COATING APPARATUS

FIELD

The present disclosure relates to an apparatus and method for coating a surface with a layer of metallic or metal-looking particles, in particular with a single layer.

BACKGROUND

In certain types of printing, a film supported by a carrier is transferred to a substrate (*e.g.*, paper, cardboard, plastic films *etc.*) by application of pressure and/or heat in a desired pattern. One example of this is the foil used in hot or cold foil blocking wherein the film on the foil is metallic or metallic-looking. The latter term is used herein to refer to materials, and any particles thereof, having a metal-like reflectivity.

A problem in using a conventional film coated carrier, be it a sheet, a web or a ribbon, is that the process is wasteful, and therefore expensive. This is because, at the time that it has to be discarded, only a small proportion of the film coating will have been used (*e.g.*, for printing) and most of the film coating will remain on the carrier.

OBJECT

The present disclosure seeks to provide an apparatus for applying to a surface, hereinafter termed a donor surface, a coating of individual particles that is transferable to a substrate, in which the parts of the surface from which the coating has been removed in an operating cycle (also termed "exposed regions") can be recoated without substantially increasing the coating thickness on the remaining parts of the surface, so as to enable the entire surface to be re-used time and again.

SUMMARY

In accordance with a first aspect of the present disclosure, there is proposed a coating apparatus for coating an endless donor surface, the donor surface being movable so as to pass cyclically through the coating apparatus and the coating apparatus serving to coat the donor surface during each passage with a layer of metal or metal-looking particles for subsequent transfer of the particles from at least selected regions of the donor surface to a substrate, the coating apparatus comprising:

a) a supply of particles suspended in a fluid that does not wet the donor surface, the particles adhering more strongly to the donor surface than to one another,

b) an application device for applying the fluid to the donor surface in a manner to cause the particles suspended in the fluid to adhere to the surface, so as to form a substantially continuous particle coating on the donor surface, wherein the particles are transferable to a substrate, and

c) a surplus extraction system operative to extract fluid and remove surplus particles that are not in direct contact with the surface so as to leave adhering to the donor surface, after each passage through the coating apparatus, a coating that is substantially only a single particle deep.

In accordance with a second aspect of the present disclosure, there is proposed a method for coating a cyclically movable endless donor surface with a layer of metallic or metal-looking particles, the method comprising:

a) providing a supply of the particles suspended in a fluid that does not wet the donor surface, the particles adhering more strongly to the surface than to one another,

b) applying the fluid to the donor surface, by means of a particle applicator, in a manner to cause the particles suspended in the fluid to adhere to the surface so as to form a substantially continuous particle coating on the surface as the surface is moved relative to the particle applicator, wherein the particles are transferable to a substrate, and

c) extracting fluid and surplus particles that are not in direct contact with the surface, so as to leave adhering to the surface, after each cycle, a coating that is substantially only a single particle deep.

In the present disclosure, a non-limiting use of the coating apparatus is illustrated as part of a printing system and particles from the donor surface will in use be transferred to a printing substrate. The donor surface may be looked upon as equivalent to a foil used in foil blocking, but with the advantage that can it be restored to its original state after use.

In the present disclosure, because the coating applied to the donor surface and subsequently transferred to a substrate is made up of a mosaic of individual particles, the proportion of the donor surface covered with particles will be less than 100% on account of the interstices between the individual particles. Depending on the use that is subsequently made of the applied particle coating, the proportion of the donor surface that is covered may need only be 95%, or 90%, or 85%, or 80%, or 75%, or 70% or even 65% or less.

The acceptable proportion in a printing system would depend, for example, on the color of the particles and the color of the substrate. If printing with light colored particles on a white substrate, acceptable quality may be achieved with only 65% coverage, or possibly even less (*e.g.*, about 40%), whereas printing with light colored particles on a black substrate would benefit from greater coverage to avoid the color of the substrate showing through and marring the appearance.

After the particles in selected areas of the donor surface are transferred to a printing substrate, those areas will be left depleted of particles and the donor surface will be exposed. If the donor surface is now again passed through the coating apparatus, a fresh coating of particles will be applied onto the depleted areas. However, the surplus extraction system will remove any particles that are not in direct contact with the donor surface, so that there will be no build up of coatings on areas from which particles are not transferred to the printing substrate.

