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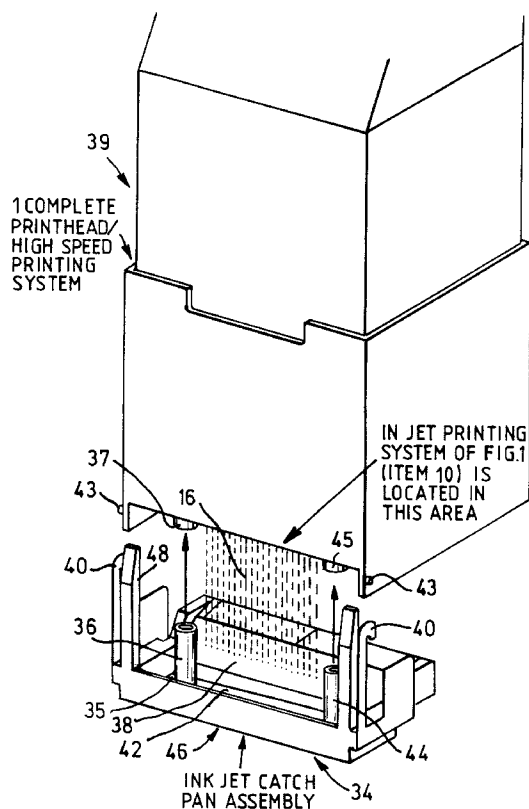
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(54) Ink catcher

(57) An ink jet catch pan structure provides necessary functions to allow performance of diagnostic and maintenance work on a high speed printing system printhead. The ink jet catch pan structure has at least one printhead. The catch pan is mounted to the printhead, has an investment cast body, and is grounded.

Ink flow is received from the printhead and returned to the printhead. An ink impact slope receives ink impact from the printhead, and has a non-mist generating geometry. An ink collection cavity holds ink as it impacts the ink impact slope. The catch pan follows the printhead.

**FIG. 2****EP 0 791 468 A2**

Description

Technical Field

The present invention relates to continuous ink jet printers and, more particularly, to improved construction for the ink jet catch pan which addresses maintenance needs for the printhead.

Background Art

In continuous ink jet printing, electrically conductive ink is supplied under pressure to a manifold region that distributes the ink to a plurality of orifices, typically arranged in a linear array(s). The ink discharges from the orifices in filaments which break into droplet streams. Individual droplet streams are selectively charged in the region of the break off from the filaments and charge drops are deflected from their normal trajectories. The deflected drops may be caught and recirculated, and the undeflected drops allowed to proceed to a print medium.

Drops are charged by a charge plate having a plurality of charging electrodes along one edge, and a corresponding plurality of connecting leads along one surface. The edge of the charge plate having the charging electrodes is placed in close proximity to the break off point of the ink jet filaments, and charges applied to the leads to induce charges in the drops as they break off from the filaments.

In the prior art, a catcher body, including a catcher plate, is used to catch and recirculate deflected drops. The current catcher plate or trough used to maintain high-speed printing systems (HSPS) does not address all the maintenance needs for a printhead. Several problems exist making diagnostic and maintenance work on high-speed continuous ink-jet printheads difficult to perform. These problems include poor visibility of the printing area, eliminating the capability to see ink impact the pan or through; ink spills; ink mist creation; interference with other components in the machine; lack of capability to track or move with the printhead; no guarantee of a grounded collection of ink drops; and inability to use the device with different inks.

It is seen then that there exists a need for an ink jet catch pan which addresses the maintenance needs for a printhead.

Summary of the Invention

This need is met by the catch pan according to the present invention, wherein it is a primary object to provide a device which will accomplish necessary functions to perform diagnostic and maintenance work on a high speed printing system printhead.

In accordance with one aspect of the present invention, an ink jet catch pan structure is provided for use with a high speed printing system having at least one printhead. The catch pan structure comprises a mount-

ing means for mounting the catch pan to the at least one printhead, the catch pan having an investment cast body; a fluid receiving means for receiving ink flow from the at least one printhead and returning the ink to at least one printhead; an ink impact slope for receiving ink impact from the at least one printhead, the ink impact slope having non-mist generating geometry; an ink collection cavity for holding ink as it impacts the ink impact slope; grounding means for grounding the catch pan; and tracking means for allowing the catch pan to follow the at least one printhead.

Accordingly, it is an object of the present invention to provide an ink jet catch pan for a high speed printing system. It is a further object to provide such a device which will accomplish necessary functions to perform diagnostic and maintenance work on the high speed printing system printhead.

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

Brief Description of the Drawings

Fig. 1 is an illustration of an existing high speed continuous ink jet printing system; and

Fig. 2 is a perspective view of an ink jet catch pan, according to the present invention, shown suspended under the high speed printing system of Fig. 1.

