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WHITE PRINTHEADS (OR PURGERS) REMOVAL ROUTINE TO REDUCE INK SPILL

HP INC

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White Printheads (or purgers) removal routine to reduce ink spill

Abstract

In some printers, a printhead receives a stream of a printing fluid from an intermediate tank which is supplied with ink from a supply tank. In such a system, printing fluid can be fed from the intermediate tank to the printhead using an air pump to pressurize the supply of ink by pressurizing the air volume inside the tank.

During a printhead replacement, in order to reduce the ink spill, the pressure of the air is decreased by deactivating the air pump and activating a pressure relief valve, hence reducing the pressure of the ink. Nevertheless, when the intermediate tank is full of ink, the pressure of the ink is high because the bag is pushing the intermediate tank walls. The air pressure and ink pressure can be monitored by pressure sensors.

Color printheads are intended to not be removed from the carriage in normal operation. However, the white printhead usage is lower than Color printhead usage and are recommended to be taken out after printing and moved to an external maintenance device to keep printhead health and to save on ink waste due to servicing. Therefore, increasing the chances of having ink spill when the printheads are removed.

In some printers, during the start-up the ink delivery system is purged by using a gas purger (instead of a printhead) fluidically connected to the fluid connector of the mounting structure in the ink delivery system, which allows to evacuate air or any other gas that may be present in the ink delivery system.

Due to the chemical properties of the white ink, it is necessary to recirculate the ink to avoid issues related with ink settling onto the Ink Delivery System components. This problem is solved by a system that allows the ink recirculation, which typically includes multiple supply tanks to recirculate the ink between these cartridges and the intermediate tank.

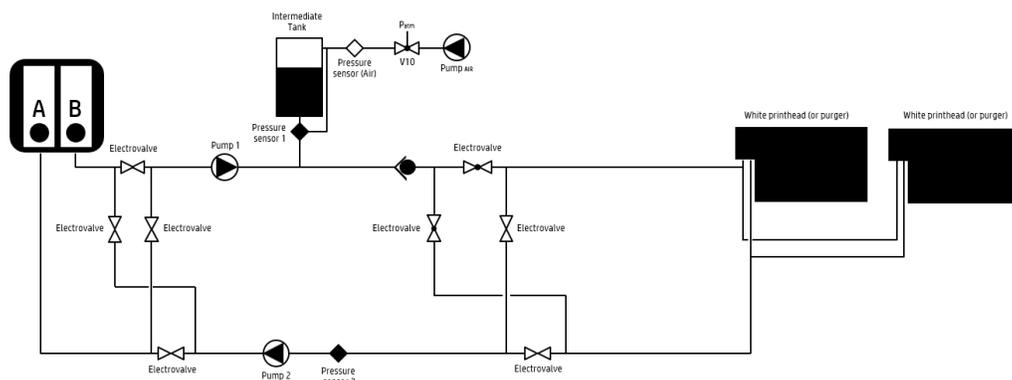


Figure 1. Schematics of an Ink Recirculation Delivery System with an Intermediate

This invention describes a process to reduce the chances of having ink spill when removing the White printheads from the carriage (or the purgers during the start-up). The invention takes advantage of the Ink Recirculation System of the printer to move ink from the intermediate tank to the supplies tank in order to reduce the pressure of the ink.

The pressure of the ink is being monitored to ensure that the printheads are removed within a certain ink pressure, which minimizes the chances of having ink spill if ink pressure is too high, but also a minimum ink pressure to avoid air ingestion when removing the printheads.

When a White printhead replacement is triggered, (or purger removal during the start-up), the pressure of the ink on the intermediate tank is checked. If the pressure of the ink is higher than a certain threshold, the ink from the intermediate tank is moved to one of the supplies tanks, reducing the ink pressure.

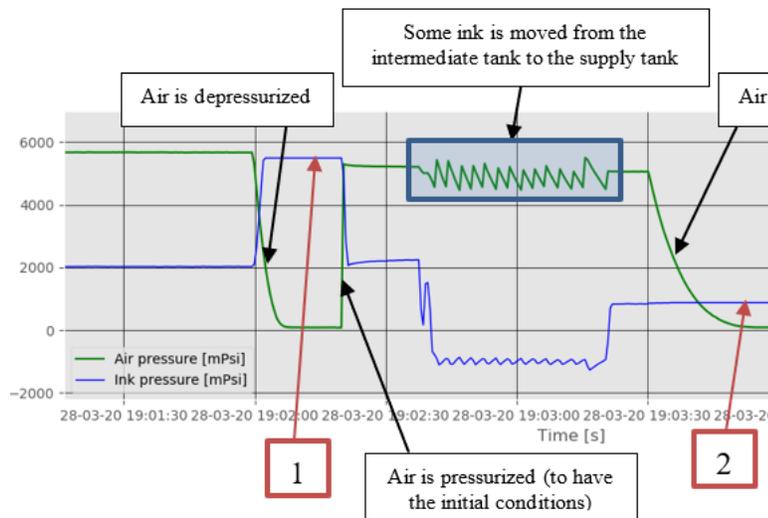
When the pressure target is reached, the movement of the ink from the intermediate tank to the supply tank is stopped. Then, the pressure of the air is decreased by deactivating the air pump and activating a pressure relief valve, hence reducing the pressure of the ink.

Since the pressure of the ink has been reduced prior to depressurizing the air, final ink pressure is lower.

The following graphs shows the comparison of the ink pressure after having depressurized the air of the intermediate tank with the intermediate tank full of ink (point 1), and the ink pressure having moved a certain amount of ink to the supply tank prior to the depressurization of the air of the intermediate tank (point 2)

- Air pressure: plots the pressure of the air inside the Intermediate tank respect the atmospheric pressure.
- Ink pressure: plots the pressure of the ink measured by the pressure sensor respect the pressure of the air on the intermediate tank.

1. The pressure of the ink after depressurizing the intermediate tank is 5.5 Psi.
2. Some ink is moved from the intermediate tank to the supply tank. Then, the pressure of the ink after depressurizing the intermediate tank is 0.8 Psi.



The advantages of the invention are as follows:

- Customer experience: reduce the chances of ink split over the carriage when the White printheads are removed (or the purgers during the start-up), having a direct impact not only on the perception of the customer, but also can lead to malfunction is the ink is settled on the electronic located on the carriage.
- Automatic process: it does not require extra operations to be done by the customer.
- Cost: this solution does not imply to modify the current hardware of the printer. The solution will be implemented by a firmware upgrade.

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