In some embodiments, particles remaining on the donor surface after an impression has been made on a printing substrate can be removed from the donor surface upstream of the

Claims

1. A coating apparatus for coating an endless donor surface, the donor surface being movable so as to pass cyclically through the coating apparatus and the coating apparatus serving to coat the donor surface during each passage with a layer of metal or metal-looking particles for subsequent transfer of the particles from at least selected regions of the donor surface to a substrate, the apparatus comprising:

a) a supply of particles suspended in a fluid that does not wet the donor surface, the particles adhering more strongly to the donor surface than to one another,

b) an application device for applying the fluid to the donor surface in a manner to cause the particles suspended in the fluid to adhere to the surface, so as to form a substantially continuous particle coating on the donor surface, wherein the particles are transferable to a substrate, and

c) a surplus extraction system operative to extract fluid and remove surplus particles that are not in direct contact with the surface so as to leave adhering to the donor surface, after each passage through the coating apparatus, a coating that is substantially only a single particle deep.

2. A coating apparatus as claimed in claim 1, wherein the application device comprises a spray head for spraying the fluid and suspended particles directly onto the donor surface.

3. A coating apparatus as claimed in claim 1, wherein the application device comprises a rotatable applicator operative to wipe the fluid and suspended particles onto the donor surface.

4. A coating apparatus as claimed in claim 3, wherein the applicator is a cylindrical sponge.

5. A coating apparatus as claimed in claim 3, wherein the applicator has a plurality of flexible strips extending radially from a rotatable axle.

6. A coating apparatus as claimed in claim 4 or 5, wherein the sponge or the flexible strips are formed of a closed-cell foam.

7. A coating apparatus as claimed in any one of the preceding claims, wherein the application device and the surplus extraction system are each independently contained within

an interior plenum of a housing having a rim adjacent the surface, the rim being configured to prevent egress of particles from a sealing gap defined between the rim of the housing and the donor surface.

8. A coating apparatus as claimed in claim 7, wherein a wiper blade is provided at the rim to prevent egress of particles and/or fluid at an upstream side of the coating apparatus.

9. A coating apparatus as claimed in claim 7 or 8, wherein the surplus extraction system includes a suction source connected to the housing to extract from the plenum surplus sprayed fluid and particles suspended in the sprayed fluid.

10. A coating apparatus as claimed in any one of claim 7 to claim 9, wherein a fluid flow passage is provided at the rim of the housing to enable fluid to be drawn from, or introduced into, at least regions of the sealing gap disposed downstream of the application device.

11. A coating apparatus as claimed in claim 10 when appended to claim 9, wherein the fluid flow passage is connected to the, or to a second, suction source of the surplus extraction system, so as to draw from the gap any fluid that would otherwise escape from the interior plenum through the gap.

12. A coating apparatus as claimed in claim 10, wherein the fluid flow passage is connected to a supply at above atmospheric pressure of a gas devoid of suspended particles so that fluid within which the particles are suspended is prevented from escaping from the interior plenum through the gap owing to the pressure in the gap being higher than the pressure in the interior plenum.

13. A coating apparatus as claimed in any one of the preceding claims, wherein the fluid within which the particles are suspended is a gas.

14. A coating apparatus as claimed in claim 13, wherein the particles are entrained into a stream of said gas by a Venturi.

15. A coating apparatus as claimed in any one of claim 1 to claim 12, wherein the fluid within which the particles are suspended is a liquid.

16. A coating apparatus as claimed in claim 15, wherein the liquid is sucked from the surface by the surplus extraction system such that the particle layer is at least partially dry or substantially dry on exiting the apparatus.

17. A coating apparatus as claimed in any one of the preceding claims, wherein particles extracted by the fluid extraction system are recycled to the application device.

18. A coating apparatus as claimed in claim 1, wherein in order to achieve a shiny surface, the apparatus further comprise a burnishing station.

19. A coating apparatus as claimed in any one of the preceding claims, wherein the application device and the surplus extraction system are contained within a single housing.

20. A method of coating a cyclically movable endless donor surface with a layer of metallic or metal-looking particles, the method comprising:

a) providing a supply of the particles suspended in a fluid that does not wet the donor surface, the particles adhering more strongly to the surface than to one another,

b) applying the fluid to the donor surface, by means of a particle applicator, in a manner to cause the particles suspended in the fluid to adhere to the surface so as to form a substantially continuous particle coating on the surface as the surface is moved relative to the particle applicator, wherein the particles are transferable to a substrate, and

c) extracting fluid and surplus particles that are not in direct contact with the surface, so as to leave adhering to the surface, after each cycle, a coating that is substantially only a single particle deep.

21. The method according to claim 20, the method being implemented in an apparatus according to any one of claim 1 to claim 19.

22. The method according to claim 20 or 21, wherein the particles have the form of flat platelets.