United States Patent

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[54] **DOCUMENT FEEDER CONTROL SYSTEM**
9 Claims, 3 Drawing Figs.

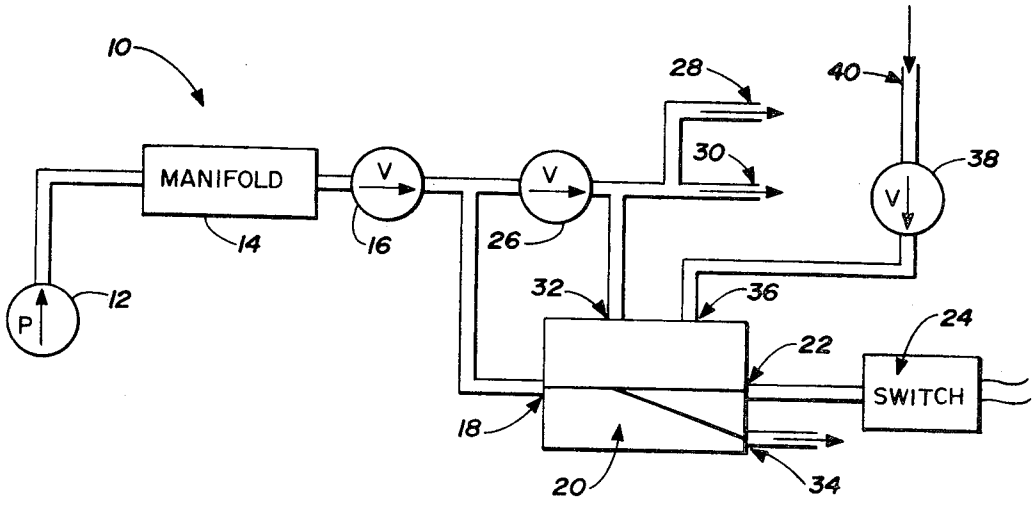
[52] **U.S. Cl.** **271/26,** 137/81.5
[51] **Int. Cl.** **B65h 7/02,** F15c 1/10
[50] **Field of Search** 271/56, 26; 137/81.5

[56] **References Cited**
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3,285,608	11/1966	Lyman	271/56 X
3,300,207	1/1967	Childs et al.	271/26

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ABSTRACT: A control system for document feeders of the type having a document advancing paddle includes a fluidic OR gate and a pressure-sensitive switch. The OR gate normally activates the switch which in turn connects operating power to a paddle advancing motor. The OR gate includes control ports that are coupled to the faceplate and bottom plate ducts in the feeder. Whenever one of the ducts is blocked, the OR gate deactivates the switch and thereby stops the operation of the paddle.



