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(54) Replaceable ink mist filter

(57) A vacuum system is usable with an ink jet printer, the printer having an access door. The vacuum system comprises an ink reservoir, wherein a vacuum is supplied to the ink reservoir. A user replaceable mist filter is situated within the access door of the printer for

capturing ink mist from the ink reservoir. The location of the mist filter makes the mist filter easily accessible, removable and replaceable.

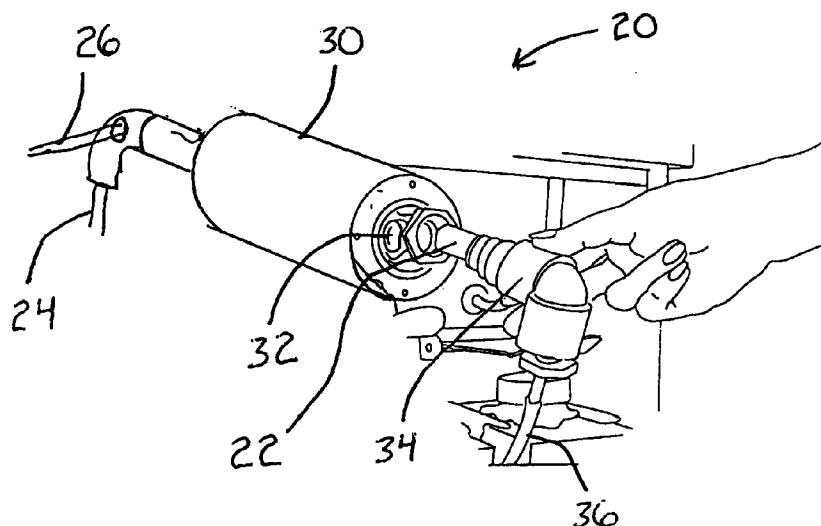


Fig. 2

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Description

Technical Field

The present invention relates to continuous ink jet printers and, more particularly, to an easily replaceable apparatus for the collection of ink mist generated in an ink reservoir.

Background Art

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. Printers of this type have a front door to allow the user access to certain components, such as ink bottles and the like.

In an ink supply system for an ink jet printer of the type shown in U.S. Patent No. 4,399,446, clogging of the vacuum system downstream of the ink reservoir was observed during testing of the system. The clogging material appeared to be ink which entered the vacuum system, proceeded through the system to a restriction, dried in the restriction, and caused clogging.

This problem was exacerbated by a high degree of ink splatter in the ink reservoir in the area of the vacuum port, which is where much of the ink entering the vacuum port was believed to originate. Several attempts were made to solve this problem. One method for solving this problem was to install a baffle to prevent splattered ink from entering the vacuum port. However, clogging of the vacuum system still occurred, in spite of the effectiveness of the baffle in splatter control.

Another attempt to solve the clogging problem was to separate the suck dry vacuum and the system vacuum to isolate the two systems. Although no ink appeared to enter the system vacuum when this method was employed, clogging of the system vacuum still occurred. Upon further investigation, dried ink mist was unexpectedly discovered in a T-fitting connecting the ink reservoir to the system vacuum, and in a check valve in the system vacuum. The pattern of the build up in the check valve indicated that the clogging was caused by a gradual accumulation of ink mist which was dried by the continual flow of air through the system.

Commonly assigned Serial No. 07/858,930, totally incorporated herein by reference, discloses an ink mist filter for collecting mist and eliminating clogging of the system vacuum. The apparatus collects ink mist generated in an ink reservoir under vacuum. Various materials were used to attempt to collect the mist. For example, a porous plastic cigarette shaped filter was tested, but proved to be too easily clogged by the mist.

Finally, it was determined that melamine foam provided the needed level of reliability.

In an ink supply system for an ink jet printer of the type shown in U.S. Patent No. 4,399,446 and a mist filter of the type shown in U.S. Serial No. 07/858,930, the life of the mist filter varies from 500 to 1000 hours of use, depending on the operating conditions. Consequently, the ink mist filter is required to be removed and replaced often. Unfortunately, the location of the ink mist filter in prior art systems requires removal of a cover to access, and thus to replace, the ink mist filter. However, UL reliability requirements prevent the customer operator of the system from opening the cover, thereby preventing access to the ink mist filter except by service personnel.

It is seen then that there is a need for an customer replaceable ink mist filter, which allows the customer operator to remove and replace the ink mist filter at the required intervals.

