

On-demand Transcript Foil Print Technology for Smart-Phone Decoration

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Abstract

Recently, the spread of a smart phone is especially remarkable though the portable terminal is widespread. On the other hand, the diversity of the commodity is requested, and there are a lot of demands of the color variation of the product as for the market, too. Moreover, the demand of the decoration of a metallic color has increased in the market.

There are three needs in the decoration of a smart phone. The first is a part around the screen on the surface of the touch panel and a decoration of the logo. The second is a decoration of the back cover of the battery cover. The third is a decoration of a hard case to cover the whole to the purpose as for protection from the dropping impact of a smart phone. For this demand, we have developed totally dry, environment-friendly and small-footprint digital printing machine which is characterized by its Foil printing. It achieved it in the decoration of the surface of the touch panel of the first demand by decorating Anti scattering film. Moreover, because the 2nd and 3rd demand was three-dimensional the shape, the decoration with 3D transcript was achieved by 3D heat transcript method with an expanding film. Moreover, it was necessary to avoid the electromagnetic interference in the metallic color decoration with portable telecommunications equipment. We made the ribbon of metallic ink of non-conductive for this problem, and achieved the method of the decoration with the on-demand. As a result, we achieved the on-demand decoration of a smart phone, and came to be able to meet diversified needs.

Introduction

Thermal transfer printing is totally dry process and is the printing technology with simple structure and high reliability. It doesn't choose the transfer material such as pigment. Likewise, it could utilize the material used in gravure printing which is the most major method of In-mold and Hot stamp foil printing and reproduce the output in dry process without losing the characteristics. In addition, Metallic ink such as Foil which is mandatory for exterior parts decoration could be printed. We have developed seven colors tandem system also capable to print spot colors aiming to achieve both productivity and versatility which is required in business use product while making best use of these characteristics of thermal transfer.

On the other hand, diversity is requested with the spread in a smart phone that grows up rapidly recently, and needs of the color variation and the metallic color decoration have extended. The method of printing small - volume production in great varieties is necessary to meet needs of the on-demand of the decoration. However, it is not possible to make it to the on-demand in the print method so far. Moreover, a metallic color cannot be decorated with the widespread IJ printer. Moreover, there is electromagnetic

interference for the metal and Non-conductive Vacuum Metallization is needed. We achieved the on-demand decoration of a smart phone by using thermal transfer printer for this problem. Moreover, the back cover of a smart phone and the decoration of the curved surface of a hard case applied 3D heat transcript method and achieved the on-demand decoration by the combination with thermal transfer printer.

On-demand Thermal Transfer Tandem Printer

First, figure1 explains outline structure of printing system we developed this time. Printing film will be fed in roll form and winded after passing drum platen. Seven printing heads are allocated radially on drum platen. Drum platen rotates and film will be fed. Printing head will be applied one by one accordingly to the transferred film and print on it. One color ribbon is arranged in each head. In the head resolution, 600dpi and the width of the print are six inches. The print speed can be printed with one inch/sec by the density of 175LPI of an equal offset lithography. Print result is shown in figure2. It realizes equal print quality with the offset printing shown as comparison.

