DESCRIPTION

Storage System and Printing System

The invention relates to a storage system for storing and providing printing compound for a printing device, in particular for printing on planar substrates, comprising at least one container, which is formed for storing a liquid printing compound, and comprising at least one carrier, on which the container can be detachably arranged.

The invention furthermore relates to a printing system for printing on planar substrates, in particular circuit boards, solar cells, or wafers, comprising at least one print head, in particular dispenser, for applying printing compound to the substrates, wherein the print head can be connected or is connected to a container providing a printing compound, and comprising a storage system, which has at least one container, which is formed for storing a liquid printing compound, and at least one carrier, on which the container can be detachably arranged.

Storage means and printing systems of the above-mentioned type are already known from the prior art. The printing on planar substrates with different printing compounds, such as, for example, color or electroconductive paste, is already known, for example, from the circuit board technology or solar technology. Due to the fact that the same printing compound is not always used in known printing devices, it is necessary to store the different printing compounds in containers, which are suitable for this purpose, and, if required, to connect the respective container to the print head or the printing means, respectively, so that the printing compound can be extracted from the container and can be applied to the substrate. It is one option to permanently connect the print head to several containers, in order to be able to promptly access different printing compounds. This, however, requires an installation space-intensive print head comprising a complex cabling and wiring. Solutions with exchangeable containers are thus preferred. So that the container can be stored safely outside the printing means or the print head, storage means are known, which have a carrier matching the container, so that the container can be arranged safely on the carrier and can be extracted out of or from the container, if required

lamellar curtains, is also conceivable in the region of the opening, in order to close the latter at least for the most part, and to thus protect the internal space against the climate in the surrounding area of the housing. The opening is preferably formed in its side wall and/or ceiling wall of the housing.

According to a preferred embodiment of the invention, all of the carriers of the storage magazine are formed identically. All of the carriers thus serve the purpose of receiving identically formed containers. The system can thus be used easily and different printing compounds can be filled into the containers. A simple exchange as well as an optimized utilization of the installation space are thus securely ensured.

The conveyor belt is in particular formed so as to circulate in a horizontal plane, so that by driving the conveyor belt, the containers are likewise displaced or shifted, respectively, in the horizontal plane. The containers are thus always located next to one another in the storage magazine, and a collision of adjacent containers is securely prevented. According to an alternative embodiment, the conveyor belt runs in a plane, which is inclined to the horizontal plane, whereby the carriers can then be rotated relative to the conveyor belt, in order to maintain the alignment of the containers independently of the position along the course of the conveyor belt, so that it is ensured that printing compound cannot escape from one of the containers. Each container preferably has a closing element or a cover, which closes a filling and/or removal opening for the printing compound. Each container of the system optionally has an actuatable valve, which allows for an automatic connection of the container to a print head.

It is preferably furthermore provided that each carrier has a V- or U-shaped receptacle, which is open on the edge side. The containers can thus be introduced laterally or on the edge side, respectively, into the respective carrier, and do not have to be inserted completely, for example, into the carrier from the top. A simple inputting and removal of containers is thus ensured at the carriers of the storage magazine.

The storage means preferably has several containers, which are likewise formed identically, so that each container securely cooperates with each carrier. The respective container preferably has a guide section, which can be inserted into the receptacle, and a holding section, wherein the holding section has at least one holding protrusion, which protrudes laterally beyond the guide section, for placement on the carrier. With the guide section, the container can thus be inserted with the edge side laterally or based on a central axis of the container, radially, respectively, into

the receptacle of the respective carrier, in order to subsequently deposit or place, respectively, the container with the holding section onto the carrier. For this purpose, the holding protrusion has a width, which is larger than the inside diameter of the receptacle of the carrier, so that the container can be arranged securely on the carrier.

The holding protrusion is particularly preferably formed as collar extending over the circumference of the container. It is thus ensured that, independently of a rotational position of the container about its longitudinal central axis, the container can always be fastened securely to the carrier because the collar can be deposited onto the carrier on the edge of the receptacle, independently of the rotary position.

The container particularly preferably has a circular cross-section, so that it is formed in the shape of a circular cylinder or of a test tube and can be mounted securely to the carrier at any time. The containers are in particular formed as printer cartridges, which can be inserted into a print head or a printing device.

It is furthermore preferably provided that in the housing at least one sensor for detecting at least one state value of a printing compound in one of the containers is arranged. The sensor thus serves the purpose, for example, of determining the fill level of the printing compound in a container arranged on a carrier. It is preferably furthermore provided that at least one sensor is formed to determine a quality of the printing compound, for example with respect to a color particle density or a moisture value or an aging state.

For this purpose, the sensor is in particular formed as light sensor or fill level sensor. The sensor is thereby in particular arranged and firmly positioned in the housing, so that the containers comprising the printing compounds can be conveyed past the sensor by driving the conveyor belt, so that a sensor process is always performed in the same place in the housing.

Particularly preferably, each container has an identification means, and the storage magazine has at least one reader for detecting an identification of the respective container provided by the identification means. The identification means is formed, for example, as optically detectable identification feature, such as, for example, as barcode, DMC code (data-matrix code), or QR code (quick response code). The identification means is preferably formed as RFID chip (RFID – radio frequency identification), so that a contactless detection, which forgoes optical means, of the identification of the respective container is possible. With the use of an RFID chip, it is moreover

at least the deflection roller 22 has an outer toothing corresponding to the teeth of the toothed belt, in order to ensure a secure torque transmission to the toothed belt.