Summary of the Invention

This need is met by the system according to the present invention, wherein a user replaceable apparatus collects ink mist generated in an ink reservoir under vacuum. In accordance with the present invention, the location of the ink mist filter is changed, locating the filter within the front door of the ink jet printing system to allow the user access to the filter.

In accordance with one aspect of the present invention, a vacuum system comprises an ink reservoir and a vacuum pump for supplying vacuum to the ink reservoir. The vacuum system is usable with an ink jet printer, the printer having an access door. A user replaceable mist filter is situated within the access door of the printer for capturing ink mist from the ink reservoir. The location of the mist filter makes the mist filter easily accessible, removable and replaceable.

Accordingly, it is an object of the present invention to provide a vacuum system for solving the problem of mist generation from an ink reservoir under vacuum, the vacuum system comprising a user replaceable mist filter. 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 a block diagram of a prior art embodiment of a vacuum system;

Fig. 2 is an exploded view of a mist filter housing of Fig. 1, incorporating the user replaceable feature of the present invention;

Fig. 3A is a block diagram illustrating the prior art location of the mist filter; and

Fig. 3B is a block diagram illustrating the location of the mist filter according to the present invention.

Detailed Description of the Preferred Embodiments

The present invention protects vacuum system components from ink mist generated in the air from an ink reservoir, by employing a user replaceable mist filter. Referring to the drawings, in Fig. 1 a prior art vacuum system 10 is illustrated. The vacuum system 10 includes an ink reservoir 12 which stores ink for recirculation in an ink supply system for a typical ink jet printer of the type shown in commonly assigned U.S. Patent No. 4,399,446, issued August 16, 1983, to McCann et al. The ink reservoir 12 is under vacuum to provide a means for returning ink from the ink supply system to the ink reservoir 12. In the top of the ink reservoir 12 is a port 14 to which a vacuum source, such as vacuum pump 16, is attached. The vacuum in the ink reservoir 12 is provided by vacuum pump 16, which may be any commercially available vacuum pump such as a WISA model no. 113.079.100.0. The port 14 is situated well above the surface of the ink stored in the ink reservoir 12. A float switch 18 controls the fluid level in the ink reservoir 12.

Referring now to Fig. 2 and continuing with Fig. 1, a mist filter housing 20 containing the user replaceable mist filter 22 shown in Fig. 2, is connected between the vacuum pump 16 and the ink reservoir 12 to protect the vacuum pump 16 from ink mist and moisture. The mist filter 22 eliminates clogging of the vacuum system downstream of the ink reservoir caused by dried ink mist in the system 10.

An exploded view of the housing 20 is shown in Fig. 2 to illustrate the user replaceable mist filter 22 of the present invention. A first inlet port 24 of the housing 20 connects directly to the top of the ink reservoir 12 of Fig. 1, by any suitable means, such as a tube. A second inlet port 26 of the housing 20 is connected to a servo controlled vacuum bleed 28, shown in Fig. 1, which regulates the vacuum in the ink reservoir 12.

Under certain environmental conditions, condensation of water vapor in the air from the reservoir 12 can occur on interior side and bottom walls of the filter housing 20. This moisture can possibly collect to the point that it is passed on to the vacuum pump 16 through the mist filter 22. To eliminate this potential problem, the vacuum bleed 28 of fresh air is included in the system 10 to reduce the humidity in the filter housing 20. Inclusion of the vacuum bleed 28 in the system 10 also provides the advantage of allowing greater latitude in the onset of condensation.

The housing 20 of Fig. 2 is comprised of a body 30 which is mounted inside the system. A mist filter receptor means within the machine securably and slidably receives the user replaceable mist filter 22. A release means, such as button 32, is mounted at the front of the ink jet printing system for release of the filter 22. The mist filter 22 is inserted into a filter fitting or elbow 34, which is easily accessible inside an access door of the ink jet printer, making the filter 22 easily replaceable by the user. When it is desired to remove and/or replace

the filter 22, the operator simply opens the access door of the printer, engages the release button 32 to release the filter 22 from the elbow 34, and slides the filter out. A tube 36 interconnects the mist filter with the fluid system of the ink jet printer.

The mist filter 22 is preferably a non-hollow, cylindrically shaped filter. The mist filter 22 material is preferably a melamine foam, or equivalent material, having minuscule lattice-work openings on the order of 140 microns each. As the air-mist mixture from the reservoir 12 flows through the filter 22, the resulting ink mist collects on the lattice work openings of the filter 22. Eventually, of course, the mist filter becomes restricted by the collection of ink mist, and requires replacement. In accordance with the present invention, replacement of the mist filter 22 can now be accomplished by the user, merely requiring opening of the access door of the printer to access the filter 22, and sliding the filter out of the elbow fitting.