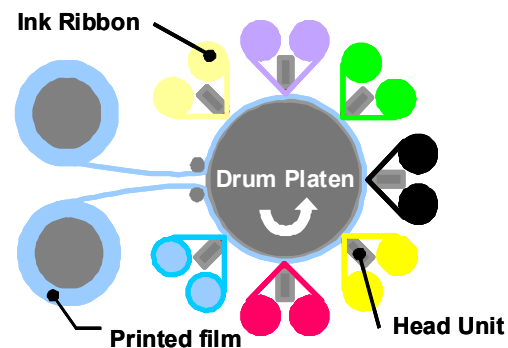


Figure1. On-demand Thermal Transfer Tandem Printer

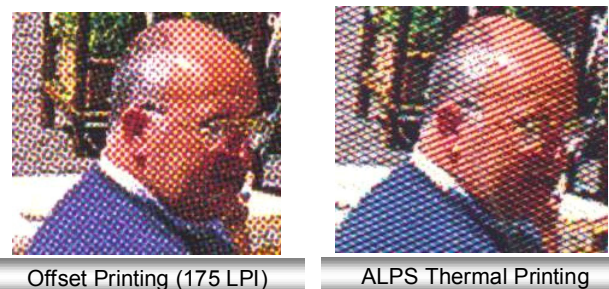


Figure2. Comparison between offset printing and thermal printing

Smart phone decoration

Decoration on touch panel

The decoration of the touch panel is printed on the picture frame in the part around the display with the logo and the product name. (figure3) The purpose of this is to conceal the wiring pattern and the flexible printed wiring board built into the picture frame. The place where the decoration print of the touch panel is done is the back of the window glass, and it prints with a screen printing so far. Moreover, Anti scattering film (ASF) is applied to the crack of the window glass of the touch panel.

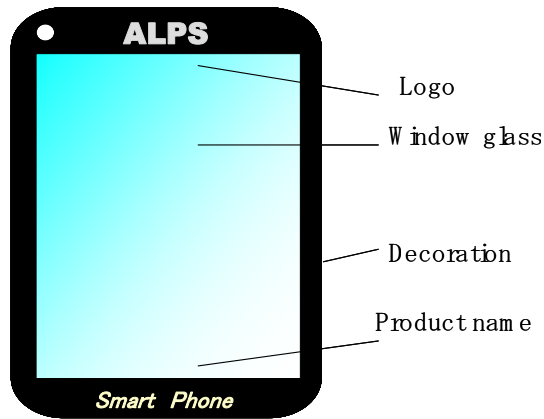


Figure3. Decoration on touch panel

Anti scattering film (ASF) decoration

The touch panel is decorated with the screen printing on the back side of the window glass. The on-demand print is needed for the decoration needs of the color variation in the future. We achieved the on-demand print by giving ASF the print for this problem, and using the method of pasting to the surface of the window glass with an optical paste. The cross section structure is shown in figure4. The surface of ASF is a hard court for the scratch measures and the fingerprint prevention processing. And, it prints with thermal transfer printer on the back side of this ASF. The decoration of the window glass is achieved by dividing the printed film into the size of the panel, and bonding to the glass with an optical paste. The decoration of the touch panel is completed by bonding the window glass to the sensor of the touch panel. Because the ink of the thermal transfer printer is thin film ink spread on the radical material of the ribbon, the thickness of about 1/10 is more possible than the ink of the screen printing. When ASF was decorated with a past screen printing, it was necessary to lose the step of ink. It was possible to achieve it easily in the thermal transfer printer compared with the screen printing. The window glass by the ASF decoration is shown in figure5.

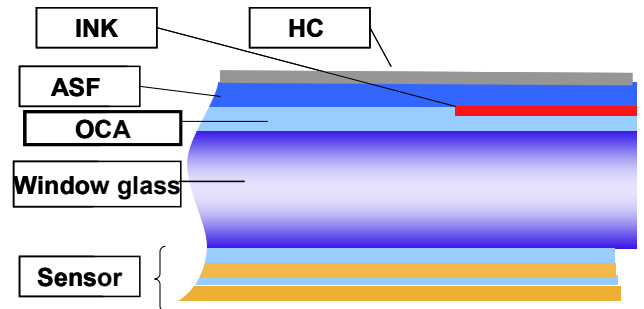


Figure4. Cross section structure of touch panel

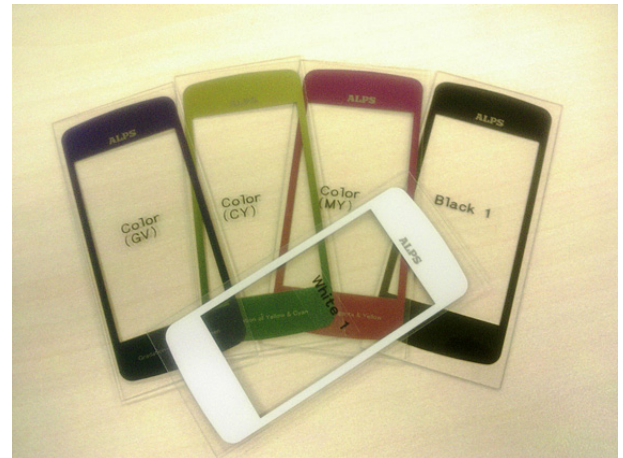


Figure5. The window glass by the ASF decoration

Decoration of the back cover (the battery cover) and hard case.