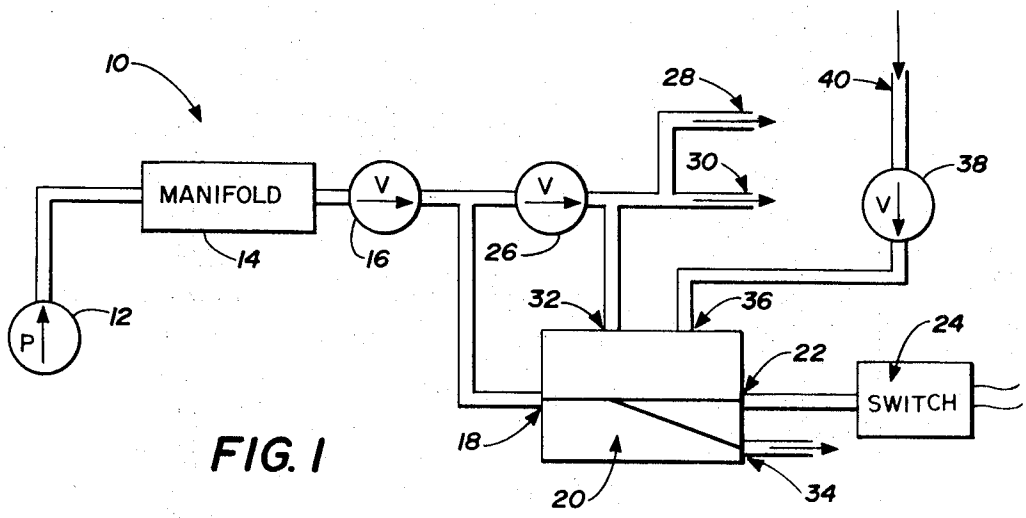


FIG. 1

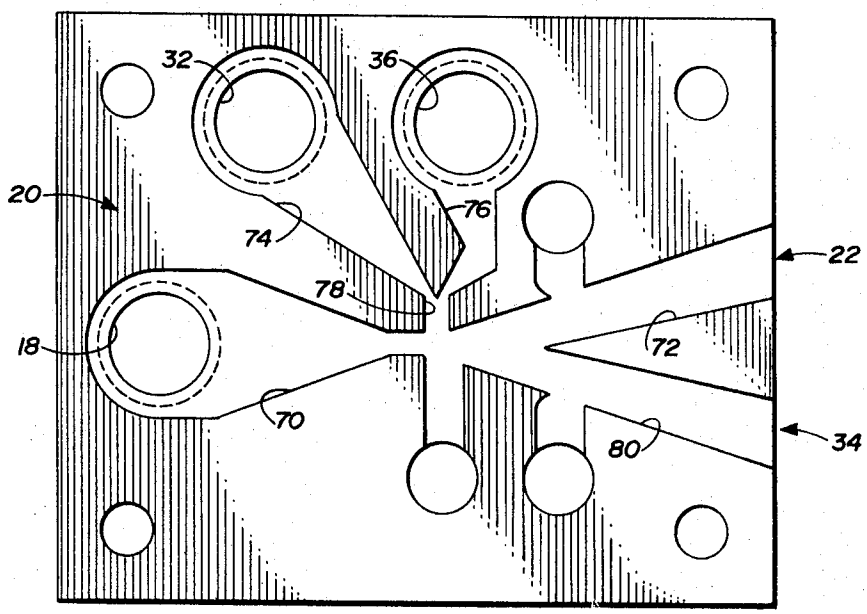


FIG. 3

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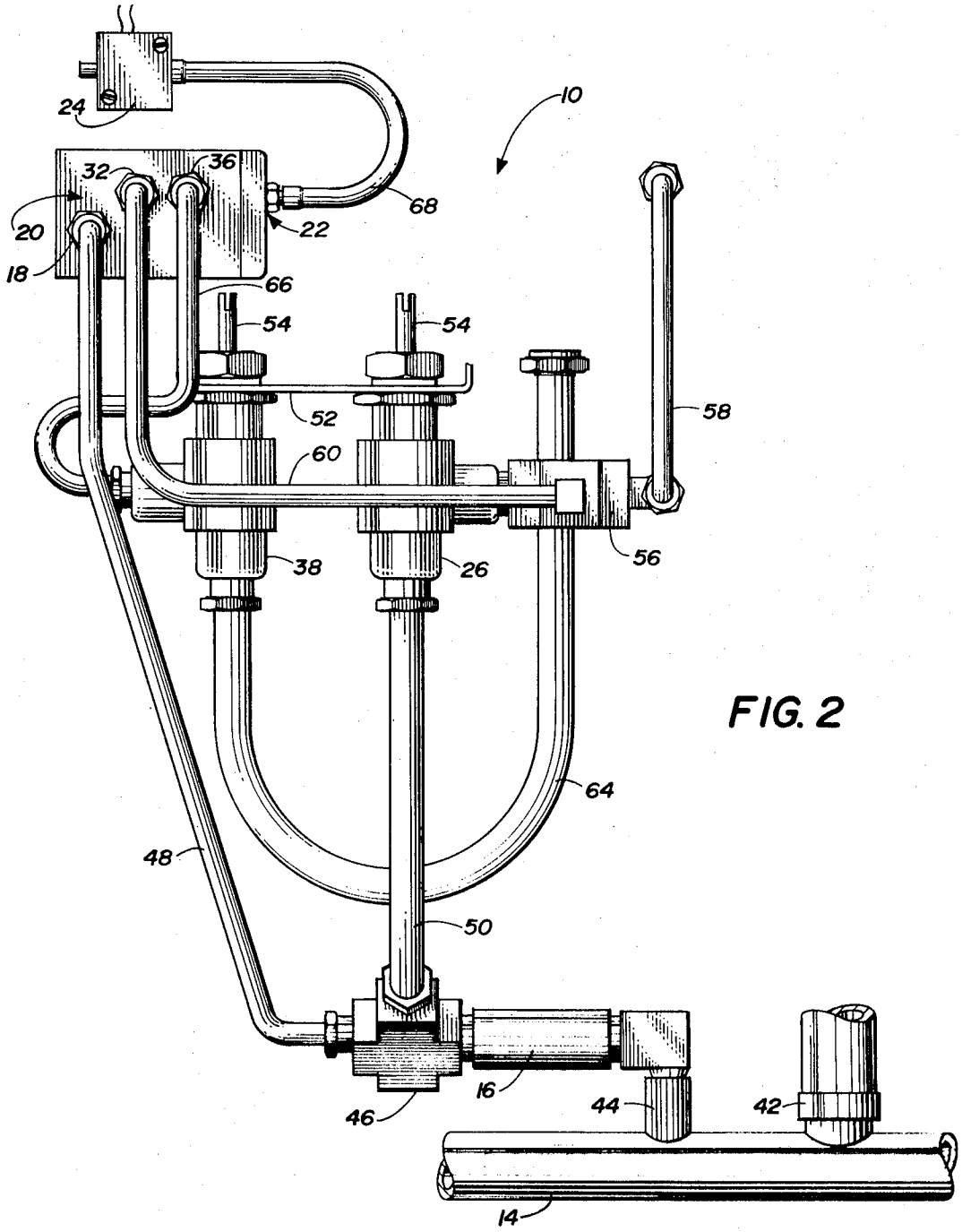