Referring now to Fig. 3A, there is a block diagram illustrating the prior art location of the mist filter 22. Fig. 3B is a block diagram illustrating the location of the mist filter according to the present invention. The location of the ink mist filter 22 in the prior art system requires removal of a cover 38 to access, and thus to replace, the ink mist filter. However, UL reliability requirements prevent the customer operator of the system from opening the cover, thereby preventing access to the ink mist filter except by service personnel.

According to the present invention, the location of the ink mist filter is changed, so it is user replaceable. The mist filter 22, as shown in Fig. 3B, is situated within access door 40 of printer 42 for capturing ink mist from ink reservoir 44. The location of the mist filter 22 according to the present invention makes the mist filter easily accessible, removable and replaceable. Locating the filter 22 inside the door 40 of the ink jet printing system allows the user access to the filter.

Industrial Applicability and Advantages

The present invention is useful in the field of ink jet printing, and has the advantage of providing a user replaceable system for protecting components from ink mist generation from an ink reservoir. The present invention provides the further advantage of allowing more reliable operation of the ink supply system for an ink jet printer. Finally, the present invention provides the advantage of allowing the user easy access to the mist filter, for removal and replacement of the filter.

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. A vacuum system for an ink jet printer, the printer having an access door, the vacuum system comprising:
an ink reservoir;
a means for supplying vacuum to the ink reservoir; and
a user replaceable mist filter situated inside the access door of the printer.
2. A vacuum system as claimed in claim 1 further comprising a mist filter receptor means for securely receiving the user replaceable mist filter.
3. A vacuum system as claimed in claim 2 wherein the mist filter receptor means slidably receives the user replaceable mist filter.
4. A vacuum system as claimed in claim 3 further comprising a release mechanism for releasing the user replaceable mist filter from the mist filter receptor means.

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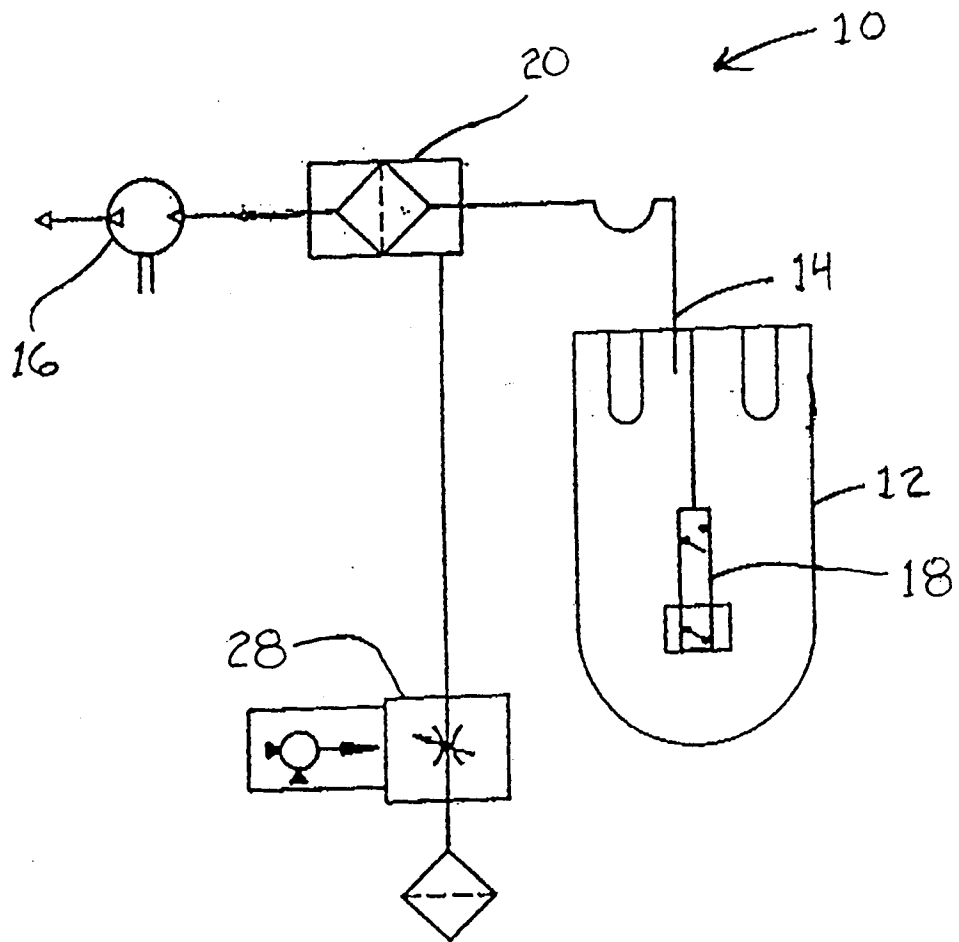


