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MULTIPLEXING INK SUPPLY SLOT DETECTION

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Multiplexing Ink Supply Slot Detection

Abstract

In all inkjet printers the ink cartridges are arranged in a slot array where is required to insert each ink supply (cartridge containing ink of a certain colour) on the right slot position. Installing an ink cartridge in the wrong slot may lead to the mixing of different ink colours inside the printer's ink delivery system causing a severe service issue which basically consists of purging and cleaning all the internal ink tubes.

The innovation presented in this paper takes advantage of the electrical circuitry to allow the printer to identify the ink supply and verify that it has been inserted in the right slot with no need of mechanical features before pumping the ink into the printer.

Background

The ink supply position is fixed by design according to the customer expected needs and cannot be changed. All printers for the same model bring the supplies in the established order.

HP ink supplies are provided with a supply memory device which stores all the parameters required to identify the supply: type, serial number, manufacturing date... This chip is accessed by the printer during the printer power-up and the supplies replacement workflow to verify which supplies are available before start printing. While this mechanism only verifies the available inks, the correct insertion of an ink supply in the correct slot relies on other strategies. Prior solutions in HP printers include colour labels, mechanical lock-outs or even complex electronic circuits. Note that the use of mechanical features (in the printer and in the supply) require different mechanical parts for each ink reference.

Description

This invention is based on a multiplexed circuit currently used to isolate the communications between the printer (micro-controller) and each of the supply memory devices. This architecture allows ink supply hot-swapping on the HP industrial printers which includes intermediate ink tanks. Thanks to this hardware circuit each supply can be removed while the printer is doing a plot without the need to stop.

Proposed invention takes the advantage of this circuit by sending the right supply memory device detection command on each channel. Firmware algorithm fixes the electrical path on the multiplexor pointing to the desired ink supply slot, the addressing command to the expected supply memory device is sent. If device acknowledge is detected means that supply is present and correct.

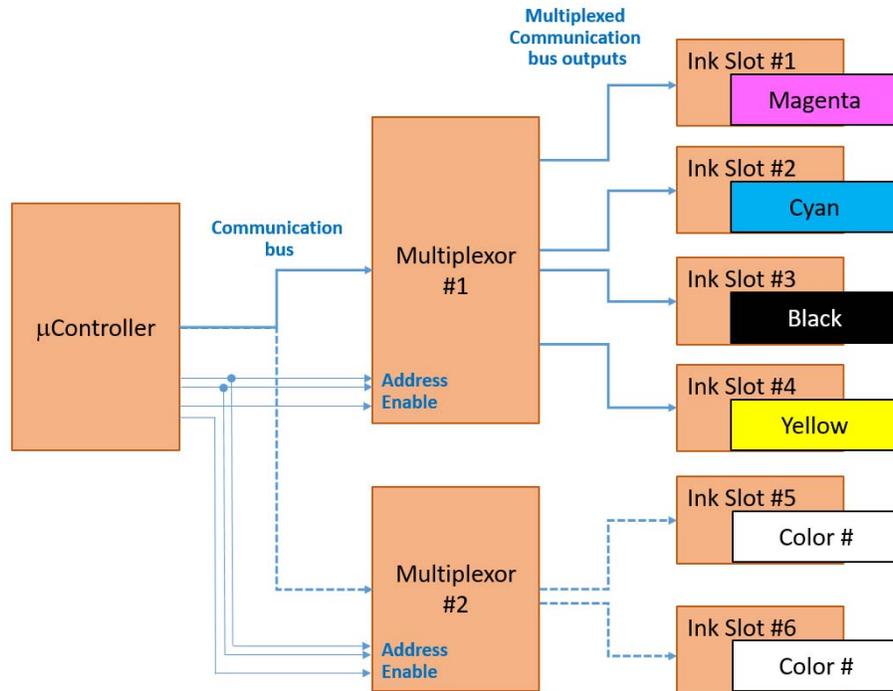


Figure 1. General Multiplexed ink supplies memory device communication bus.

A Microcontroller is in charge to address the multiplexor, enable the path and sending the proper command to the expected supply memory device. Each supply includes a supply memory device with a different communication address depending on the colour. If the command is not addressing the right supply colour the acknowledge is not reported.

By multiplexing ink slots one by one and sending the different supply memory device addresses can be detected any colour on any slot, also if the slot is empty. Once the Microcontroller detects the supply can give indication of the position, errors, required movements, ...

The normal printer operation starts once all the detections are done ensuring all the supplies are located on the right position.

Conclusions:

The design described in this paper can detect if the ink supply is inserted on the right slot and give indications to the customer to change the mistaken one. Additionally, the following advantages are achieved:

- Allows Ink Supply detection on the printer supply slots before start pumping.
- Diagnostic can be implemented on front panel giving advice of insertion mistake with indication of which slot is mistaken and the right position for that supply.
- Mechanical lockouts could be removed on color inks on both sides, printer slots and supplies.
- Same mechanical part design for all the ink supplies and ink supply slots reducing the number of parts and increasing quantities for the same part number use.

- Moving the identification of the ink supply slot from "mechanic" to "electronic", increases the supply security against counterfeiting.
- Global design saves costs, reduces the parts stockage and the number of service kits.

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