FIG. 2

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DOCUMENT FEEDER CONTROL SYSTEM

BACKGROUND OF THE INVENTION

U.S. Pat. No. 3,300,207 granted to Childs et al., on Jan. 24, 1967 relates to a Vacuum Actuated Document Feeder in which a paddle advances documents toward a document-feeding mechanism. The operation of the paddle is governed by a control system including a plurality of reed switches. The reed switches are in turn controlled by permanent magnets mounted for movement relative to the reed switches under the control of pneumatic signals.

This invention relates to an improved paddle control system for use in the Childs et al. document feeder and in similar mechanisms. Rather than reed switches and permanent magnets, the improved system employs fluidic logic to govern the operation of the paddle.

SUMMARY OF THE INVENTION

In the preferred embodiment, this invention comprises a fluidic logic member responsive to the flow of air through ducts in a document feeder to control the operation of the document advancing paddle of the feeder. Preferably, the logic member normally operates the paddle and interrupts operation of the paddle whenever one of the ducts is blocked.

DESCRIPTION OF THE DRAWINGS

A more complete understanding of the invention may be had by referring to the following detailed description when taken in conjunction with the drawings, wherein:

FIG. 1 is a schematic illustration of a control system employing the invention;

FIG. 2 is a front view of a control system employing the invention in which certain parts have been broken away more clearly to illustrate certain features of the invention, and

FIG. 3 is a cutaway view of a fluidic OR gate employed in the system shown in FIG. 2.

DETAILED DESCRIPTION

Referring now to the drawings, and particularly to FIG. 1 thereof, a control system 10 for use in controlling a document feeder such as the Vacuum Actuated Document Feeder described in Childs et al. U.S. Pat. No. 3,300,207 granted Jan. 24, 1967 is schematically illustrated. The system 10 includes a pump 12 which supplies compressed air to a manifold 14. Air from the manifold 14 is directed through a valve 16 to the inlet 18 of a pneumatic OR-gate 20. The pneumatic OR-gate 20 is a monostable device that normally operates to direct air through a first outlet 22 to a switch 24.

The switch 24 is a pressure-sensitive device which operates in response to the receipt of air through the outlet 22 to close a pair of electrical contacts (not shown). When closed, the contacts of the switch 24 connect operating power to the paddle-operating motor of the document feeder. Whenever operating power is connected to it, the motor advances the document-feeding paddle of the feeder. Thus, in the normal state, the control system 10 operates to cause the paddle-operating motor to advance the paddle of the document feeder.

Air from the valve 16 is also directed through a valve 26 to a pair of outlet ports 28 and 30 which correspond to the ports 132 and 133 of the Childs patent. The control system 10 illustrated in FIG. 1 differs slightly the control system of the Childs patent in that air is normally directed through the ports 28 and 30 by the pump 10 whereas, in the Childs device, air is drawn into the ports 132 and 133 by a vacuum pump. This difference results in improved performance of the system 10 because the ports 28 and 30 do not become clogged by paper dust and the like as is often the case in vacuum operated control systems.