Fig. 1

Prior Art

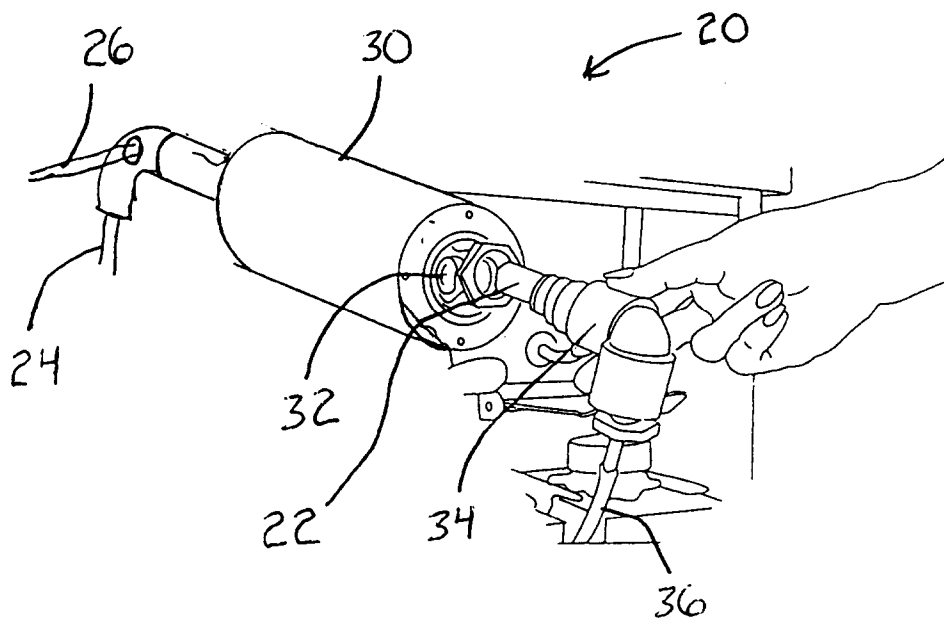


Fig. 2

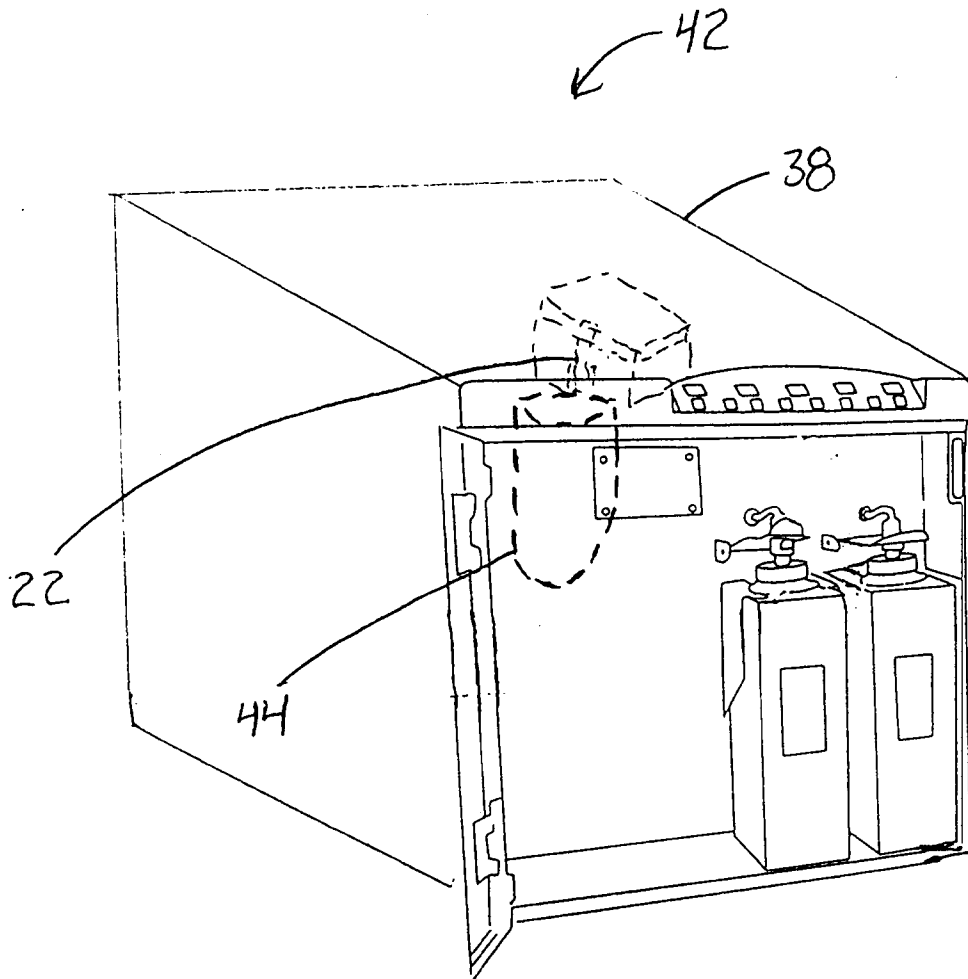


