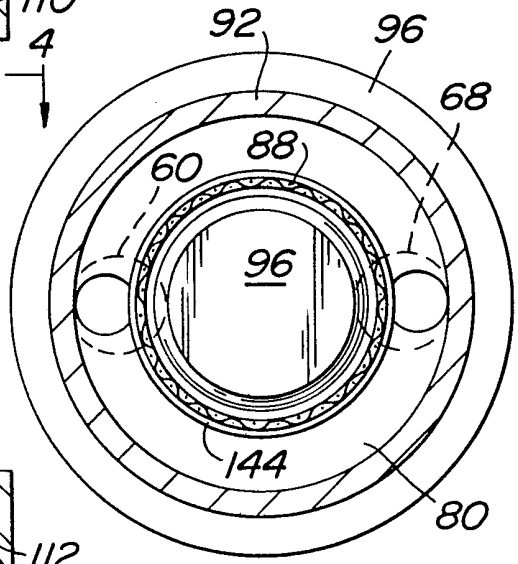


FIG. 4

SPECIFICATION

Ink system with self-washing filter

The present invention is directed to a distribution and filter system for use with liquids such as ink. Such systems and filters are typically employed in flexographic printing.

Ink filters are well known in the printing art. Typically, whenever an ink colour change is made, the filter must be disassembled and washed manually by the printing press operator. This is a time-consuming and often distasteful chore for the operator. The operator's clothing and hands may be soiled during the process. This is likely to cause the washing operation to be shortened or improperly performed, with resultant deterioration of the printed product. Since a properly performed washing operation is time-consuming, it results in inefficiency of the printing operation. Moreover, because the filter must be disassembled, the delicate filter screen is subject to damage. During reassembly, the filter screen could allow foreign matter to pass into the press fountain, resulting in damage to the ink distribution rolls or degratation of the print quality.

Accordingly, there is a need for an ink distribution and filter system wherein the filter can be cleaned or washed automatically without being disassembled.

According to one aspect of the invention there is provided a self-washing filter comprising first and second chambers, a piston reciprocable in the first chamber, means for introducing wash fluid into the first chamber selectively at opposite sides of the piston, a filter screen mounted in the second chamber, a nozzle connected to the piston so as to reciprocate in the second chamber adjacent the screen during reciprocation of the piston, and means for conducting wash fluid from the first chamber to the nozzle.

According to another aspect of the invention there is provided an ink system comprising a self-washing filter including a housing, an ink filter screen for filtering ink introduced within the housing, and spraying means disposed within the housing for spraying wash fluid onto said filter screen so as to wash the filter screen.

The invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a schematic diagram of an ink distribution system with a self-washing filter in accordance with the present invention;

Figure 2 is a longitudinal section of the self-washing filter;

Figure 3 is a section taken along the line 3-3 in Figure 2; and

Figure 4 is a section taken along the line 4-4 in Figure 2.

Referring to the drawings, wherein like numerals indicate like elements, there is shown in Figure 1 an ink distribution system 10 including a diagrammatic representation of a self-washing filter 12 in accordance with the present invention. The ink distribution system 10 includes an pair of solenoid valves 14, 16 coupled at their inlets by conduits 18, 20 to a conduit 22 fed from a pressurized fluid source. The fluid may be a wash medium such as water or a heated mixture of water and detergent. The outlet of solenoid valve 14 is coupled by conduits 24, 26 and needle valve 28 to an inlet 130 of self-washing filter 12. The outlet of solenoid valve 14 is also coupled by conduits 24, 30 and needle valve 32 to a plurality of spray nozzles 34 positioned within a compartment 70. The outlet of solenoid valve 14 is also coupled to a conduit 36 by a needle valve 38, check valve 40 and conduit 42. The outlet of conduit 36 is positioned over a funnel 44 disposed above the interface between print rolls 46, 48 in ink fountain 4g. Introduction of wash medium is inlet 130 of self-washing filter 12, spray nozzles 34 and funnel 44 by solenoid valve 14 is explained in greater detail hereinafter.

The outlet of solenoid valve 16 is coupled by needle valve 50 and conduit 53 to a right angle inlet 132 of the self-washing filter 12. The outlet of solenoid valve 16 is also coupled by a conduit 54 to spray nozzles 56, 58 positioned above the print rolls 46, 48.

