Abstract: The invention relates to a printing machine (10) for overprinting pre-printed foils (60) on blister packages (50), comprising: - a conveyor (12) for conveying the blister packages (50), - a first camera (18) arranged along the conveyor (12) for capturing an image of a pre-printed foil (60), - a first UV ink print head (20) arranged downstream of the first camera (18), - a UV pinning unit (22) arranged downstream of the first UV ink print head (18), - second UV ink print head (24) arranged downstream of the UV pinning unit (22), - a UV curing unit (26) arranged downstream of the second UV ink print head (24), - second camera (28) arranged downstream of the UV curing unit (26) for capturing an image of the overprinted foil (60). The invention further relates to a process for overprinting pre-printed foils (60) on blister packages (50).
PRINTING MACHINE AND PROCESS FOR OVERPRINTING PRE-PRINTED FOILS ON BLISTER PACKAGES

The present invention relates to a printing machine and a process for overprinting pre-printed foils on blister packages, especially blister packages containing pharmaceuticals, food supplements and medical devices.

Pharmaceuticals in the form of tablets, capsules or lozenges are often packaged in blister packages, also called blister cards, blister packs and push-through-packs. Figs. 1 and 2 schematically illustrate an exemplary prior art blister package 50 having a front blister 52 generally made of plastic and comprising one or more thermo-formed or cold-formed protrusions 54 defining corresponding number of cavities 55 wherein pharmaceutical products 56 (e.g. in the form of tablets or capsules) are placed. The back side of the blister package 50 is then covered by a lidding foil 60, which is permanently attached to the front sheet 52. Information relating to the pharmaceutical products 56 contained within the blister package 50 is generally printed on the back side of the lidding foil 60 that is visible to the users, although some information may be carried by the plastic blister 52 as well. The printed matter 62 on the lidding foil 60 depicted in Fig. 2 serves purely as an illustration and is not intended to be a reproduction of any existing blister package information. Such printed matter 62 comprises the required printed text matter that is generally prescribed by legal regulations. This may include the trade name of the pharmaceutical, strength (e.g. 50 mg), pharmaceutical form (e.g. capsule or tablet), active substance (e.g. clopidogrel), name and sometimes address of Marketing Authorization Holder. The blister package 50 may also carry other information (e.g. batch number, expiry date) embossed or printed with other technology on the front or
even on the back sheet 52. Exemplary embossed information is indicated with reference numeral 64.

Such a blister package 50 is often called a push-through-pack because of its two key properties: (i) the lidding foil 60 is brittle allowing to press the pharmaceutical product out while breaking the foil 60 and (ii) the semi-rigid protrusions 54 forming the cavities 55 are sufficiently collapsable to be able to dispense the tablet or capsule by means of pressing it out with the thumb. The main advantage of the multiple unit-dose packages provided within the blister package 50 is the assurance of product/packaging integrity (including shelflife) of each individual dose.

The disadvantage of the push-through-pack is that once the lidding foil 60 is printed for use in a given country, the blister package 50 cannot be reused in another country which would require different printed matter 62 to be printed on the foil 60. However, calculating the right amount of pharmaceutical products for a given market is becoming more and more complicated for all the market participants especially in regions, where there are many small countries with small consumption rate, non harmonized regulatory regimes, GxP based, but also not harmonized local regulations. Further complexity is caused by tenders, price bidding, huge batch sizes, large minimum orders and continuously changing artworks. Because of the complexity of the market the manufacturers are likely to enter the market with inadequate stock level or to overstock, thus unable to sell within product expiry.

The possibility of late stage customization of the lidding foil 60 is only a partial solution to this problem since even if the blister-packed pharmaceutical product is customized at the latest possible stage, a change in quantity demand may arise after this point as well.

