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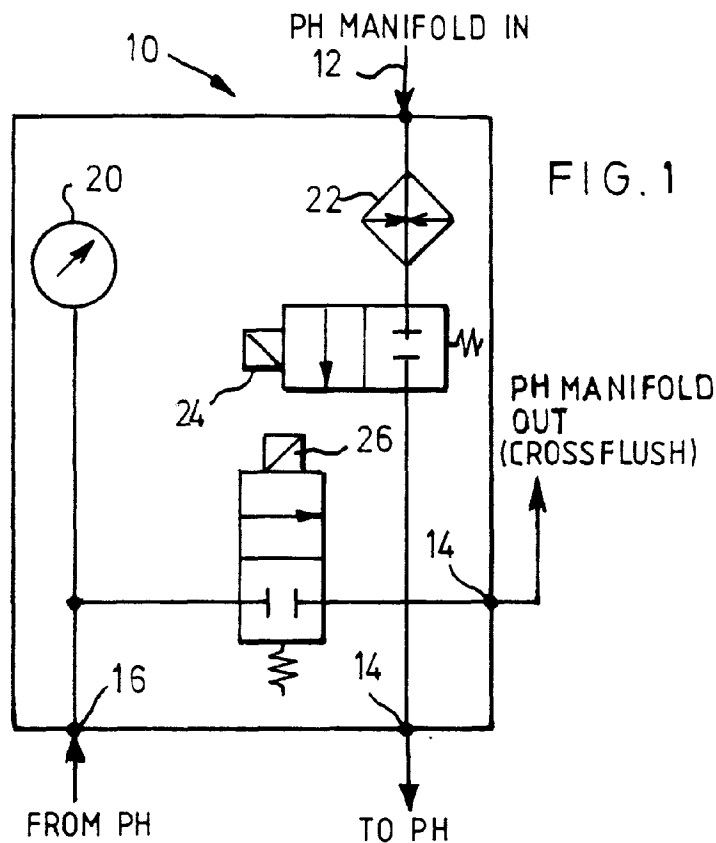
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Reginald W. Barker & Co.,
Chancery House,
53-64, Chancery Lane
London, WC2A 1QU (GB)**(54) Fluid manifold for ink jet printhead**

(57) A fluid system for an ink jet printhead comprises fluid paths, fluidic sensors, fluidic valves, and fluidic connectors. A fluid manifold integrates this collection of individual components, thereby eliminating free-hanging

fluid connections, valves, and printhead sensing functions. The present invention integrates all umbilical to printhead fluid paths, connections, valves and sensors into a single compact, easily tested, assembled, and serviced unit.



Description

Technical Field

The present invention relates to ink jet printing systems and, more particularly, to a fluid manifold for integrating fluid paths, fluidic sensors, and fluidic connectors for an ink jet printing system.

Background of the Invention

Ink jet printing systems are known in which a print head defines one or more rows of orifices which receive an electrically conductive recording fluid from a pressurized fluid supply manifold and eject the fluid in rows of parallel streams. Printers using such print heads accomplish graphic reproduction by selectively charging and deflecting the drops in each of the streams and depositing at least some of the drops on a print receiving medium, while others of the drops strike a drop catcher device. The continuous stream ink jet printing process is described, for example, in U.S. Pat. Nos. 4,255,754; 4,698,123 and 4,751,517, the disclosures of each of which are totally incorporated herein by reference.

As is obvious to those skilled in the art, the fluid system for a continuous ink jet printer must perform a number of functions. These functions include liquid supply, catch fluid return, startup and shutdown of the print head, and long-term storage. Known fluid systems typically provided electronic control for pressure at the print head, ink temperature during startup, or ink concentration. The control of these functions leads to improved long-term ink jet performance. There are various major components which accomplish these tasks. These components include a dc liquid pump, an ac vacuum pump, and various controls.

In prior ink jet fluid system designs, only very minimal manifolding, i.e., collection of individual components which share a common integrated structure, was done to eliminate free-hanging fluid connections, valves, printhead sensing functions, and improved fit of larger components into small packages.

It is seen, then that there is a need for an integrated printhead fluid system packaging design which is easier to build and service than prior art fluid system designs.

Summary of the Invention

This need is met by the present invention which discloses a fluid manifold which integrates fluid paths, fluidic sensors, and fluidic connectors in a small, compact unit communicating between an ink jet printhead and the electrical/fluidic supply umbilical.

In accordance with one aspect of the present invention, a fluid system for an ink jet printhead comprises fluid paths, fluidic sensors, fluidic valves, and fluidic connectors. A fluid manifold integrates this collection of individual components into a common structure, thereby

eliminating free-hanging fluid connections, valves, and printhead sensing functions. The present invention, therefore, integrates all umbilical to printhead fluid paths, connections, valves and sensors into a single compact, easily tested, assembled, and serviced unit.

It is an object of the present invention to integrate fluidic operations in an ink jet printing system. It is another object of the present invention to integrate fluidic operations into a small compact unit. It is a further object of the present invention to provide an integrated fluid system which communicates between an ink jet printhead and an electrical/fluidic supply umbilical.