Another inles 210 of self-washing filter 12 is coupled by a conduit 60 to an ink pump 62 positioned in the compartment 70. As shown in Figure 1 the self-washing filter 12 also includes an inlet 138 and outlet 212. Inlet 138 is connected by conduit 64 to conduit 36, and outlet 212 is coupled to bypass valve 66 and a conduit 68. The outlet of conduit 68 is positioned in the compartment 70. The outlet of a drain 72 for the ink fountain 49 is coupled to a conduit 74 having an outlet which is also positioned in the compartment 70.

The self-washing filter 12 comprises an upper cylinder chamber 76 separated by a partition 78 from a lower cylinder chamber 80. A piston 82 connected to a piston rod 84 is reciprocable between upper and lower positions within upper cylinder chamber 76. The piston rod 84 reciprocates through an opening in partition 78. A spray nozzle 86 is connected to the end of piston rod 84 radially inward of a tubular filter screen 88 located in the lower cylinder chamber 80.

During printing the compartment 70 takes the form of an ink bucket or reservoir. Pump 62 pumps ink from the reservoir to lower cylinder chamber 80. Ink introduced into chamber 80 is filtered by filter screen 88 and pumped along conduits 64, 36 to funnel 44. The ink passes through the funnel onto the rolls 46 and 48. Excess ink is collected at the fountain drain 72 and returned through con-

duit 74 to the ink reservoir. Bypass valve 66 is adjusted to bleed off ink from chamber 80 back to the reservoir via conduit 68. That is, valve 66 is is adjusted to regulate the flow of ink from chamber 80 through conduits 64, 36. Backflow of the ink to the outlet of solenoid valve 14 is blocked by check valve 40.

Prior to a wash operation the ink reservoir 70 is moved out of juxtaposition with pump 62 and is replaced by a wash compartment. Piston 82 is maintained in the initial, uppermost position by preloading the portion of chamber 76 below the piston with pressurized wash medium through needle valve 50, conduit 52 and right angle passage 132 in partition 78. Thereafter, solenoid valve 16 is operated to block the flow of wash medium to chamber 76, and solenoid valve 14 is operated to admit pressurized wash medium above piston 82 to initiate descent of the piston against the fluid pressure of the wash medium below the piston.

In particular, pressurized wash medium is introduced to the portion of chamber 76 above piston 82 via conduits 24, 26, needle valve 28 and chamber inlet 130 located above the piston. The pressurized wash medium flows through the inlet and fills the portion of chamber 76 above the piston, forcing the piston to descend from its uppermost position. As the piston 82 descends, spray nozzle 86 descends in chamber 80 along a path radially inward of filter screen 88. As the piston and spray nozzle descend, pressurized wash medium flows from the outlet of solenoid valve 14 through needle valve 38, check valve 40, conduit 42 and conduit 64 and passage 138 in partition 78 so as to wash chamber 80 and the spray nozzle and piston rod 84. Wash medium in compartment 80 is drained via bypass valve 66 and conduit 68.

During descent of piston 82 wash medium in chamber 76 below piston 82 is displaced, ensering a plurality of orifices (designated collectively as 120 in Figure 1) in the upper end of piston rod 84. The displaced wash medium travels through a passage in the piston rod and is ejected from spray nozzle 86 under relatively low pressure. The wash medium is collected at the outlet of lower cylinder chamber 80 and conducted via bypass valve 66 and conduit 68 to the wash compartment 70.

When operated, solenoid valve 14 also passes pressurized wash medium through needle valve 38, check valve 40, conduits 42 and 36 to funnel 44. The wash medium passes through the funnel, washes the interface of rolls 46, 48, and is collected by drain 72 and conducted by conduit 74 to the wash compartment 70. Pressurized wash medium is also passed by solenoid valve 14 via conduits 24, 30 and needle valve 32 to spray nozzles 34 in the wash compartment. The spray nozzles spray the wash compartment and pump 62 with wash medium so as to clean the compartment and pump.