The problem of changing the information content printed on blister packages 50 can arise in any other field as well, where the products 56 are blister-packed. In particular, strict information regulations may apply to food supplements (including vitamins) medical devices (e.g. contact lenses, medical needles, etc.) and veterinary products as well.
It is an object of the present invention to overcome the problems associated with the prior art. In particular, it is an object of the invention to provide a printing machine and process to "save" already produced blister packages containing pharmaceutical or other type of products by changing the printed matter on the lidding foil of the blister packages. This allows for recycling the blister packages for a different market.

This object is achieved by providing a printing machine according to claim 1 and a printing process according to claim 9.

Advantageous embodiments of the invention are defined in the attached dependent claims.

Further details of the invention will be apparent from the accompanying figures and exemplary embodiments.

Fig. 1 is a schematic front view of an exemplary prior art blister package.

Fig. 2 is a schematic back view of an exemplary prior art blister package.

Fig. 3a is a schematic side view of a preferred embodiment of the printing machine according to the invention.

Fig. 3b is a schematic perspective view of a preferred embodiment of the printing machine according to the invention.

Fig. 4a is a schematic block diagram of an exemplary arrangement of print heads and UV pinning units.

Fig. 4b is a schematic block diagram of another exemplary arrangement of print heads and UV pinning units.

Fig. 5 is a block diagram of a preferred embodiment of the printing process according to the invention.

Fig. 6 is a schematic back view of a lidding foil of an exemplary blister package after application of a background print.

Fig. 7 is a schematic back view of a lidding foil of an exemplary blister package after application of new printed matter on the background print.

Fig. 1 schematically illustrates the main units of a first preferred embodiment of a printing machine 10 for overprinting pre-printed lidding foils 60
on blister packages 50, e.g. such as the prior art blister package 50 depicted in Figs. 1 and 2. The blister package 50 may contain any kind of products 56, however, the present invention is particularly important in the case of pharmaceuticals, veterinary products, food supplements and medical devices or other products 56 having strict packaging regulations regarding the information content carried by the packaging.

The main units of the printing machine 10 illustrated in Figs. 3a and 3b are arranged along a conveyor 12, which conveys the blister packages 50 from one unit to the other. The conveyor 12 maybe formed e.g. by one or more conveyor belts or any other means suitable for transporting the blister packages 50 and may include any other device e.g. for transmitting the blister packages 50 from one conveyor belt to the other or e.g. for positioning the blister packages 50 with respect to the other units of the printing machine 10. According to the present embodiment the conveyor 12 comprises two parallel conveyor lines 13 (Fig. 3b) between which blister carrying tools (not shown) are arranged for conveying the blisters packages 50 from one unit to the other.

Preferably, a blister package feeder 14 is arranged at an upstream end 12a of the conveyor 12 for feeding the blister packages 50 to the conveyor 12. The blister package feeder 14 may be for example a rotary blister feeder or a continuous blister feeder known in the art which are commercially available for example from MGS Machine Corporation, US. A pick and place module 16 is preferably provided between the feeder 14 and the conveyor 12 for placing the blister packages 50 sequentially on the conveyor 12 from the feeder 14. Optionally the pick and place module 16 may also serve as the feeder. Pick and place modules for blisters are also well known in the art and commercially available, e.g. from MGS Machine Corporation, US.

A first vision system comprising at least a first camera 18 is arranged downstream of the feeder for capturing an image of a pre-printed foil 60 on the back side of the blister package 50.

A first UV ink print head 20 is arranged downstream of the first camera 18, which is provided for overprinting the pre-printed foil 60 with a UV ink, preferably UV white pigmented ink providing a background print 70 (see Figs. 5
and 6). The first print head 20 is preferably a drop-on-demand piezo inkjet print head utilizing UV ink. Such drop-on-demand piezo inkjet print heads are well known in the art and commercially available e.g. from Konica Minolta Inc.

A UV pinning unit 22 is arranged downstream of the first UV ink print head 20. The UV pinning unit 22 is a unit suitable for performing UV pinning the ink printed on the blister package 50 by the first UV ink print head 20. The UV pinning unit 22 is preferably a UV pinning unit 22, i.e. a device suitable for emitting UV radiation of an intensity of preferably about 0.5 - 3 W/cm², more preferably 1 - 2 W/cm². The wavelength of the UV light is preferably between 300 - 400 nm, more preferably between 315 - 380 nm. Suitable low energy UV pinning units 22 are for example UV LED devices capable of emitting UV light of such wavelength. Suitable UV ink for this wavelength range is also commercially available.