By means of a shaft guided through the guide plate 21, the deflection roller 22 is connected in a rotationally fixed manner to a drive motor 24, which is arranged below the guide plate 21 and thus between the housing bottom and the guide plate 21. The drive motor 24 is formed in particular as electric motor. By means of electrically controlling the drive motor 24, the conveyor belt 4 can thus be set into motion, so that it runs in a ring-shaped manner around the deflection rollers 22, 23.

A guide element 45, which ensures that the toothed belt follows a provided track in the region between the deflection rollers 23, preferably lies between the deflection rollers 22, 23. The element 25 serves in particular as spacer between the conveyor belt sections of the conveyor belt 4, which run in opposite directions, during operation.

As shown in Figure 3, several, in the present case ten carriers 5, are arranged on the conveyor belt 4. Due to the fact that the conveyor belt 4 runs in a ring-shaped manner in a horizontal plane, all of the carriers 5 are arranged on the outer side of the conveyor belt 4 and in particular evenly spaced apart from one another – viewed in the direction of extension of the conveyor belt 4. While there are ten carriers 5 according to the present exemplary embodiment, the storage means 1 can obviously also have more or fewer carriers 5.

Figure 3 thereby shows the storage means 1 on the side of the housing 2 facing away from the opening 7. In particular on the front side of the conveyor belt 4 facing away from the drive motor 24, several sensor means 25 to 27”’ are optionally arranged, which serve the purpose, for example, to determine a fill level of printing compound in the respective container 6 or a quality of the printing compound. According to the present exemplary embodiment, the sensor 25 is formed for the container or cartridge detection, respectively, in particular for detecting the presence of a cartridge and/or of its fill level. The sensor 26 is in particular formed as barcode reader, which serves the purpose of reading a barcode applied to the respective cartridge or the respective container 6, respectively. The sensor 27’ is preferably formed as reader and/or writer for RFID chips or tags. The sensor 27’ is thereby assigned to the top side of the carriers 10, in order to read or to write RFID chips arranged on the carriers 10. A further sensor means 27” is alternatively or additionally provided and is likewise formed as reading and/or writing means for RFID chips, which are then arranged or can be arranged on the respective container 6 in this case. A further

CLAIMS

1. A storage system (1) for storing and providing printing compound for a printing device (37), in particular for printing on planar substrates, comprising at least one container (6), which is formed for storing a liquid printing compound, and comprising at least one carrier (5), on which the container (6) can be detachably arranged, **wherein** it has a storage magazine comprising several carriers (5) and comprising several containers (6), wherein the carriers (5) are fastened to a circulating conveyor belt (4), wherein at least one controllable drive motor (24) for driving the conveyor belt (4) is assigned to the conveyor belt (4), **characterized in** that the conveyor belt (4) comprising the carriers (45) is arranged in a housing (2), and that the housing (2) has at least one opening (7) at a transfer point, through which the container (6) can be fastened to one of the carriers (5) or can be removed from one of the carriers (5), that a closing element is assigned to the opening (7), by means of which the opening (7) can be closed completely, and that, apart from that, the housing (2) is formed to be closed.

2. The storage system according to any one of the preceding claims, **characterized in** that all of the carriers (5) are formed identically.

3. The storage system according to any one of the preceding claims, **characterized in** that the conveyor belt (4) is formed so as to circulate in a horizontal plane.

4. The storage system according to any one of the preceding claims, **characterized in** that each carrier (5) has a V- or U-shaped receptacle (11), which is open on the edge side.

5. The storage system according to any one of the preceding claims, **characterized in** that the respective container (6) has a guide section, which can be inserted into the receptacle (11), and a holding section, wherein the holding section has at least one holding protrusion, which protrudes laterally beyond the guide section, for placement on the carrier (5).

6. The storage system according to any one of the preceding claims, **characterized in** that the holding protrusion (18) is formed as collar (19) extending completely over the circumference of the container (6).

7. The storage system according to any one of the preceding claims, **characterized in** that the container (6) has a circular cross-section.

8. The storage system according to any one of the preceding claims, **characterized in** that all of the containers (6) are formed identically.

9. The storage system according to any one of the preceding claims, **characterized in** that in the housing (2) at least one sensor (27) for detecting at least one state value of a printing compound in one of the containers (6) is arranged.

10. The storage system according to any one of the preceding claims, **characterized in** that the sensor (27) is formed as light sensor, fill level sensor, or matrix scanner.

11. The storage system according to any one of the preceding claims, **characterized in** that each container (6) has an identification means (36), and that at least one reader for detecting an identification feature provided by the identification means (36) is assigned to the conveyor belt (4).

12. The storage system according to any one of the preceding claims, **characterized in** that at least one holding-down device (28) having a run-on slope is arranged above the conveyor belt (4) and is assigned to the carriers.

13. The storage system according to any one of the preceding claims, **characterized in** that a transport means (43), in particular a dispenser (39) of a printing device (37), which is formed to extract a container (6) from a carrier (5) of the storage magazine and to deliver it to a printing device (37), and to extract a container (6) from a printing device (37) and to arrange it on a carrier (5) of the storage magazine (3), is assigned to the storage magazine.

14. A printing system for printing on planar substrates (42), in particular circuit boards, solar cells, or wafers, comprising at least one print head (38), in particular dispenser, for applying printing compound to the substrates (42), wherein the dispenser (39) can be connected or is connected to a container (6) providing a printing compound, and comprising a storage system (1), which has at least one container (6), which is formed for storing a liquid printing compound, and at least one carrier (5), on which the container (6) can be detachably arranged, **characterized in** that the storage system (1) is formed according to any one of claims 1 to 13.

15. The printing system according to claim 14, characterized in that the dispenser (39) forms a transport means (43), by means of which a container (6) can be extracted from the storage system (1) or can be delivered to the storage system (1).