Fig. 3A

Prior Art

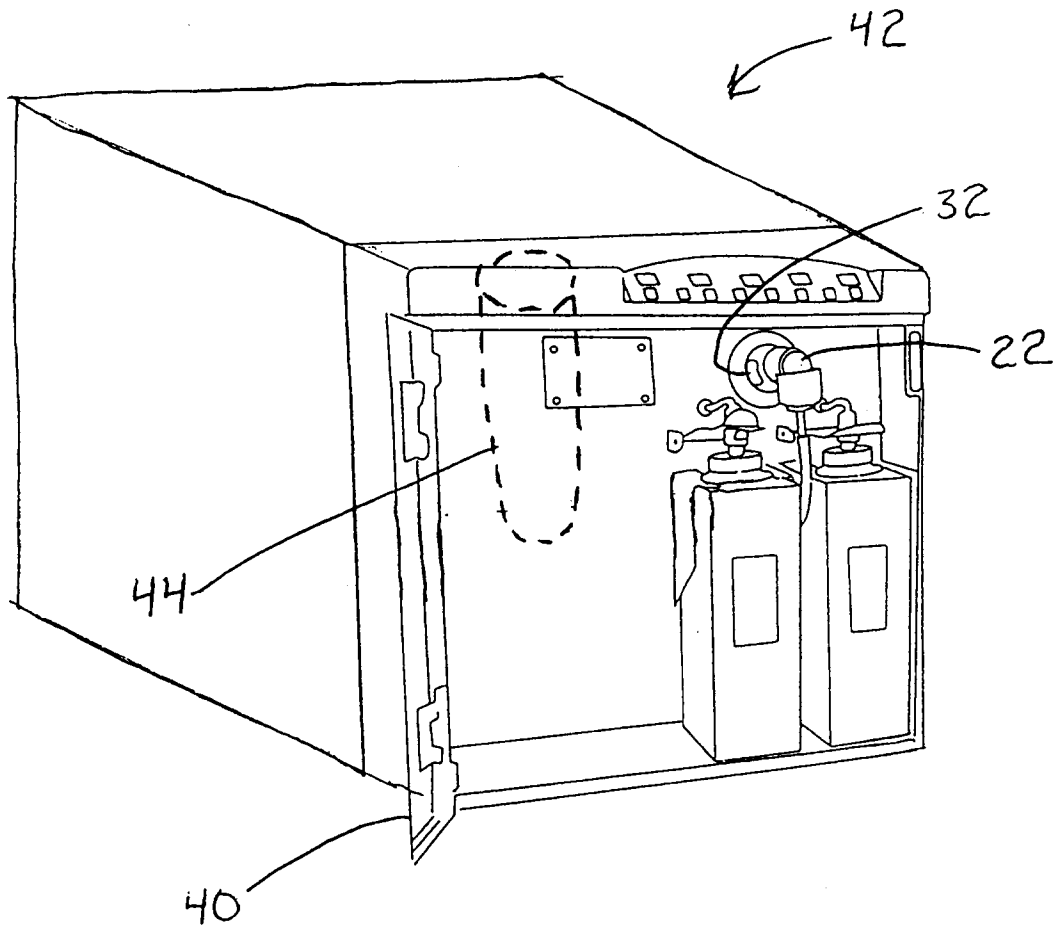


Fig. 3B