It is also possible to provide a print heads 22a and UV pinning units 22 along the 12 conveyor as shown in Fig. 4a, in order to allow for printing a colour background print 70, e.g. with a CMYK process and applying UV pinning between the application of each colour.

A second UV ink print head 24 is arranged downstream of the UV pinning unit 22. The second print head 24 can be the same type as the first print head 20, for example a drop-on-demand piezo inkjet print head which may use black, white or coloured UV ink. Preferably the second print head 24 is followed by a plurality of further print heads 24a, which together with the second print head allow for colour printing for example by using a CMYK process, in which case three more print heads 24a are provided. Both the second print head and the further print heads 24a along the conveyor 12 may be followed by a UV pinning unit 25 as illustrated in Fig. 4a for performing an UV pinning step between the application of each colour. Alternatively, CMYK wet on wet process can be applied, in which case there are no UV pinning units between the second print head 24 and the subsequent print heads 24a. The resolution of the second print head 24 and the optional subsequent print heads 24a is preferably at least 360 x 720 dpi, although the actual resolution requirement depends on the intended application.
A UV curing unit 26 is arranged downstream of the second UV ink print head 24. If further print heads 24a are provided, the UV curing unit is 26 is arranged downstream of all of them. The UV curing unit 26 may be a similar UV LED device as the UV pinning unit 22, although with higher power requirement for the purpose of full curing/drying of the printed UV ink. For example about 8 - 12 W/cm² intensity can be applied, or in case of low migration ink process about 12 W/cm². The same wavelength can be used as by the UV pinning unit 22.

A second vision system comprising a second camera 28 is arranged downstream of the UV curing unit 26 for capturing an image of the overprinted foil 60. The same types of cameras can be used as for the first camera 18.

Preferably a second pick and place module 30 is provided downstream of the second camera 28 for discarding failed blister packages 50, which is determined by a quality check based on the image captured by the second camera 28 as will be explained later on. The discarded failed blister packages 50 are preferably collected in a waste collector for monitoring purposes.

A further pick and place module 32 may be provided at the downstream end 12b of the conveyor 12 in order to remove the finished overprinted blister packages 50 having suitable quality from the conveyor 12 and to load them to a collector, which may be for example a further conveyor 33 for transporting the finished overprinted blister packages 50 to a storage, or a secondary packaging site or other further processing site.

The pick and place modules 30 and 32 may coincide in which case the blister package 50 is either transferred to the waste collector or to the finished blister package collector depending on the result of the quality check based on the images captured by the cameras 18, 28.

The images captured by the first and second cameras 18, 28 are preferably processed by a computer 34 which may form part of the printing machine 10, or which may be an external device running a software application for processing the camera images.

The computer 34 preferably also controls the operation of the printing machine 10 and may thus be connected (through wired and/or wireless connection) to the described main components. Alternatively the components of
the printing machine 10 may be connected to one or more separate controlling devices, such as microcontrollers and the computer 30 may provide control signals for the one or more microcontrollers over wired and/or wireless connection.

In the context of the present invention the term computer 34 is intended to express all types of external or integrally built computing and controlling devices that are suitable for image processing and preferably for controlling the printing process of the printing machine 10. Such computing device can be, but is not limited to a server, desktop computer, laptop, notebook, tablet, minicomputer, smart phone or an integral device, such as a board computer of the printing machine 10, a Winchester disk with a user interface, etc.

The computer 34 is preferably equipped with user input and output interfaces, which may be, but are not limited to interfaces such as keyboard, mouse, touch screen, LCD screen, CRT monitor, CD reader/writer, hard disk or floppy disk reader/writer, pendrive, printer, communication ports for data exchange over local or global wired or wireless communications networks such as a LAN or the Internet.

