DESCRIPTION

Screen Provision System

The invention relates to a screen provision system - in particular, for a printing device, and, in particular, a 3-D screen printing device - having a screen receptacle for a printing screen and a squeegee device associated with the printing screen.

Printing devices which apply a material layer having a structure determined by the printing screen to a substrate by means of a squeegee device and a printing screen - also referred to as a printing mask - are known from the prior art. For example, in order to produce printed circuit boards, it is known to print electrically-conductive structures onto a printed circuit board substrate by means of such a printing device. The use of the printing screen has the advantage that the structures can be applied multiple times to several substrates or even to one substrate in a simple manner. Time and cost advantages are key. An alternative to this is to apply conductor track structures in a targeted manner by means of a spray nozzle, this being disadvantageous in terms of time and cost compared to the aforementioned printing device.

A disadvantage of screen printing devices is that different printing screens have to be used for the production of different structures. This means an increased outlay for the user because he has to replace the printing screen, clean it, and exchange it with a new printing screen which has to be refilled.

The aim of the invention is to provide a screen provision system which reduces the processing time, improves material utilization, and ensures a reliable printing process.

Summary

According to an aspect, the present disclosure refers to a screen provision system - in particular, for a printing device - which has a screen receptacle for a printing screen and a squeegee device which is associated with the screen receptacle, having a conveying device for conveying a printing screen, having at least one screen magazine which has multiple screen storage portions that can each receive a printing screen, and, in particular, having at least one treatment station for treating the printing screens, wherein the conveying device supplies printing screens to the

screen magazine and, in particular, to the at least one treatment station.

The aim underlying the invention is achieved by the provision device having the features of the above aspect. This has the advantage that a printing screen is automatically made available for a printing process - in particular, for a printing of three-dimensionally-shaped structures - and, moreover, preparatory and post-processing steps are facilitated and, in part, completely avoided. As a result, the throughput of the printing device can be increased and the load on the user reduced, thereby not adversely affecting the printing result or the printing quality.

In an example, the screen provision system according to the present disclosure is characterized in that it comprises a conveying device for conveying a printing screen in each case, and at least one screen magazine

which has multiple screen storage portions for receiving a printing screen in each case, and, in particular, at least one treatment station for treating the printing screens, wherein the conveying device is designed to supply the at least one screen magazine and, in particular, the at least one treatment station with printing screens. The screen provision system thus has a screen magazine for receiving multiple printing screens. It is thus possible to store a plurality of identical and/or different printing screens in the screen magazine if they are not needed for a printing process at the moment. This centralized storage ensures simple handling of multiple printing screens. Preferably, the printing screens have markers and the screen magazine a recognition means for detecting the presence and position of printing screens in the screen magazine, so that, if necessary, the desired printing screen can be removed from the screen magazine in a simple manner. In particular, existing printing screens can, in particular, be pre-treated or post-treated by the at least one treatment station in order to make the printing process of a printing device efficient. In particular, the treatment station is designed to take over activities otherwise the responsibility of the user and thereby simplify a printing process. Because the conveying device reaches or supplies both the treatment station and the screen magazine, the printing screens can be brought automatically by means of the conveying device from the screen magazine to the treatment station and vice versa, so that the pre- or after-treatment of a printing screen takes place automatically. Moreover, storage in the screen magazine has the advantage that cleaning of a printing screen does not necessarily have to take place after a printing process has been carried out. Instead, the printing screen is stored in the screen magazine with residues of printing compound remaining thereon until it is again required for a printing process with the same printing compound. A cleaning step can thereby also be completely dispensed with.

In a preferred example of the invention, the screen provision system has a screen usage station which can be supplied by the conveying device with the printing screens. In this context, the screen usage station is understood to mean a station in which the screen is supplied to its actual destination. The user therefore does not have to remove a screen from the screen magazine himself and, for example, feed it to a printing device. Rather, a printing screen is automatically provided to the user and/or a printing device. Alternatively, the screen magazine is designed in such a way that the user himself removes a desired printing screen there. For this purpose, the screen magazine can be open on two sides, for example, wherein, on one side, the conveying device has access to the printing screens, and, from the other side, the users.