Detailed Description of the Preferred Embodiments

Referring to the drawings, the present invention relates to the type of continuous ink jet system 10 illustrated in Fig. 1. A plurality of conducting elements, or charge leads 12, are located on a planar charge plate 14. A plurality of streams of drops 16 are supplied by drop generator 18. A plurality of independently switchable sources 20 of electrostatic potential are supplied to the plurality of charge leads 12. A catcher 22, having an associated catcher plate 24, intercepts the slightly deflected streams of drops. The plurality of streams of drops impacting on the catcher forms a film of ink 26, which in turn forms a flow of ink 28, sucked away from the face of the catcher and into the catcher plate by a vacuum. Reference number 30 represents the area on the catcher at which the deflected drops impact the catcher and merge together to form a film of ink on the catcher face, to be caught in catcher plate 24. The undeflected ink drops then print the image on substrate 32.

Continuing with Fig. 1 and referring now to Fig. 2, the present invention relates particularly to a catch pan assembly 34 used to maintain the high speed printing system of Fig. 1. In Fig. 2, structure 39 comprises a complete printhead and high speed printing system, including the ink jet printing system 10 of Fig. 1, located in area 41. The catch pan assembly 34 comprises a drain aperture 35 associated with a recirculation tube or pipe 36. Ink flows into the drain aperture 35 and is drawn up,

via a vacuum, through the fluid pipe 36 to evacuate during diagnostics and maintenance. When this fluid connection is made, by inserting protrusion 37 into pipe 36, ink is returned to the host printhead of structure 39, thus assuring that no fluid supply module will be flooded. Furthermore, this allows different ink formulations and colors to be used in the same machine.

The catch pan 34 further comprises an ink impact slope 38. Ink from the printhead impacts this slope, which has non-mist generating geometry to prevent the generation of ink mist. To prevent the generation of ink mist, the slope is preferably not less than 15° and not more than 40° from vertical. Furthermore, in a preferred embodiment of the present invention, the surface finish on the slope 38 should not be greater than 20 RMS with a downward grain direction.

Continuing with Fig. 2, mounting means 40, such as hooks, are used to mount the catch pan 34 to the printhead, such as by mounting to protrusions 43. This allows the catch pan to follow the printhead. The catch pan structure 34 of the present invention never actually contacts any part of the printing system 10 of Fig. 1. Instead, the catch pan 34 follows the printhead, under the printhead, so ink drops 16 fall into the pan 34. The system operator can then actually see the ink curtain or drops 16 falling into the catch pan 34, to check for jet straightness and allow swabbing of the orifice plate.

Continuing with Fig. 2, an ink collection cavity 42 holds ink during high-flow use. In a preferred embodiment of the present invention, the cavity 42 design is optimized for pooling ink and allowing clear visibility of the ink as it impacts slope 38. A ground stud 44 grounds the pan, when the stud 44 of the catch pan structure receives protrusion 45, so that charged drops of ink are properly attracted and collected. The charged drops are attracted to the grounded slope, rather than trying to attach to anything else.

The catch pan 34 is preferably nickel plated along with the ground stud 44, which is integral with the pan, so that when the fluid pipe 36 and ground stud 44 receive members 37 and 45, respectively, of the printhead, fluid recirculation and a grounding of the catch pan are achieved.

Reference number 46 refers to open view areas for accommodating the maintenance and diagnostic work. These areas allow visibility of the ink 16 that flows from the printhead, yet also keep the ink contained within the catch pan region. Guide posts 48 guide the catch pan into position when the pan is being attached to the printhead, using hooks 44 and mating members 37 and 45.

The catch pan structure of the present invention accomplishes necessary functions to perform diagnostic and maintenance work on the high speed printing system printhead. For example, the catch pan 34 provides recirculative fluid flow from printhead to printhead module. This allows "printing" in the catch pan, which is used to check jet straightness, and swabbing of the orifice plate. Furthermore, the ink jet catch pan 34 according

to the present invention does not generate ink mist. This is accomplished by having the correct impact angle in the catch pan and appropriate surface finish. The catch pan 34 can also track or follow the printhead for remote use, since the catch pan mounts to the printhead and not to the printing press. This includes fluid, and mechanical connections, so if the printhead is moved with the pan plugged into it, the pan follows the printhead.

Prior art designs include a soft tubing, as a vacuum line, routed where it could be pinched off, thereby creating an overflow condition. Since the design of the present invention does not include a soft vacuum line, the catch pan can handle a large volume of ink and still evacuate effectively. In addition, the catch pan of the present invention is grounded so that charged drops of ink are collected properly. The catch pan of the present invention also facilitates use of different inks in the same machine. Each printhead has its own fluid system and there are multiple printheads per machine. Prior art catch pans are designed as a trough that all printhead fluid is gathered in, so inks from different systems get mixed in the pan when printed. The catch pan design of the present invention is printhead dependent, so fluid is returned to its host system, rather than having to be discarded.