As will be appreciated many other variations are possible to the printing machine 10 for carrying out the steps of the printing process according to the invention. The steps of a preferred embodiment of the printing process are illustrated in Fig. 5.

In step 100 the blister package 50 is fed to the conveyor 12 via the blister package feeder 14 possibly with the interaction of the first pick and place module 16. The pick and place module 16 preferably places the blister package 50 on the conveyor 12 in a pre-given direction (e.g. the longer side of the blister package 50 being parallel with the conveyor 12) and such that the foil 60 faces upwards.

The conveyor 12 (e.g. conveyor belt) transports the blister package 50 to the first camera 18, which captures an image of the foil 60 of the blister package 50 in step 102.

In step 104 the computer 34 processes the image of the foil 60 and the original printed matter 62 and/or embossed information 64 thereon and
compares it with pre-defined blister package data concerning the blister packages 50 that are to be overprinted. The computer 34 verifies whether or not the currently processed blister package 50 corresponds to the blister packages 50 that are supposed to be overprinted. For example the pre-defined blister package data may be the original printed matter 62, such as text matter and/or other graphical signs that are carried by the pre-printed foils 60 of the blister packages 50 and/or data relating to the size and shape of the blister packages 50 which are supposed to be overprinted. If the image of the currently processed blister package 50 does not correspond to the pre-defined blister package data (e.g. the blister package 50 carries other text matter and/or graphical sign and/or the blister package 50 is of different shape) then the blister package 50 is discarded in step 104a. The verification of the foil 60 may include quality control as well, and if the computer 34 determines from the captured image that the foil 60 is damaged then the blister package 50 is discarded in this case as well.

Discarding the unsuitable blister package 50 maybe carried out by omitting the printing steps and transporting the blister package 50 to the second pick and place module 30 or by providing an additional pick and place module (not shown) directly after the first camera 18 along the conveyor 12 for discarding the blister package 50 there. The blister package verification ensures that only those blister packages 50 will be overprinted which were actually intended to be overprinted. This step is especially important when overprinting blister packages 50 containing pharmaceuticals, food supplements or medical devices, since printing any erroneous printed matter 62 on the blister packages 50 containing such products 56 could have serious even fatal consequences.

If the computer 34 establishes in the verification step 104 that the currently processed blister package 50 corresponds to the pre-defined blister package data, then the blister package 50 is conveyed to the first print head 20 where UV ink is applied on the pre-printed foil 60 in step 106 in order to cover any original printed matter 62 and to create a covering background print 70 as illustrated in Fig. 5. As can be seen an unprinted border 72 may be left on the foil 60 around the covering background print 70 in order to render the printing
technically simpler and because there is generally no original printed matter contained in the border area. The border 72 is chosen in view of the given pre-printed blister packages 50 such as to cover the original printed matter 62, however, generally a border of about 1 to 3.5 mm, more preferably about 2 to 3 mm can be left free of the UV ink. The border 72 may also have different width along the different sides of the foil 60. The background print 70 preferably covers at least 80% of the foil 60, more preferably at least 90%.

Preferably UV white pigmented ink is used for the background print 70. Any other suitable UV ink printing technology maybe employed as well. It has been found that low migration printing process can be used to create the background print 70, whereby the chemical compounds in the UV ink will not penetrate the foil 60 or only to an acceptable level.

After the first UV ink printing step 106 the blister package 50 is conveyed to the UV pinning unit 22 where a low energy UV curing step 108 is carried out. The low energy UV curing step 108 (also called UV drying) is performed at lower surface power density than what would be required for fully curing the background print 70. The applied surface power density is chosen so as to stabilize the surface of the ink for the second printing step 110, it is preferably 0.5 - 2.5 W/cm², more preferably 1 - 2 W/cm². This process is also called "freezing" the surface of the ink. The low energy UV curing may be carried out with an UV radiation of about 300 - 400 nm, preferably of 315 - 380 nm wavelength. Suitable UV ink for this wavelength range is commercially available.