When piston 82 reaches its lowermost position in chamber 76, solenoid valve 16 is operated so as to admit pressurized wash medium to the portion of chamber 76 below the piston via needle valve 50, conduit 52 and right angle partition passage 132. Solenoid valve 14 may be operated so as to block the flow of wash medium at this time. The pressurized wash medium entering passage 132 forces piston 82 to ascend against the fluid pressure exerted by the wash medium previously introduced in chamber 76 above the piston. Needle valves 28 and 50 are adjusted so that the differential in fluid pressure above and below piston 82 results in wash medium being injected in piston rod orifices 120 at relatively high pressure during ascent of the piston. The wash medium enters orifices 120 and travels through the piston rod and is ejected at relatively high pressure by spray nozzle 86. Preferably nozzle 86 is adapted to eject the wash medium in a relatively flat disc-like pattern over 360° so as to thoroughly clean filter screen 88.

In addition, as the piston ascends wash medium above the piston is driven out of chamber 76 via passage 130, needle valve 28, conduits 26 and 30 and needle valve 32 to spray nozzles 34 which spray compartment 70 and pump 62 with the wash medium.

When piston 82 reaches its uppermost position in chamber 76, solenoid valve 16 is operated so as to block further flow of wash medium to the chamber below the piston. Solenoid valve 14 may then be operated to re-admit pressurized wash medium to the portion of chamber 76 above the piston via conduits 24 and 26 and needle valve 28, in the manner already described. Piston 82 therefore repeats its descent in chamber 76, and pressurized wash medium flowing through conduit 64 and partition passage 138 washes nozzle 86 and piston rod 84 as previously described.

Solenoid valves 14 and 16 are repeatedly operated as described to reciprocate the piston 82 within chamber 76. The solenoid valves may be operated automatically by a sequential control (not shown) or in response to manual push buttons. During reciprocation of the piston, print rolls 46 and 48, wash compartment 70, pump 62, filter screen 88, nozzle 86 and rod 84 are cleaned by the wash medium.

Referring now also to Figures 2 to 4, there is shown a preferred embodiment of the self-washing filter 12 of the present invention. The filter includes cylinders 90 and 92 which are seated at their outer ends by caps 94 and 96 respectively. Cylinders 90 and 92 are seated at their inner ends on opposite faces of

the partition 78. Four tie rods (two rods numbered 98, 100 are shown in phantom in Figure 2) are positioned radially outwardly of cylinder 90. The tie rods are threaded in partition 78 and extend through clearance bores in cap 94. Hexagonal nuts (two nuts numbered 102, 104 are shown in Figure 2) are threaded on the tie rods to secure cap 94 against the outer end of cylinder 90. Cap 94 is seated on a neoprene ring gasket 106, and cylinder 90 is seated on a neoprene ring gasket 108.

A pair of tie rods (not shown) are disposed radially outwardly of cylinder 92 and are threaded in cap 96. These tie rods extend through clearance bores in partition 78, and each rod is tapped at its upper end to threadediy receive a mating tie rod (not shown) which extends through a clearance bore in cap 94 and which is secured in position by a hand knob threaded on the rod. The partition 78 is seated on a neoprene ring gasket 110, and cylinder 92 is seated or a neoprene ring gasket 112.

The piston 82 is located in upper cylinder chamber 76 and is provided with an annular groove within which an O-ring 114 is seated. The piston is a push fit on piston rod 84. Upward displacement of the piston 82 with respect to rod 84 is prevented by a snap ring 116. The piston rod is provided with a central passage 118 and four orifices 120a, 120b, 120c and 120d.

A cartridge type check valve 122 is inserted in the lower end of piston rod 84 abutting an annular shoulder 124 formed in the interior wall of the piston rod. Check valve 122 is captured by a ring-shaped plug 126 having a centrally located bore adapted to threadedly receive the stem of spray nozzle 86. Plug 126 is captured in the piston rod by a snap ring 128.

Cap 94 is provided with a passage 130 which serves as a fluid inlet for the portion of upper chamber 76 above piston 82. Partition 78 is provided with a right-angle passage 132 which serves as a fluid inlet for the portion of chamber 76 below piston 82. The lower end of piston rod 84 extends through a centrally located opening 134 in partition 78 and wipes against an O-ring 136 seated in an annular groove in the partition. Partition 78 is also provided with a passage 138 which communicates with an inverted well-shaped cavity 140 formed in the partition 78. The filter screen 88 is secured at each end to ring-shaped support members 142 and 144. Preferably filter screen 88 comprises a pair of cylindrical stainless steel wire screens having different meshes which are folded over and welded at their ends. The support members 142, 144 are molded over the ends of the welded screen to provide a unitary structure which is easily removable from the lower cylinder chamber 80.