Needs of the color variation have extended to the back cover as well as the decoration on the touch panel side. Moreover, various patterns are printed and put on the market as for a hard case. The on-demand print of these is needed in small-volume production in great varieties. We achieved for this problem by using 3D heat transcript method with an expanding film printed by the thermal transfer printer.

3D heat transcript method

The outline of 3D heat transcript method is shown in figure6. In 3D heat transcript method, it is possible to transcribe it on the surface of the molded product. The trimming is unnecessary in case of the transcript. An unnecessary part can be removed only by peeling off the base film as well as a general, hot stamp when 3D transcript film is used. In 3D heat transcript method, the turn crowding to complex shape and the back is possible, and the preprocessing and post processing are unnecessary methods.

3D transcript film printed with the thermal transfer printer is positioned in the upper part of the molding products and it sets it up in the device. The sticking transcript is done as the transcript film expanding along the part surface because it makes to the vacuum in the device, and it does the pressurizing heating. As a result, the decoration is achieved on the surface of the molding

products of 3D shape. The result of decorating the back cover is shown in figure7.

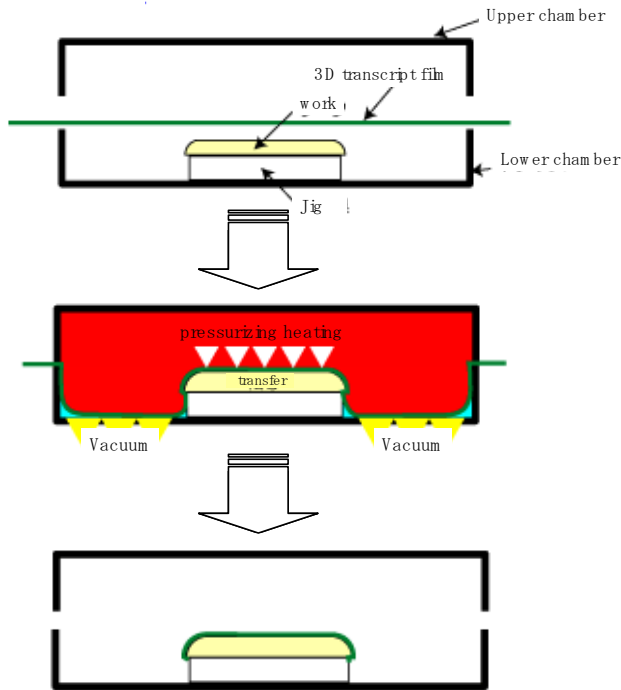


Figure6. 3D heat transcript method

Metallic color decoration

The decoration needs of a metallic color are also high in the decoration of a smart phone. However, it becomes an electromagnetic interference when a usual metallic deposition is transcribed and influence in the communication characteristic. It solved it by making the ink-ribbon using Non-conductive Vacuum Metallization (NCVM) by the tin deposition for this problem. Moreover, tin was able to be transcribed to the molding product by using 3D transfer method. Because tin has the expanding characteristic. As for the decoration of a smart phone, the decoration of a metallic color was achieved in not only the touch panel side but also the back cover and a hard case by applying NCVM.



Figure7. The result of decorating the back cover

Conclusion

It is thought that it will spread more and more in the future and the diversification advances in a smart phone. At the same time, it is thought that the decoration needs of a smart phone extend, and shape and the design change. Recently, small - volume production in great varieties is becoming a trend of exterior parts decoration. We have developed totally dry, environment-friendly and small-footprint digital printing machine which is characterized by its Foil printing. Digital printing is capable to print from 1 sheet and we believe the system we developed will contribute to this needs.

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Author Biography

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