The background print 70 may be created from multiple layers of UV ink, in which case steps 106 and 108 are repeated for creating each layer e.g. with the print head arrangement according to Figs. 4a and 4b. Optionally, the layers may be applied in a wet on wet in which case a single UV pinning step suffices. The print heads 24, 24a may apply different coloured inks, however, preferably UV white pigmented ink is used in all layers.

After this, the blister package 50 is conveyed to the second UV ink print head 24, where new printed matter 74 containing the required new information
is printed on the stabilised (partially cured) surface of the covering background print 70 with UV ink in step 110.

The new printed matter 74 to be printed on the foil 60 is preferably inputted in the computer 34, which sends the printing command to the second print head 24.

The printed matter 74 depicted in Fig. 7 serves purely as an illustration and is not intended to be a reproduction of any existing blister package information.

In the context of the present invention the term printed matter 74 is intended to embrace any kind of print which is not a background print 70, i.e. a print which covers less than 80% of the whole surface of the foil 60, preferably less than 70%, more preferably less than 50%, even more preferably less than 30%. The printed matter 74 may comprise letters, words, numbers, any other text matter, graphical images, signs, colour codes, etc. In a preferred embodiment the printed matter 74 comprises a unique identification number for traceability of the blister package 50.

For colour printing CMYK wet on wet process can be used in step 110 e.g. with the print head arrangement according to Fig. 4b but other suitable UV ink printing technology maybe employed as well, for example CMYK with UV pinning between the application of each colour, e.g. by with the print head arrangement according to Fig. 4a. Preferably low migration printing process is used, whereby the chemical compounds in the UV ink will not penetrate the foil 60 or only to an acceptable level.

The information printing step 110 is followed by a step 112 of fully curing the UV ink on the overprinted foil 60 by the UV curing unit 26. Hence in step 112 both the UV ink applied by the first print head 20 in the background printing step 106 and the UV ink applied by the second print head 24 in the information printing step 110 is fully cured. This is preferably carried out at the same wavelength as the first UV curing step 108, i.e. at 300 - 400 nm, preferably 315 - 380 nm wavelength. However, the applied intensity is preferably about 8-12 W/cm\(^2\) or, in case low migration ink process is applied, about 12 W/cm\(^2\).
After the curing step 112 the blister package 50 is conveyed to the second camera 28 by the conveyor 12, where the camera 28 captures an image of the overprinted foil 60 in step 114. The image is transmitted to the computer 34 which processes the image and performs a quality check thereon. The quality check may include checking that the printed result is spotless, homogeneous, colour deep and the tones are identical on all printed blister packages. The computer 34 may also perform a double check by comparing the image captured by the first camera 18 and the image captured by the second camera 28 in order to establish whether the overprinted new printed matter 74 corresponds to what has been set for printing on the blister package 50 carrying the original printed matter 62 visible in the first image. A variety of other quality checks are conceivable, for example readability check of any text matter of the new printed matter 74, visual check that the foil 60 is undamaged, etc.

If any quality problems are detected during the quality check, the overprinted blister package 50 is discarded in step 116a. Discarding the unsuitable failed blister packages 50 may be carried out by the second pick and place module 30, which displaces the blister package 50 from the conveyor 12. The blister packages 50 discarded in either step 104a or 116a are preferably collected in the waste collector and are first counted before being destroyed, in order to be able to verify that the number of discarded and finished blister packages 50 is exactly the same as the number of blister packages 50 fed to the printing machine 10.

The finished overprinted blister packages 50 which are found suitable during the quality check are preferably collected at the downstream end 12b of the conveyor 12. The finished blister packages 50 are removed from the conveyor 12 by the last pick and place module 30 and are forwarded for storing or secondary packaging or any other further processing step.

It is also possible to include an additional monitoring step after the low energy UV curing process in order to check whether or not the background print 70 is satisfactory, and the blister package 50 may also be discarded to the waste collector if the quality of the background print 70 is unsatisfactory.
The printing machine 10 and the printing process according to the present invention allows for "saving" already produced and printed blister packages 50 and for recycling them for a different market by changing the information content printed on the foils 60 of the blister packages 50 to meet the requirements of the new market.

