cut to remove unwanted portions of the vinyl media. Generally, products that are produced in this way are stiff and heavy and have relatively slow production speeds when compared with high speed laser or inkjet printing. In addition, such products use environmentally damaging materials in their manufacturing processes such as PVC and solvents.

Yet another method of producing digitally printed heat transfers entails laser-printing a toner printable sheet, pressing an adhesive coated paper to the print such that the adhesive only sticks in the digitally printed areas, and then use those layers in conjunction with an opaque layer as the final transfer decoration. This approach is described in US Patent No. 8,236,122 to Kronzer issued 7 August 2012. Unfortunately, the laminating conditions used in this process have very small tolerances that are difficult to achieve on a regular basis.

Additionally, the processing time to adhere the adhesive to the print is substantial, on the order of 30 seconds per sheet, which cannot compare to the speed of production of a high speed laser or inkjet printing.

What is needed is a method for applying adhesive in a fully-digital printing process.

SUMMARY OF THE INVENTION

Embodiments of the present invention provide a fully-digital -printed heat transfer graphic and method of manufacture, to meet the needs of the market for smaller order quantities and even customized heat transfers produced in a more environmentally friendly way.

Embodiments of the present invention provide a more efficient process for producing a fully-digitally printed heat transfer capable of little to no process changeover between different graphics.

~~According to a first aspect of the present invention, there is provided a process to create printed heat activated transfers for application to soft goods, including the steps of: printing onto one side of a hot melt adhesive film to define printed areas and unprinted areas; transferring the printed hot melt adhesive film to a carrier layer against the print side; laser-cutting the hot melt adhesive film around the unprinted areas; removing the laser-cut hot melt adhesive film from the unprinted areas.~~

According to a first aspect of the present invention, there is provided a process to create printed heat activated transfers for application to soft goods, including the steps of: obtaining a film composed essentially of thermoplastic hot melt adhesive; applying a primer to one side of said hot melt adhesive film; digitally printing directly onto the primed surface of the hot melt adhesive film to define printed areas and unprinted areas; transferring the printed hot melt adhesive film to a carrier layer against the print side; laser-kiss-cutting through the hot melt adhesive film around the unprinted areas; removing the unprinted laser-kiss-cut areas of hot melt adhesive film without removing any of the printed areas from the carrier layer and without removing any of the carrier layer;

~~According to a second aspect of the present invention, there is provided a heat transfer product made by the above process capable of retaining product quality after heat sealing to a garment and undergoing hot wash (60°C) and medium dryer conditions for at least fifty washes.~~

According to a ~~third~~second aspect of the present invention, there is provided a heat transfer product made by the above process where the ~~adhesive consists of two layers~~

thermoplastic hot melt adhesive film consists of two layers of thermoplastic hot melt adhesive with different melt points.

According to a ~~fourth~~ third aspect of the present invention, there is provided a heat transfer product made by the above process where the printed image elastically stretches ~~up to~~ at least 5% in one direction~~about 2%~~.

According to a ~~fifth~~fourth aspect of the present invention, there is provided a heat transfer product made by the above process capable of ~~elongating from about 2% to about 75% in at least one direction without substantially cracking, speckling, or forming any other substantial defect when the graphic is applied to the clothing article or soft good~~ stretching at least 75% in one direction without defect.

~~According to a sixth aspect of the present invention, there is provided~~Disclosed herein is a method of manufacturing a thermal transfer, including the steps of: coating one side of a roll of thermo-plastic adhesive sheet with an ink receptive primer; digitally printing a graphic image onto the coated side of said thermo-plastic adhesive sheet, said graphic image including a plurality of discrete indicia; applying a polymeric protective layer over the digitally printed graphic image to produce an intermediate transfer; adhering a carrier layer over the polymeric protective layer to produce an uncut final transfer; kiss-cutting partially through the uncut final transfer according to a kiss-cut pattern; through-cutting fully through the uncut final transfer according to a through-cut pattern to produce a cut final transfer; and weeding out waste sections of the cut final transfer.

Specifically, embodiments of the method comprise printing a digital image onto an adhesive substrate, applying the image side to a carrier substrate, then digitally cutting and removing substrate not containing graphic elements to produce a high stretch, multi-color photographic quality print transfer for the apparel and soft goods industry. More particularly, embodiments of the method entail laser printing or inkjet printing onto the adhesive, laser cutting the adhesive/substrate in register with the print and “weeding” the unprinted adhesive areas and or cutting through internal unprinted areas. Weeding involves removing the adhesive from the non-printed areas.

Embodiments of the above method print using a laser printer onto a transfer paper, transfer the graphic from the paper directly to an adhesive film, laser cutting the adhesive in register with the print and weeding the unprinted adhesive areas or cutting through internal unprinted areas. Also disclosed are some forms of a heat transfer product generated through either of these methods.