The catch pan of the present invention allows a user full view access to swab, (i.e., perform maintenance on) a printhead; view the printing device, (i.e., the printhead) straightness in a catch pan; and view the ink "curtain" for irregularities. Finally, in accordance with the present invention, the catch pan body is investment cast and offers a significant cost reduction over current technology, by eliminating much scrap metal and minimizing machining time.

In accordance with the present invention, the body of the ink catching device 34 is investment cast from an aluminum alloy which allows intricate features to be incorporated without significant cost increases. The device of the present invention provides all the necessary features to allow a high speed printing system user to properly maintain and trouble-shoot the associated high speed printing system printhead.

Industrial Applicability and Advantages

The present invention is useful in the field of ink jet printing, and has the advantage of being able to provide necessary functions, thereby allowing a user to perform diagnostic and maintenance work on the high speed printing system printhead. The catch pan provides recirculative fluid flow from printhead to printhead module; does not generate ink mist; can track or follow the printhead for remote use; can handle a large volume of ink and still evacuate effectively; is grounded so that charged drops of ink are properly collected; facilitates use of different inks in the same machine; allows a user full view access to perform maintenance on a printhead, view the printing device straightness in a catch pan, and

view the ink "curtain" for irregularities; and has an investment cast body which offers a significant cost reduction over current technology. The present invention provides the further advantage of unprecedented ease of use for this type of device. The catch pan device is simply loaded into the printhead area, the guide posts are used to put the device into the right area, the catch pan is pushed up and automatically snapped into position, and fluid and ground connections are automatically made.

Having described the invention in detail and by reference to the preferred embodiment thereof, it will be apparent that other modifications and variations are possible without departing from the scope of the invention defined in the appended claims.

Claims

1. An ink jet catch pan structure for use with a high speed printing system having at least one printhead comprises:
 - a. mounting means for mounting the catch pan to the at least one printhead, the catch pan having an investment cast body;
 - b. a fluid receiving means for receiving ink flow from the at least one printhead and returning the ink to at least one printhead;
 - c. an ink impact slope for receiving ink impact from the at least one printhead, the ink impact slope having non-mist generating geometry;
 - d. an ink collection cavity for holding ink as it impacts the ink impact slope;
 - e. grounding means for grounding the catch pan; and
 - f. tracking means for allowing the catch pan to follow the at least one printhead.
2. An ink jet catch pan structure as claimed in claim 1 wherein the grounding means comprises;
 - a ground stud;
 - a mating member for mating with the ground stud to ground the ink jet catch pan.
3. An ink jet catch pan structure as claimed in claim 1 wherein the fluid receiving means comprises a recirculation pipe for mating with the high speed printing system.
4. An ink jet catch pan structure as claimed in claim 1 wherein the ink impact slope has a range between 15 degrees and 40 degrees from vertical.
5. An ink jet catch pan structure as claimed in claim 1 wherein the ink impact slope has a surface finish not greater than 20 RMS with a downward grain di-

rection.

6. An ink jet catch pan structure as claimed in claim 1 wherein the mounting means comprises hooks for mating with protrusions associated with the at least one printhead.
7. An ink jet catch pan structure as claimed in claim 1 wherein the ink collection cavity pools ink and allows visibility of the ink.
8. An ink jet catch pan structure as claimed in claim 1 wherein the grounding means comprises a nickel plated ground stud integral with the catch pan.
9. An ink jet catch pan structure as claimed in claim 1 wherein the catch pan is nickel plated.