One of the advantages of the disclosed printing machine 10 is that the risk of mix-up can be reduced to a minimum level by the first visual inspection step 104. Another advantage is that the second visual checking step 116 allows for discerning and discarding the blister packages 50 provided with unsuitable overprint from the faultless finished blister packages 50.

A further advantage is that all operations can be automated after the inputting of production data into the control system of the printing machine 10, which is preferably the computer 34. The production data may be inputted manually by the user (e.g. an operator of the printing machine 10) or received by the computer via a communication port (e.g. in the form of a command program sent from a remote location over a wired or wireless electronic communication channel). Such production data may include the definition of the blister package 50 that is to be overprinted (i.e. the pre-defined blister package data), the shape and colour of the background print 70, the number of UV ink layers to be applied, the size and shape of the unprinted borders 72, the printed matter 74 and its colours. Some adjustable parameters (running speed of the conveyor 12, printing time, low energy curing and full curing time) can be monitored and adjusted automatically based on a standard and approved method so that the user does not have to set the individual values, although the user may be allowed to set these parameters as well.

A further advantage of the printing machine 10 is that it can be programmed (e.g. by programming the computer 34) to print exactly as many blister packages as defined by the user through a user interface of the computer 34. By counting the discarded waste blister packages 50 and/or the faultless finished overprinted blister packages 50, the printing machine 10 can be stopped automatically when reaching the desired number of overprinted blister packages 50.
Various modifications to the above disclosed embodiments will be apparent to a person skilled in the art without departing from the scope of protection determined by the attached claims.
CLAIMS

1. Printing machine (10) for overprinting pre-printed foils (60) on blister packages (50), characterised by comprising:
   - a conveyor (12) for conveying the blister packages (50),
   - a first camera (18) arranged along the conveyor (12) for capturing an image of a pre-printed foil (60),
   - a first UV ink print head (20) arranged downstream of the first camera (18),
   - a UV pinning unit (22) arranged downstream of the first UV ink print head (18),
   - second UV ink print head (24) arranged downstream of the UV pinning unit (22),
   - a UV curing unit (26) arranged downstream of the second UV ink print head (24),
   - second camera (28) arranged downstream of the UV curing unit (26) for capturing an image of the overprinted foil (60).

2. The printing machine according to claim 1, characterised by comprising at least one computer (34) for controlling the operation of the printing machine (10) and processing the images captured by the first and second camera (18, 28).

3. The printing machine according to any one of claims 1 or 2, characterised by that the first and second UV ink print heads (20, 24) are drop-on-demand piezo inkjet print heads.

4. The printing machine according to any one of claims 1 to 3, characterised by that the UV pinning unit (22) and the UV curing unit (26) are adapted to emit UV radiation of 300 - 400 nm, preferably of 315 - 380 nm.
wavelength and preferably the UV pinning unit (22) has an intensity of 0.5 - 3 W/cm², preferably 1 - 2 W/cm² and preferably the UV curing unit (26) has an intensity of 8 - 12 W/cm².

5. The printing machine according to any one of claims 1 to 4, characterised by that further pairs of UV ink print heads (20a) and UV pinning units (22a) are provided downstream of the first UV pinning unit (22) following the first UV ink print head (20) and upstream of the second print head (24) and further UV ink print heads (24a) are provided downstream of the second UV ink print head (24) and upstream of the UV curing unit (26), and optionally an UV pinning unit (25, 25a) is provided downstream of at least a part of the UV ink print heads (24, 24a) and upstream of the UV curing unit (26).

6. The printing machine according to any one of claims 1 to 5, characterised by that the printing machine (10) further comprises a blister package feeder (14) arranged upstream of the first camera (18).

7. The printing machine according to claim 6, characterised by that a pick and place module (16) is provided between the blister package feeder (14) and the conveyor (12).