Embodiments of the method replace the conventional multi-step process, using a sheet or roll-fed process.

BRIEF DESCRIPTION OF THE DRAWINGS

Other aspects, features, and advantages of the present invention will become more apparent from the following detailed description of the preferred embodiment and certain modifications thereof, in which:

FIG. 1 is a cross sectional showing a completed digitally printed heat transfer 100.

FIG. 2 is a block diagram of the sequential method of manufacturing the digitally printed heat transfer of FIG. 1.

FIG. 3 is a cross sectional view of the digitally printed graphic images 130 to yield an intermediate transfer.

We claim:

1. A process to create printed heat activated transfers for application to soft goods, comprising the steps of:

obtaining a film composed essentially of thermoplastic hot melt adhesive;

applying a primer to one side of said hot melt adhesive film;

digitally printing directly onto the primed surface of the hot melt adhesive film~~one side of a hot melt adhesive film~~ to define printed areas and unprinted areas;

transferring the printed hot melt adhesive film to a carrier layer against the print side;

laser-kiss-cutting through the hot melt adhesive film around the unprinted areas;

removing the unprinted laser-kiss-cut areas of hot melt adhesive film without removing any of the printed areas from the carrier layer and without removing any of the carrier layer~~ unprinted areas~~;

2. The process of claim 1, wherein said step of obtaining a film comprises obtaining a film composed essentially of thermoplastic hot melt adhesive ~~film is~~ on a carrier layer.

3. The process of claim 1, wherein said thermoplastic hot melt adhesive film is any one of ~~a thermoplastic such as~~ polyurethane, polyester, polyamide or polyolefin film.

4. The process of claim 1, wherein said thermoplastic hot melt adhesive film comprises one or more added components for opacity.

5. The process of claim 4, wherein said one or more added components comprise TiO2.

6. The process of claim 4, wherein said one or more added components comprise carbon black.

7. The process of claim 1, wherein said hot melt adhesive film includes an adhesion promoter to improve print quality.

8. The process in claim 1, wherein the hot melt adhesive film is coated with a primer to improve printability.

9. The process in claim 1, further comprising a step, after said step of digitally printing directly onto the primed surface of the hot melt adhesive film, ~~wherein the printed hot melt adhesive film is coated~~ of coating the digitally-printed surface of the hot melt adhesive film with a protective coating layer to improve washability.

10. The process of claim 1, wherein said carrier ~~paper~~layer is a paper substrate coated with a ~~transfer~~release layer.

11. The process of claim 1, wherein said carrier ~~paper~~layer is a polymer substrate,

12. The process of claim 11, wherein said polymeric substrate is coated with a ~~transfer~~release layer.

~~13. A heat transfer product made by the process of claim 1 capable of retaining product quality after heat sealing to a garment and undergoing hot wash (60°C) and medium dryer conditions for at least fifty washes.~~

~~14~~13. A heat transfer product made by the process in claim 1 where the ~~adhesive~~ thermoplastic hot melt adhesive film consists of two layers of thermoplastic hot melt adhesive with different melt points.

~~15~~14. The heat transfer product of claim ~~14~~13 where the first thermoplastic hot melt adhesive film adhesive layer is ink receptive and has a ~~softening~~melt point above 110°C.

~~16~~15. The heat transfer product of claim ~~14~~13 where the second thermoplastic hot melt adhesive layer has a ~~softening~~melt point below 110°C to enable heat sealing to delicate soft goods at lower temperatures.

~~17~~16. A heat transfer product made by the process in claim 1 where the printed image elastically stretches ~~up to~~ at least 5% in one direction ~~about 2%~~.

~~18~~17. A heat transfer product made by the process in claim 1 capable of ~~elongating from about 2% to about~~stretching at least 75% in ~~at least~~ one direction without ~~substantially~~

~~cracking, speckling, or forming any other substantial~~ defect ~~when the graphic is applied to the clothing article or soft good~~.

~~19. A method of manufacturing a thermal transfer, comprising the steps of:~~

~~coating one side of a roll of thermo-plastic adhesive sheet with an ink receptive primer;~~

~~digitally printing a graphic image onto the coated side of said thermo-plastic adhesive sheet, said graphic image comprising a plurality of discrete indicia;~~

~~applying a polymeric protective layer over the digitally printed graphic image to produce an intermediate transfer;~~

~~adhering a carrier layer over the polymeric protective layer to produce an uncut final transfer;~~

~~kiss-cutting partially through the uncut final transfer according to a kiss-cut pattern; through-cutting fully through the uncut final transfer according to a through-cut pattern to produce a cut final transfer; and~~

~~weeding out waste sections of the cut final transfer.~~