In a preferred example of the invention, the screen usage station is a screen removal

station for the user. The respectively selected printing screen is thus made available to the user at the

removal station, so that he does not himself have to search for the appropriate printing screen in the magazine. In particular, the removal station has a screen storage portion in which the conveying device can store the selected printing screen for removal.

In an alternative example of the invention, it is preferably provided that the screen usage station be a printing device. The conveying device is thus designed to supply a selected printing screen directly to a printing device for performing a printing operation. In particular, the conveying device is designed to insert the selected printing screen into the screen receptacle of the printing device or to arrange it there, so that a printing process can subsequently be carried out automatically. In particular, the printing device is designed for printing three-dimensionally-shaped structures, for which purpose the print head and/or a printing table can be adjusted in height, so that several layers of material can be produced by the screen printing. By an automated exchange of the printing screens, different three-dimensional structures are produced fully automatically in a simple manner.

A preferred further development of the invention provides for several screen magazines to be present. The number of storable printing screens is thereby increased, and the variance in the production of, in particular, three-dimensional printing structures is achieved. Advantageously, all screen magazines can be reached by the conveying device.

Preferably, at least one of the screen magazines or the at least one screen magazine has a conditioning device designed to generate and maintain a climate in the screen magazine, which prevents a drying of printing compound remaining on a printing screen. The conditioning device ensures that printing screens which are also in the screen magazine for a longer time and still have residues of printing compound can be reused without first having to be cleaned and filled again completely with printing compound. This both reduces the material consumption and shortens the processing time.

The conditioning device preferably has at least one humidifier and/or dehumidifier, by means of which the air located in the screen magazine can be humidified or dehumidified in order to establish an optimal climate in the screen magazine for the respective printing compound. If several screen magazines are present, several screen magazines can also each have a conditioning device, wherein the conditioning devices can then be designed to be different or identical, but can be operated differently. In this way, it can be achieved that, in each screen magazine, an optimal climate for the printing screens located there can be set. In particular, print

height. For this purpose, there is, preferably, a lifting device in the screen magazine by means of which the screen storage portions can be raised or lowered in order to assign a selected printing screen to the removal opening or to assign an empty screen storage portion to the removal opening so that it can be covered with a printing screen.

According to a preferred development of the invention, several treatment stations are present. These are all supplied by the conveying device. Different treatment steps can thereby be carried out by the screen provision system.

In particular, at least one treatment station is designed as a printing screen cleaning station. For this purpose, the printing screen cleaning station preferably has cleaning means by which a printing screen can be completely cleaned of any printing compound possibly remaining thereon. If, for example, it is known that a specific printing screen need no longer be used for a longer period of time, and there is the risk that aging of the printing compound remaining on the printing screen is to be feared due to the long period of time, the printing screen is fed by the conveying device to the screen cleaning station, cleaned, and deposited in the screen magazine.

According to a preferred example of the invention, it is further provided that at least one treatment station be designed as a printing screen filling station, which serves to fill a printing screen with a desired printing compound before the printing screen is fed to the printing device. The effect achieved by this is that the printing compound outside the printing device is dispensed onto the printing screen. This also ensures that different print materials are applied to the print screens in a reliable manner. In particular, the printing screen filling station has tanks for storing different materials for printing the printing screens. An intermediate step, such as the manual filling of a printing screen, can thus be dispensed with, and a mechanism in the printing device itself, which otherwise performs the filling of a printing screen, can also be dispensed with, whereby the printing device can be implemented in a space-saving, compact, and also cost-effective manner.

Furthermore, it is preferably provided that at least one treatment station be a control station. In particular, the control station is designed to measure a printing screen and to compare a structure/pattern predetermined by the printing screen with a reference pattern in order to detect damage to the printing screen. If damage is detected, the printing screen is no longer put back into the screen magazine, but instead is set aside. For this purpose, the control station preferably has a camera device for detecting the printing pattern or the structure, and a memory in which

the reference pattern of the provided printing screens is stored in order to easily detect damage and/or a state of the respective printing screen by means of a comparison.