8. The printing machine according to any one of claims 1 to 7, characterised by that a pick and place module (30) is provided downstream of the second camera (28) for discarding failed blister packages (50).

9. Process for overprinting a pre-printed foil (60) on a blister package (50), characterised by the steps of:
   (a) capturing an image of the foil (60),
   (b) verifying the blister package (50) based on the captured image and pre-defined blister package data; and if the blister package (50) corresponds to the pre-defined blister package data:
(c) printing UV ink on the foil (60) to obtain background print (70) thereon,

(d) UV pinning the background print (70),

(e) printing printed matter (74) on the background print (70) with UV ink,

(f) fully curing the UV ink of the background print (70) and the printed matter (74) on the overprinted foil (60),

(g) capturing an image of the overprinted foil (60),

(h) performing quality check on the captured image and discarding the overprinted blister package (50) if quality problems are detected.

10. The process according to claim 9, characterised by:
   - feeding the blister package (50) to a conveyor (12),
   - conveying the blister package (50) to a first camera (18) and carrying out step (a) and (b),
     - conveying the blister package (50) to a first UV ink print head (20) and carrying out step (c),
     - conveying the blister package (50) to a UV pinning unit (22) and carrying out step (d),
     - conveying the blister package (50) to a second UV ink print head (24) and carrying out step (e),
     - conveying the blister package (50) to a UV curing unit (26) and carrying out step (f),
     - conveying the blister package (50) to a second camera (28) and carrying out steps (g) and (h).

11. The process according to claims 9 or 10, characterised by leaving an unprinted border (72) on the foil (60) around the background print (70) in step (c), preferably a border (72) of 1 to 3.5 mm, more preferably 2 to 3 mm.
12. The process according to any one of claims 9 to 11, characterised by applying multiple layers of UV ink for the background print (70), preferably using UV white pigmented ink, and UV pinning each ink layer before applying the next layer.

13. The process according to any one of claims 9 to 12, characterised by using drop-on-demand piezo inkjet print heads (20, 24) for applying the UV ink in the printing steps.

14. The process according to any one of claims 9 to 13, characterised by applying a CMYK process in step (e), and optionally applying a UV pinning step after application of each colour or some of the colours.

15. The process according to any one of claims 9 to 14, characterised by discarding the blister package (50) in step (b) if the blister package (50) does not correspond to the pre-defined blister package data.

16. The process according to any one of claims 9 to 15, characterised by allowing the user to input the pre-defined blister package data into at least one computer (34) controlling the operation.

17. The process according to any one of claims 9 to 16, characterised by overprinting the pre-printed foils on blister packages (50) containing pharmaceuticals, veterinary products, food supplements or medical devices.

18. Use of the printing machine according to any one of claims 1 to 8, for overprinting pre-printed foils (60) on blister packages (50) containing pharmaceuticals, veterinary products, food supplements or medical devices.
100 — Feeding blister to conveyor line

102 — Capturing image of foil

104 — Does image correspond to predefined Data?
  Yes
  106 — Printing full coverage background
  108 — UV pinning
  110 — Printing information
  112 — Full UV curing
  114 — Capturing image of overprinted foil

116 — Is quality satisfying?
  Yes
  118 — Collecting finished overprinted blister
  No
  104a — Disregard blister
  116a — Disregard overprinted blister

Fig. 5
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. B41J11/00 B41J3/407

**ADD.**

According to International Patent Classification (IPC) and both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

B41J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<tr>
<td>A</td>
<td>WO 2013/016757 Al (MANREX PTY LTD [AU]; STEVENS GERARD [AU]) 7 February 2013 (2013-02-07) abstract</td>
<td>1-18</td>
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</tbody>
</table>

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:
  - "A" document defining the general state of the art which is not considered to be of particular relevance
  - "E" earlier application or patent but published on or after the international filing date
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Date of the actual completion of the international search: 31 March 2015

Date of mailing of the international search report: 20/04/2015

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Authorized officer: Wehr, Wolfhard
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