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(71) Applicant: **Scitex Digital Printing, Inc.**
Dayton, Ohio 45420-4099 (US)

(72) Inventors:
- **Bowling, Bruce A.**
  Beavercreek, Ohio 45432 (US)
- **Blum, John N.**
  Kettering, Ohio 45440 (US)
- **Durst, Homer D.**
  Springfield, Ohio 45503 (US)
- **Hare, Timothy T.**
  Dayton, Ohio 45449 (US)
- **Loyd, John C.**
  Centerville, Ohio 45458 (US)

(74) Representative: **Freed, Arthur Woolf et al**
Reginald W. Barker & Co.,
Cliffords Inn
Fetter Lane
London EC4A 1BY (GB)

(54) Air handling for an ink jet printhead

(57) In a continuous ink jet printing system, the printhead is pressurized by the flow of filtered air supplied by the printhead docking station to which it is attached or docked. The printhead docking station has at least one fan (2) for moving air and for transferring the air from the printhead docking station into the printhead. The printhead receives air for the printhead docking station, and directs the air flow to the region around the jet array. The directing of air flow to the region around the jet array can also include reduction of air leakage from the printhead in regions which are away from the jet array region, such as by the use of a seamless cover, and eyelid sealing. Plenum (7) located in at least the printhead and/or printhead docking station serve to distribute the air across the width of the printhead. Filter media located in at least the printhead and/or printhead docking station are used to clean the air supplied to the printhead by the printhead docking station. In this way, filtered air is supplied to the ink jet printhead by the printhead docking station to which it is attached. The use of a one piece printhead cover and seals around the movable eyelid minimize air leakage from the printhead, ensuring the needed air flow in the critical region around the jets.

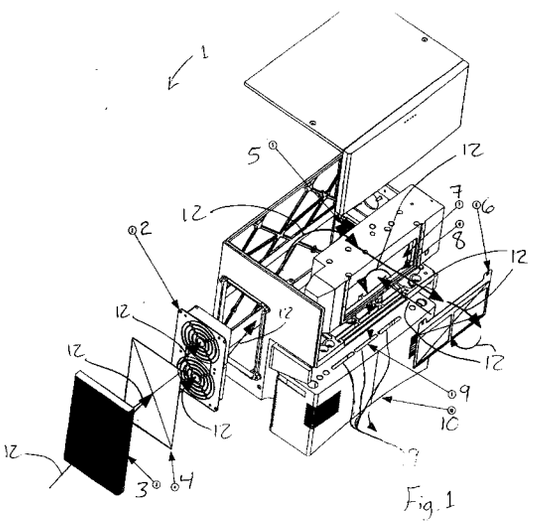

Fig. 1

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Description

Technical Field

[0001] The present invention relates to the field of continuous ink jet printing and, more particularly, to supplying filtered air to keep clean air in the printhead area to inhibit contamination from entering.

Background Art

[0002] In continuous ink jet printing systems, The printhead is susceptible to paper dust and contamination that can enter at the eyelid opening. The eyelid is a moveable seal which diverts ink on startup into the catcher, thereby recycling the ink while containing it within the printhead. The printhead is often protected by slightly pressurizing the printhead housing area with filtered air.

[0003] In prior art printer systems having short arrays of about 1 inch, this filtered air has been supplied by an air compressor which is built into the fluid system. The compressed air is then supplied to the printhead by tubing in the umbilical. For longer arrays which require much higher flow rates, the tubing and compressor sizes required to handle the flow rates make this an impractical option.

[0004] Longer array printheads have therefore supplied the filtered air by means of a fan and filter system built onto the printhead. While this system can work effectively, the placement of the fan and filter on the customer replaceable printhead is undesirable. First, it adds additional cost to the replaceable component. Second, it adds additional weight to the printhead. This additional weight makes handling of the printhead more difficult during printhead replacement. It also hurts the weight-to-rigidity ratio for the printhead, making the printhead more susceptible to being damaged by jarring or vibration.

[0005] To minimize these undesirable results of placing the fan and filter in the printhead, the tendency is to use a fan and filter with less than optimum air flow and filtration characteristics.

[0006] The prior art printheads have also been plagued by numerous undesirable air leaks. Such leaks are produced at the seams of the printhead covers. An additional large air leak is produced between the eyelid and the printhead covers. This leak is the result of the need for space between the eyelid and the covers to allow the eyelid to move. As a result of these air leaks, there is frequently insufficient flow of filtered air to the printhead to prevent contamination of the printhead by air borne debris.