Furthermore, in an example, the present disclosure relates to a screen magazine for storing printing screens for a printing device, which has at least one conditioning device for setting or maintaining a climate in the screen magazine, and, in particular, is designed as described above.

The invention shall be explained in more detail below with reference to the drawing. Shown for this purpose are:

Figure 1 an advantageous printing system in a simplified representation,

Figure 2 a screen magazine of the printing system in a simplified representation, and

Figure 3 an exemplary embodiment of a screen provision system for the printing system in a simplified top view.

Figure 1 shows in a simplified side view a printing system 1 having a printing device 2, a screen magazine 3, and a conveying device 4.

The printing device 2 has a printing table 5, which is adjustable in height by a lifting device 6, as indicated by a double arrow 7. Associated with the printing table 5 is a print head 8, which has a squeegee device 9. In addition to a blade, which is not shown here in greater detail, the squeegee device 9 has a screen receptacle 10 in which a printing screen 11 can be arranged. For this purpose, the screen receptacle 10 is designed, for example, as a receptacle into which the printing screen 11 can be inserted - in particular, inserted laterally or horizontally - as shown in Fig. 1. Alternatively, the screen receptacle 10 is designed in such a way that the printing screen 11 can be inserted therein. Optionally, the screen receptacle 10 has controllable clamping elements 12 by means of which the printing screen 11 can be clamped fixedly in the screen receptacle 10 so that, in a printing process in which the blade of the squeegee device 9 is moved over the printing screen 11, the orientation and position of the printing screen 11 does not change.

The screen magazine 3 has a housing 13 and is arranged at a distance from the printing device 2 in the present case. In the housing 13, several screen storage portions 14 are arranged so as to be

CLAIMS

1. Screen provision system - in particular, for a printing device - which has a screen receptacle for a printing screen and a squeegee device which is associated with the screen receptacle, having a conveying device for conveying a printing screen, having at least one screen magazine which has multiple screen storage portions that can each receive a printing screen, and, in particular, having at least one treatment station for treating the printing screens, wherein the conveying device supplies printing screens to the screen magazine and, in particular, to the at least one treatment station.

2. Screen provision system according to claim 1, characterized by a screen usage station which can be supplied by the conveying device with the printing screens.

3. Screen provision system according to one of the preceding claims, characterized in that the screen usage station is a screen removal station for users.

4. Screen provision system according to one of the preceding claims, characterized in that the screen usage station is the printing device.

5. Screen provision system according to one of the preceding claims, characterized in that multiple screen magazines are present.

6. Screen provision system according to one of the preceding claims, characterized in that at least one of the screen magazines has a conditioning device which is designed to generate or maintain a climate in the screen magazine which prevents a drying of printing compound remaining on a printing screen.

7. Screen provision system according to one of the preceding claims, characterized in that the conditioning device has at least one humidifier and/or dehumidifier.

8. Screen provision system according to one of the preceding claims, characterized in that the conditioning device comprises at least one cooling device and/or one heating device.

9. Screen provision system according to one of the preceding claims, characterized in that at least one screen magazine has at least one closing element which can be displaced in order to release or close a housing enclosing the screen storage portions.

10. Screen provision system according to one of the preceding claims, characterized in that at least one screen magazine has at least one sliding device for advancing a selected printing screen and/or a screen storage portion.

11. Screen provision system, according to one of the preceding claims, characterized in that multiple treatment stations are provided.

12. Screen provision system according to one of the preceding claims, characterized in that at least one treatment station is designed as a printing screen cleaning station.

13. Screen provision system according to one of the preceding claims characterized in that at least one treatment station is designed as a printing screen filling station.

14. Screen provision system according to one of the preceding claims, characterized in that at least one treatment station is a control station.