Other objects and advantages of the invention will be apparent from the following description and the appended claims.

Brief Description of the Drawings

Fig. 1 is a fluid schematic illustration of a manifold assembly, in accordance with the present invention; Fig. 2 is a front view of the manifold assembly of Fig. 1; and Fig. 3 is a side view of the manifold assembly of Fig. 1.

Detailed Description of the Invention

The present invention is described in detail with particular reference to certain preferred embodiments thereof, but it will be understood that modifications and variations can be effected without departing from the spirit and scope of the invention.

Referring to the drawings, a manifold assembly 10 is illustrated. The manifold assembly 10 integrates the functions of the fluidic sensors, valves, and connections between an ink jet printhead and a supply umbilical, thereby providing an improved fluidic packaging design.

Referring now to Figs. 1 and 2, in particular, the manifold assembly 10, according to the present invention, integrates a variety of fluidic features. These include inlet and outlet fluid connections 12 and 14, respectively, to a supply umbilical (not shown), for providing fluidic quick disconnect between the umbilical and manifold 15. The integrated fluidic features also include inlet and outlet fluid connections 16 and 18, respectively, to the printhead (not shown), for providing fluidic quick disconnect between the manifold and the printhead.

A pressure transducer 20 to the outlet of the printhead and a temperature thermistor 22 to the inlet of the printhead are also integrated by the fluid manifold 10 of the present invention. The pressure transducer 20 senses pressure at the printhead and is part of a servo loop control of the fluid pump to provide given printhead pressures. The temperature thermistor 22 senses ink temperature at the printhead, and provides servo loop control of the ink heater in the fluid system, to maintain a minimal fluid temperature.

In addition, the fluid manifold assembly 10 inte-

grates inlet and outlet solenoid valves 24 and 26, respectively, to the printhead. The inlet fluid valve 24 shuts off fluid to the printhead and prevents fluid from draining into the printhead during shutdown periods, where the printhead position may be lower than the fluid system position. The outlet fluid valve 26 provides a means for establishing pressure in the printhead when closed, while providing flow through cleaning of the printhead when open.

Finally, the manifold assembly 10 of the present invention integrates a bracket/electrical connector assembly 28, shown in Fig. 3, for the DC components. The assembly 28 provides integrated termination of electrical component wiring between the printhead and the umbilical. The DC components typically include the transducer 20, the thermistor 22, inlet/outlet valves 24 and 26, and an eyelid solenoid (not shown).

In a preferred embodiment of the present invention, the manifold design configuration integrates all of the referenced components, provides interconnecting fluid paths within the manifold as required, and provides inlet/outlet ports which directly communicate with the printhead and umbilical fluid lines. The present invention is particularly useful, given the design constraints of a smaller "footprint" for the printhead, i.e., 240 drops per inch, as compared to existing printheads which have 120 drops per inch; and the use of larger components, i.e., valves for improved reliability and flow. The present invention addresses these constraints and achieves a design which integrates a variety of fluidic functions into a compact unit which still meets manufacturing assembly approval, as well as serviceability approval.

Industrial Applicability and Advantages

The present invention is useful in the field of ink jet printing, and has the advantages of integrating all umbilical to printhead fluid paths, connections, valves and sensors. The present invention has the further advantage of integrating all of these functions into a single compact, easily tested, assembled, and serviced unit. It is another advantage of the present invention that it provides a compact unit for a 240 drops per inch printhead, which uses large components.

The invention has been described in detail with particular reference to certain preferred embodiments thereof, but it will be understood that modifications and variations can be effected within the spirit and scope of the invention.

Claims

1. A fluid system for an ink jet printhead, the fluid system comprising:

fluid paths;
fluidic sensors;

fluidic valves;
fluidic connectors; and
a fluid manifold for integrating the fluid paths, fluidic sensors, fluidic valves, and fluidic connectors into a compact unit.

2. A fluid system as claimed in claim 1 further comprising a supply umbilical for providing electrical and fluidic paths to and from the printhead.

3. A fluid system as claimed in claim 2 wherein the fluid manifold integrates functions of the fluidic sensors, fluidic valves, and fluidic connectors between the ink jet printhead and the supply umbilical.

4. A fluid system as claimed in claim 2 wherein the fluidic connectors comprise:

inlet and outlet fluid connections to the supply umbilical for providing fluidic quick disconnect between the umbilical and the fluid manifold; and
inlet and outlet fluid connections to the printhead for providing fluidic quick disconnect between the manifold and the printhead.

5. A fluid system as claimed in claim 1 wherein the fluidic sensors comprise a pressure transducer for sensing pressure at the printhead.

6. A fluid system as claimed in claim 1 wherein the fluidic sensors comprise a temperature thermistor for sensing ink temperature at the printhead.

7. A fluid system as claimed in claim 1 wherein the fluidic valves comprise an inlet fluid valve for shutting off fluid to the printhead.

8. A fluid system as claimed in claim 1 wherein the fluidic valves comprise an outlet fluid valve for establishing pressure in the printhead when closed and providing flow through cleaning of the printhead when open.

9. A fluid system as claimed in claim 1 further comprising an electrical connector assembly.