[0007] It is seen, therefore, that it would be desirable to have an improved method of providing filtered air to the printhead, particularly for long array printing systems.

Summary of the Invention

[0008] This need is met by the improved air handling technique proposed by the present invention.

[0009] In accordance with one aspect of the present invention, in a continuous ink jet printing system, the printhead is pressurized by the flow of filtered air supplied by the printhead docking station to which it is attached or docked. The printhead docking station comprises means for moving air such as at least one fan, and means for transferring the air from the printhead docking station into the printhead. The printhead comprises means for receiving air for the printhead docking station, and means for directing the air flow to the region around the jet array. These means for directing the air flow to the region around the jet array may comprise means for reducing air leakage from the printhead in regions which are away from the jet array region. Such means to reduce air leakage may include the use of a seamless cover, and means to reduce the leakage of air around the eyelid. Plenum located in at least the printhead and/or printhead docking station serve to distribute the air across the width of the printhead. Filter media located in at least the printhead and/or printhead docking station are used to clean the air supplied to the printhead by the printhead docking station. In this way, filtered air is supplied to the ink jet printhead by the printhead docking station to which it is attached. The use of a one piece printhead cover and seals around the movable eyelid minimize air leakage from the printhead ensuring the needed air flow in the critical region around the jets.

[0010] Other objects and advantages of the invention will be apparent from the following description, the accompanying drawing and the appended claims.

Brief Description of the Drawing

[0011]

Fig. 1 is an exploded view of a printhead and printhead docking station assembly illustrating the improved air handling in accordance with the present invention;

Fig. 2A is a cross-sectional view which illustrates an eyelid seal system for achieving the improved air handling technique of the present invention; and

Fig. 2B illustrates a printhead with features for achieving the improved air handling technique of the present invention.

Detailed Description of the Preferred Embodiments

[0012] In accordance with the present invention, the ink jet printhead attaches to a printhead docking station. The printhead docking station locates the printhead adjacent to the print media. As the print media moves relative to the printhead, images can be created by the

printhead, as desired. The printhead docking station may also serve as an interface between the printhead and the fluid system controller. As an interface, the printhead may attach to an umbilical from the fluid system and may include valving and other fluid related components. The printhead docking station may further include electronic interface components for handling the print data or for control of the ink jet printhead.

[0013] The printhead docking station includes means for moving air, which means may comprise a fan. The fan draws or forces air through a filter. Filtered air from the printhead docking station passes from the printhead docking station into the printhead. A plenum in at least one of the components (printhead docking station and printhead) serves to distribute the air so that a fairly uniform flow of air is supplied across the jet array to the region around the jets. This uniform flow of filtered air around the jets serves to keep airborne debris out of this critical region of the ink jet printhead.

[0014] Referring now to the drawings, Fig. 1 shows a preferred embodiment of the printhead docking station and printhead assembly 1, constructed in accordance with the teachings of the present invention. In this preferred embodiment, the printhead is a customer replaceable unit which attaches or docks with the printhead docking station. The printhead docking station provides all necessary fluid and electrical connections to the printhead. These connections are made on the upper surface of the printhead. Umbilical line connections from the printhead docking station to the fluid system controller are not shown.

[0015] Continuing with Fig. 1, fans 2 enclosed in the printhead docking station provide a means for moving air through the printhead docking station and the printhead. Intake vents 3 through which the fans 2 draw air are on a side of the printhead docking station. Replaceable air pre-filters 4 filter the air entering the printhead docking station.

[0016] In this preferred embodiment, air from the fans 2 also serves to cool electronics (not shown) contained in the printhead docking station. To facilitate this cooling function there are exhaust vents 5 on the opposite side of the printhead docking station from the air intakes, through which some air exits. Since these exhaust vents are only necessary for the function of cooling the printhead docking station components, such exhaust vents may be omitted if the cooling function is not required. When the cooling function is desired, these exhaust vents perform two functions. First, they allow sufficient air flow through the printhead docking station for the desired cooling. Second, they provide sufficient pressure build up in the printhead docking station to divert the desired flow rate of air through the filter and into the printhead.

[0017] As a result of the pressure build up in the printhead docking station, air is forced through the filter 6. The filter, which is replaceable, is located in slots on the plenum 7. One or more air transfer openings 8 in the lower wall of the plenum which are aligned with one or more air transfer openings 9 in the upper cover of the printhead, provide means for the flow of the air in the direction of arrows 12 from the printhead docking station to the printhead. Foam gaskets (not shown) or other suitable means can enclose the air transfer openings in the gap between the printhead docking station and the printhead to prevent air leakage.