Like the ports 132 and 133 of the Childs patent, the ports 28 and 30 are positioned in the faceplate of the document feeder. Therefore, whenever the document-feeding paddle of the document feeder has not positioned a document in engagement with the faceplate of the feeder, air flows freely through the ports 28 and 30. However, as soon as the document-feeding paddle positions a document in engagement with the faceplate, air is not permitted to flow through the ports 28 and 30. This causes pressure to buildup at a first control port 32 of the fluidic OR-gate 20 which in turn causes the fluidic OR-gate 20 to divert its output from the first outlet 22 to a second outlet 34.

The second outlet 34 of the gate 18 is not connected to the switch 24 and, accordingly, as soon as the OR-gate 20 has operated to divert its output to the outlet 34, the switch 24 is deactivated. When the switch 24 is deactivated, its contacts are opened. This disconnects operating power from the operating motor of the document-feeding paddle. Thus, whenever the document-feeding paddle advances a document into engagement with the faceplate of the document feeder, the system 10 operates to discontinue the operation of the document-feeding paddle.

A second control port 36 of the fluidic OR-gate 18 is connected through a valve 38 to an inlet 40. The inlet 40 is directly connected to the bottom plate plenum of the document feeder which is in turn connected to outlets formed through the bottom plate of the feeder.

In the document feeder, compressed air is continuously fed into the bottom plate plenum. From the plenum, the air flows through the outlets in the bottom plate and between the documents to separate documents being advanced over the bottom plate by the document-feeding paddle. In the event documents become closely packed over the outlets in the bottom plate, the air from the plenum can no longer flow through the outlets. This causes the pressure in the plenum to increase which in turn causes pressure to increase at the inlet 40.

Any increase in pressure at the inlet 40 in turn causes an increase in pressure at the port 36 of the fluidic OR-gate 20. When the pressure at the port 36 reaches a predetermined level the fluidic OR-gate 20 switches its output from the first outlet 22 to the second outlet 34. Whenever the output of the fluidic OR-gate 20 is switched to the second outlet 34, the switch 24 deenergizes the paddle-operating motor. Thus, the system 10 stops the operation of the document-feeding paddle of the document feeder whenever the paddle positions documents in blocking relationship with either the outlet ports in the faceplate or the outlet ports in the bottom plate of the document feeder.

Referring now to FIG. 2, the details of the control system 10 are illustrated. The manifold 14 is actually a length of large diameter tubing which is connected to the output of the pump 12 (not shown in FIG. 2). The manifold 14 has a first outlet 42 which is connected to a duct such as the duct 144 of the Childs patent that is in turn connected to the bottom plate plenum of the document feeder. The manifold 14 has a second outlet 44 which is connected to the valve 16 of the system 10.

The outlet of the valve 16 is connected to a T-fitting 46. One outlet of the T-fitting 46 is connected through a tube 48 to the inlet 18 of the fluidic OR-gate 20. Another outlet of the T-fitting 46 is connected through a tube 50 to the inlet of the valve 26. The valve 26 is supported on a bracket 52 and is provided with a member 54 by means of which the valve 26 may be adjusted.

The outlet of the valve 26 is connected to a T-fitting 56. One outlet of the T-fitting 56 is coupled to a tube 58. The tube 58 extends to a pair of tubes (not shown) similar to the tubes 184 and 185 of the Childs patent which in turn extend to the faceplate outlets of the document feeder. Another outlet of the T-fitting 56 is connected through a tube 60 to the first inlet port 32 of the fluidic OR-gate 20.

A tube 64 similar to the tube 150 of the Childs patent extends from the bottom plate plenum of the document feeder to the inlet of the valve 38. Like the valve 26, the valve 38 is supported on the bracket 52 and is provided with an adjustment member 54. The outlet of the valve 38 is connected through the tube 66 to the second inlet 36 of the fluidic OR-gate 20.

The first outlet 22 of the fluidic OR-gate 20 is connected through a tube 68 to the inlet of the switch 24. When actuated by air flowing through the tube 68, the switch 24 operates to close a pair of contacts. The contacts in turn connect operating power to the paddle-operating motor of the document feeder.