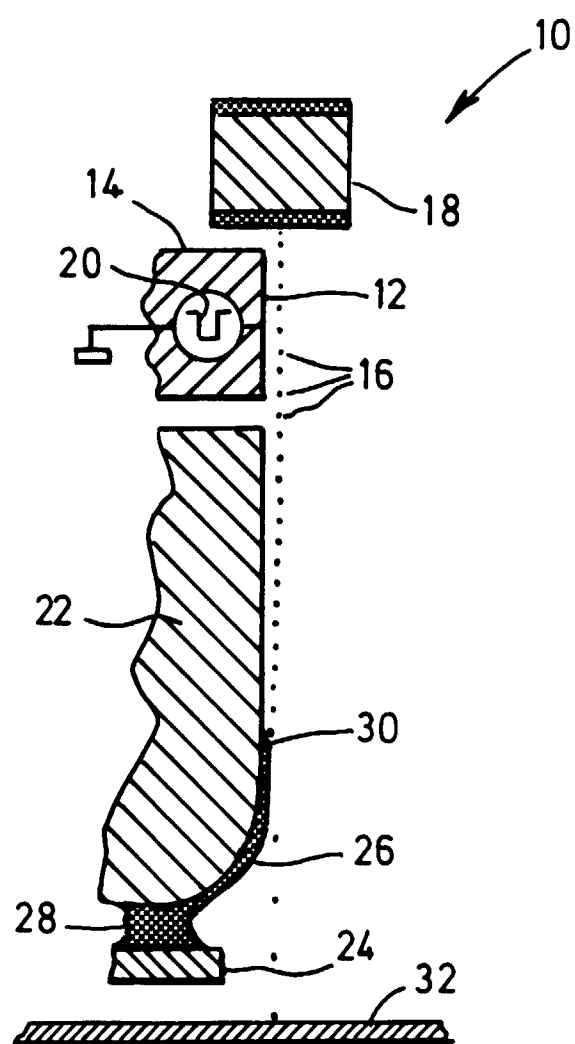


FIG. 1

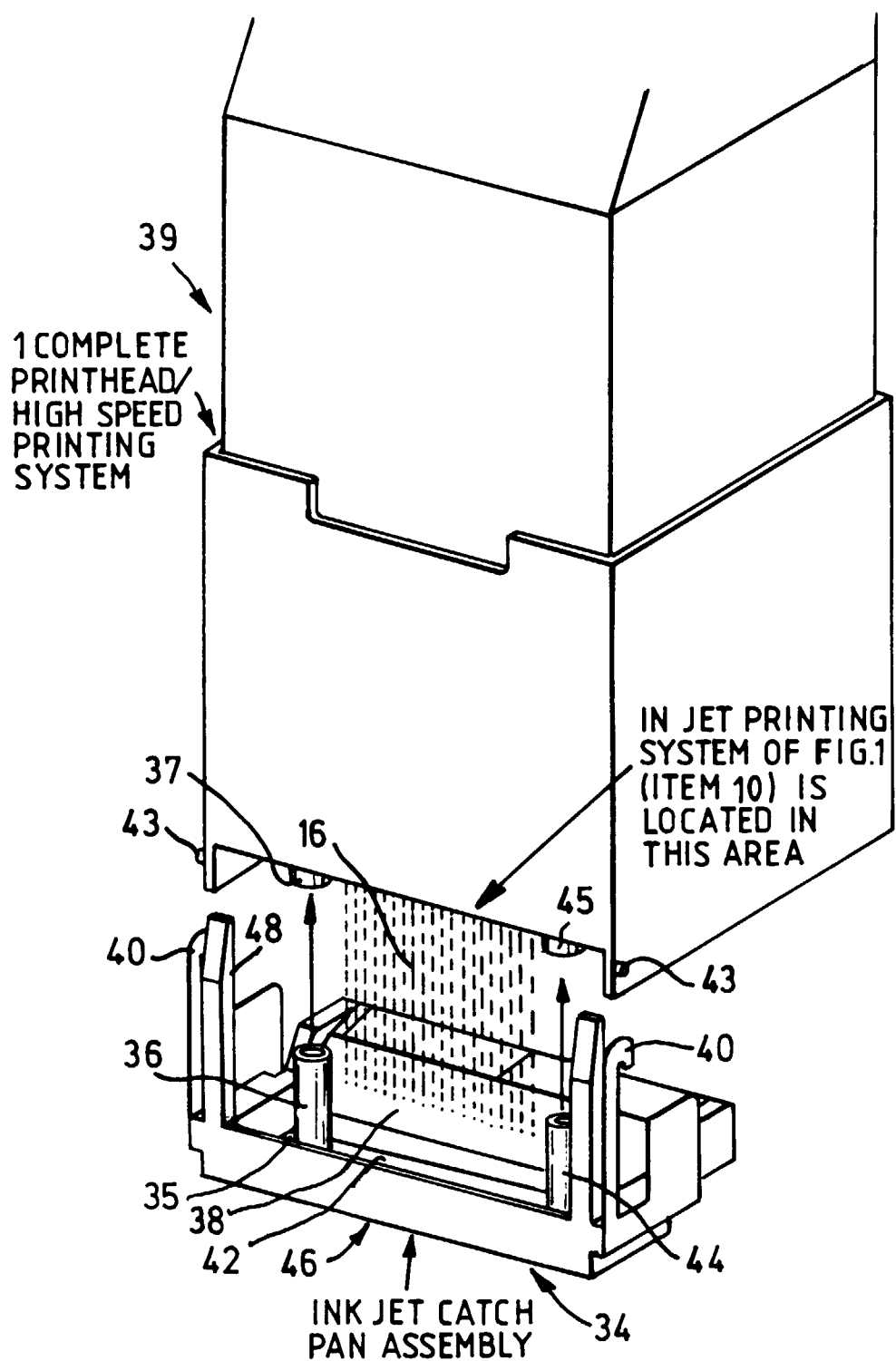


FIG. 2