[0018] The space inside the printhead serves as a second plenum for distributing the supplied air. By means of sealing gaskets 14 , and at all the printhead openings, and the use of a seamless one piece cover 10, illustrated in detail in Fig. 2B, air leakage from the printhead is minimized so that the air will exit the printhead through the opening between the catcher and the eyelid.

[0019] Referring to Figs. 2A and 2B, the particular means for achieving improved air handling are illustrated. Fig. 2A shows a cross sectional view of a portion of the printhead. To protect the printhead from contamination such as paper dust, it is desirable to maintain a flow of clean air around the drop generator, jet array, and the face of the catcher charge plate assembly as shown by the arrows. As leakage of air out of the printhead through other flow paths tends to reduce the air flow in this region around the drop generator and catcher, such leakage should be minimized. To minimize such leakage of air, the eyelid 20 incorporates the flexible sealing strip 14 which seals the space between the eyelid and the printhead covers while still allowing the eyelid to open for print or service functions. Air dams 22, best illustrated in Fig. 2B, are located at each end of the printhead to minimize the air leakage from around the ends of the eyelid.

[0020] While the preferred embodiment incorporates plenum in both the printhead and the printhead docking station, it is recognized that other embodiments could involve only one, located in either assembly. Furthermore, it is understood that the filter(s) could reside in either or both assemblies. It is also understood that means in the printhead docking station to move the air can include other means beside fan(s). For example, one such means might include a port for admitting compressed air from an outside source. This port for compressed air could further include venturi means to draw in additional air from outside the printhead docking station.

[0021] 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. An improved air handling method for affecting an ink jet printhead having an associated drop gener-

ator and attached to a printhead docking station, comprising the steps of:

supplying pressurized air from the printhead docking station;
transferring the pressurized air from the printhead docking station into the printhead to be received by the printhead, in an air flow; and
directing the air flow to a region around the jet array produced by the drop generator of the printhead.

2. An improved air handling method as claimed in claim 1 wherein the pressurized air pressurizes the printhead.

3. An improved air handling method as claimed in claim 1 further comprising the step of reducing air leakage.

4. An improved air handling method as claimed in claim 3 wherein the step of reducing air leakage comprises a seamless cover.

5. An improved air handling method as claimed in claim 3 wherein the step of reducing air leakage comprises an eyelid sealing strip.

6. An improved air handling method as claimed in claim 1 further comprising the step of filtering the pressurized air.

7. An improved air handling method as claimed in claim 6 wherein the step of filtering the pressurized air further comprises the step of integrating the filtering into the printhead or the printhead docking station.

8. An improved air handling method as claimed in claim 1 wherein air supplied to the printhead also serves to cool components in the printhead docking station.

9. An improved air handling method as claimed in claim 1 further comprising the step of distributing flow of air across a jet array.

10. An improved air handling method as claimed in claim 9 wherein the step of distributing flow of air across a jet array further comprises the step of using a plenum in the printhead docking station to aid in distributing the flow of air across jet array.