Referring now to FIG. 3, the details of the fluidic OR-gate 20 are shown. Air flowing into the inlet 18 of the fluidic OR-gate 20 passes through a passageway 70. Normally, air from the passageway 70 flows through a passageway 72 to the first outlet 22 of the OR-gate 20. The control inlets 32 and 36 of the fluidic OR-gate 20 connect to a pair of passageways 74 and 76, respectively. The ends of the passageways 74 and 76 remote from the inlets 32 and 36 both extend into a passageway 78. Whenever sufficient air flows through the passageway 78 from either or both of the inlets 32 and 36, air from the passageway 70 is diverted through a passageway 80 to the second outlet 34 of the fluidic OR-gate 20. However since the fluidic OR-gate 20 is monostable device, whenever sufficient air no longer flows through the passageway 78, air from the passageway 70 immediately resumes its normal course through the passageway 72 to the first outlet 22 of the fluidic OR-gate 20.

In use, the control system 10 illustrated in the drawings operates to supply compressed air to the faceplate ports and to receive air from the bottom plate plenum of a document feeder. Normally, the system 10 directs compressed air to a pressure-sensitive switch which in turn directs operating power to the document-feeding paddle operating motor of the document feeder. Whenever the document-feeding paddle positions documents in blocking relationship to either the faceplate ports or the bottom plate ports of the document feeder, the system 10 diverts its output from the pressure-sensitive switch. The switch in turn disconnects operating power from the document-feeding paddle operating motor of the document feeder, thereby discontinuing operation of the document-feeding paddle.

Although a specific embodiment of the invention intended for use with a specific document feeder is illustrated in the drawings and described in the foregoing specification, it will be understood that the invention is not limited to the embodiment disclosed but is capable of rearrangement, modification and substitution of parts and elements without departing from the scope of the invention.

What is claimed is:

1. In a document-feeding system of the type including face and bottom plates, a motor-driven paddle for advancing documents over the bottom plate toward the faceplate, face ducts formed in the faceplate for directing air towards the documents advanced by the paddle, and bottom ducts formed in the bottom plate for directing air between documents advanced by the paddle, a paddle control system comprising:

a pressure-sensitive switch for controlling the operation of the paddle motor, and

fluidic logic means responsive to the flow of air through the face and bottom ducts for controlling the switch and thereby controlling the operation of the motor.

2. The system according to claim 1 wherein the fluidic logic means is a monostable device that normally operates the switch to advance the paddle and that operates the switch to stop the paddle in response to a change in the flow of air through the ducts.

3. The system according to claim 1 wherein the fluidic logic means is an OR gate that controls the switch to interrupt the operation of the paddle motor whenever either the face ducts or the bottom ducts are blocked by documents.

4. In a document feeder of the type including face and bottom plates, a paddle for advancing documents over the bottom plate toward the faceplate, a paddle-advancing mechanism, and ducts for directing air through the plates, the improvement comprising:

a fluidic OR gate for alternately producing two outputs, one indicative of the movement of air through all of the ducts and the other indicative of a document in a blocking position with respect to at least one of the ducts, and

means responsive to the first output of the OR gate for activating the paddle-advancing mechanism.

5. The document feeder according to claim 4 wherein the fluidic OR gate includes control ports connected to the ducts so that the OR gate produces the second output whenever one of the ducts is blocked.

6. The document feeder according to claim 5 wherein the fluidic OR gate is a monostable device that normally produces the first output and that produces the second output only so long as at least one of the ducts is blocked.

7. A document feeder control system, comprising:

a reference plane;

a paddle for advancing documents with respect to the reference plane;

means for advancing the paddle;

a duct extending to the reference plane;

means for directing air through the duct;

fluidic logic means responsive to a flow of air through the duct to produce a first output and responsive to the absence of a flow of air through the duct to produce a second output, and

means responsive to the fluidic logic means for operating the paddle-advancing means whenever the logic means produces one of its outputs and for disabling the paddle-advancing means whenever the logic means produces the other of its outputs.

8. The system according to claim 7 wherein the fluidic logic means has an inlet and two outlets and operates to alternately direct air from the inlet through the two outlets to produce the two outputs and wherein the directing means also directs air to the inlet of the logic means.

9. The system according to claim 7 wherein the fluidic logic means has a control port the energization of which controls which output is produced by the logic means and further including a connection between the duct and the port for energizing the port whenever the duct is blocked.

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