Pressurized wash medium is introduced into the portion of upper cylinder chamber 76 below piston 82 via conduit 52 and passage 132 to pre-load the piston in the uppermost position (shown in solid lines in Figure 2). Pressurized wash medium introduced into the portion of chamber 76 above piston 82 via conduit 26 and passage 130 causes the piston to descend. As the piston decends nozzle 86 descends in lower chamber 80 along an axial path radially inwardly of filter screen 88. Wash medium introduced into well-shaped cavity 140 via conduit 64 and passage 138 washes the nozzle 86 and piston rod 84 during the descent. Once piston 82 reaches its lowermost position (shown in broken lines in Figure 2) pressurized wash medium is introduced into chamber 76 via conduit 52 and passage 132 against the fluid pressure exerted by the wash medium collected in the portion of chamber 76 above piston 82. The differential in pressure across the piston causes the piston to ascend. Pressurized wash medium continues to be introduced in the portion of chamber below piston 82 such that the wash medium enters orifices 120a, 120b, 120c and 120d and flows through passage 118 and check valve 122 at relatively high pressure. The wash medium is ejected through the orifices of spray nozzle 86 as a relatively flat spray over 360° which throughly cleans filter screen 88. Once piston 82 returns to the uppermost position, pressurized wash medium is blocked from passage 132, and the piston may again be reciprocated between the uppermost and lowermost postions.

Preferably the solenoid valves 14 and 16 are operated alternatively, each over 15 second intervals, to introduce pressurized wash medium at passages 130, 132 and 138. Each valve is operated to pass pressurized wash medium over a 15 second interval while the other valve blocks the wash medium. The time for a total wash cycle may be 120 seconds. During this time of 120 seconds, piston 82 descends four times and ascends four times in chamber 76. The type of wash medium may be varied during the wash cycle. For example, during the first 60 seconds of the wash cycle the wash medium may comprise water without detergent. A valve 200 (Figure 1) may be employed to switch between the two mediums. The valve 200 may be operated automatically or in response to manual pushbuttons.

CLAIMS

1. A self-washing filter comprising first and second chambers, a piston reciprocable in the first chamber, means for introducing wash fluid into the first chamber selectively at opposite sides of the piston, a filter screen mounted in the second chamber, a nozzle connected to the piston so as to reciprocate in

the second chamber adjacent the screen during reciprocating of the piston, and means for conducting wash fluid from the first chamber to the nozzle.

2. A self-washing filter according to claim 1 wherein said piston is connected to said nozzle by a piston rod and said fluid conducting means includes one or more orifices in said piston rod in communication with said orifices and said nozzle.

3. A self-washing filter according to claim 2 wherein said first and second chambers are separated by a partition having an opening through which said piston rod reciprocates.

4. A self-washing filter according to any previous claim including a check valve for blocking fluid flow from said nozzle to said first chamber.

5. A self-washing filter according to claim 3 including a fluid inlet in said partition proximal said partition opening and in communication with said second chamber.

6. A self-washing filter according to any previous claim in which said first and second chambers are upper and lower cylindrical chambers and said filter screen is arranged cylindrically within the lower chamber so that said nozzle is reciprocable along a path axial of said cylindrical filter screen.

7. An ink system comprising a self-washing filter including a housing, an ink filter screen for filtering ink introduced within the housing, and spraying means disposed within the housing for spraying wash fluid onto said filter screen so as to wash the filter screen.

8. A system according to claim 7 including an ink fountain and ink fountain wash means for directing wash fluid to said ink fountain so as to wash said ink fountain.

9. A system according to claim 7 or claim 8 including means for introducing wash fluid into said housing so as to wash said spraying means.

10. A system acording to any of claims 7 to 9 further comprising a pump for introducing ink into said housing, and pump wash means for directing wash fluid onto said pump so as to wash said pump.

11. A self-washing filter substantially as herein described with reference to, and as illustrated in, Figures 2 to 4 of the accompanying drawings.

12. An ink system substantially as herein described with reference to, and as illustrated in, Figure 1 of the accompanying drawings.

Printed in the United Kingdom for
Her Majesty's Stationery Office, Dd 8818935, 1985, 4235.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.