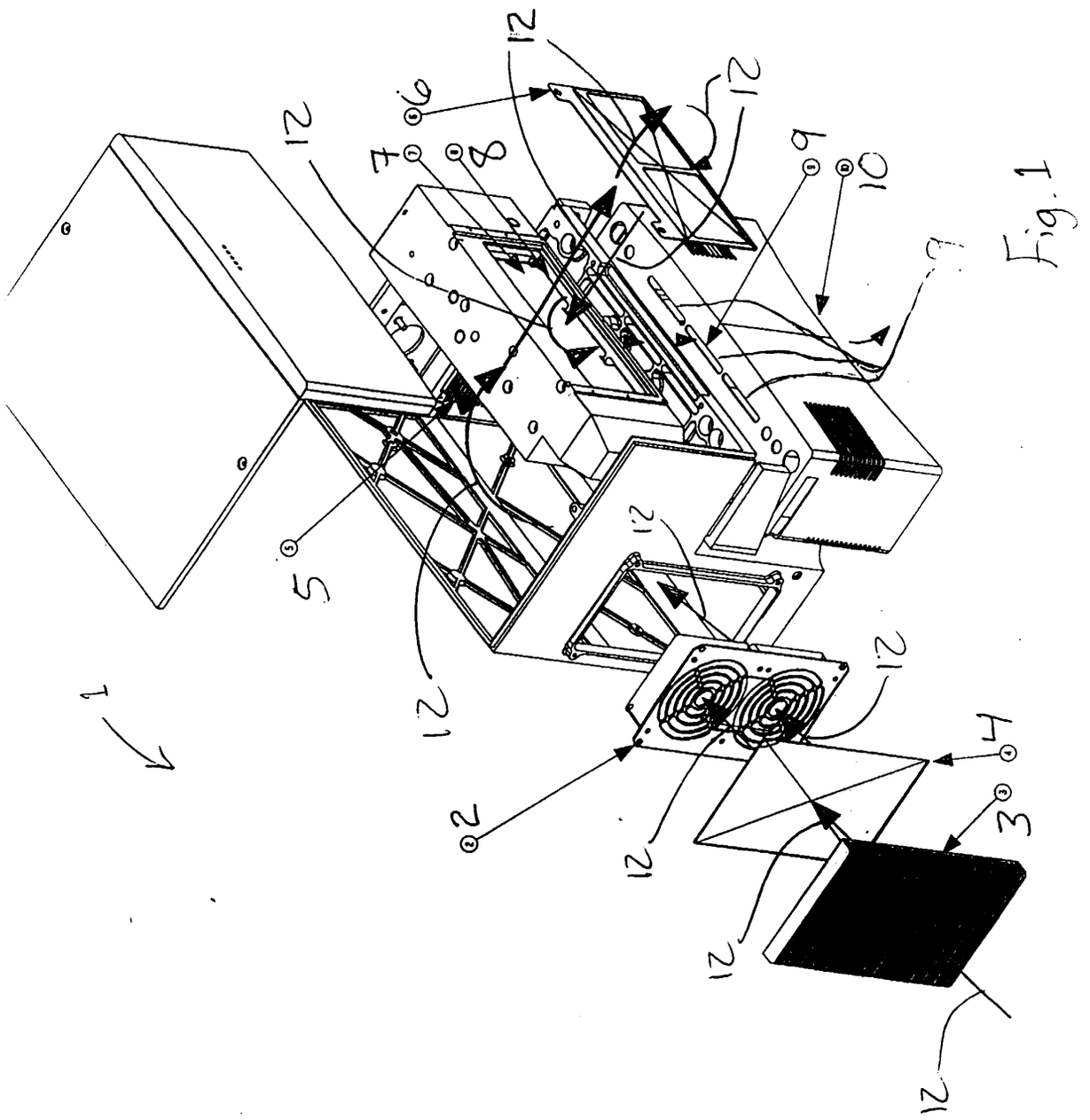


Fig. 1

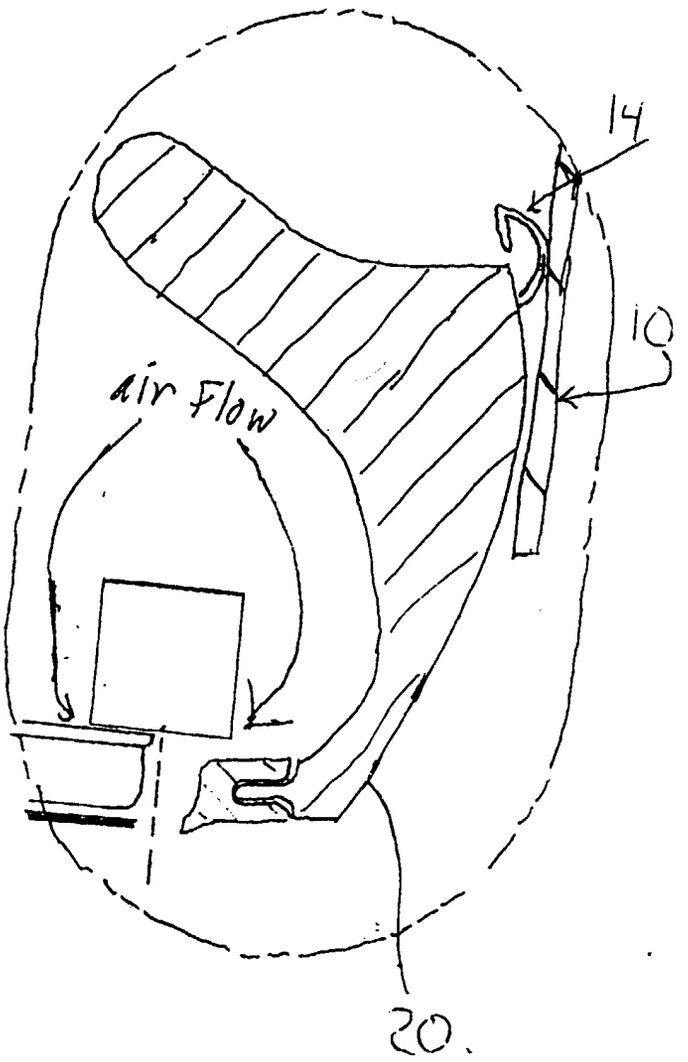
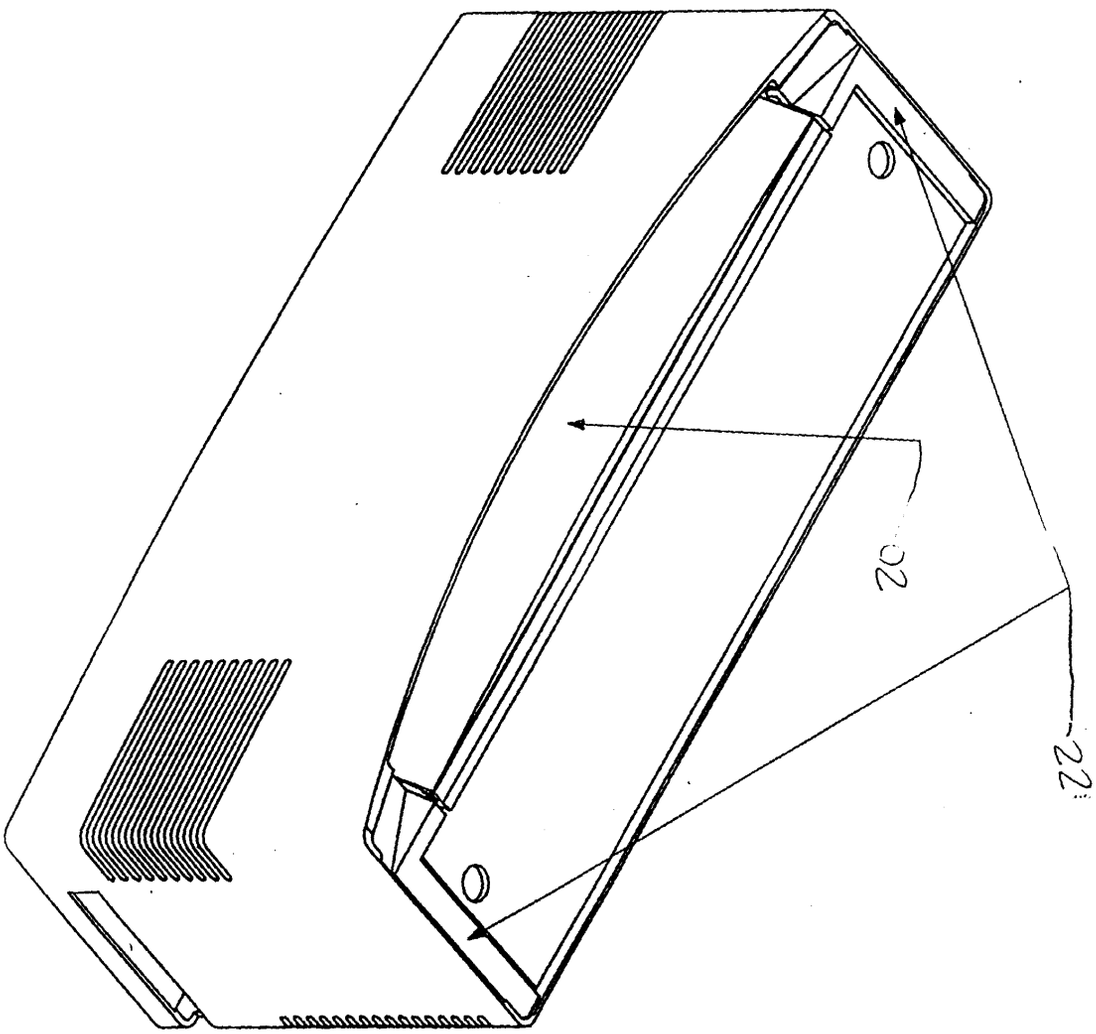


Fig 2a



FIGUR 2B

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Application Number
EP 99 30 9504

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16 February 2000	Adam, E

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EUROPEAN SEARCH REPORT

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