

SUMMARY

The present disclosure thus also proposes to answer this latter problem, in order to simplify the provision of electronic modules, while ensuring that the electronic modules are held in the apertures of a positioning structure and to facilitate assembly of the various elements and materials provided for manufacturing the cards.

Therefore, the present disclosure concerns, firstly, an assembly produced during the manufacture of cards, which each include an electronic module. The card manufacturing process includes the provision of a plate, which has at least one, at least partially through aperture, and at least one electronic module, which is electrically independent of said plate and housed, at least partially, in said at least one aperture, in an installation where a resin is added to at least one side of said electronic module, said plate forming a positioning structure for said electronic module. This assembly includes said plate and said at least one electronic module and is characterized in that, before said assembly is brought to said installation, said plate and said at least one electronic module are assembled in a sufficiently rigid manner for said at least one electronic module to remain in a substantially defined position relative to said plate, firstly until the resin is added, and subsequently during said resin is added.

It should be noted that the resin could be added in various forms and in various states. The term "resin" should be understood in a broad sense, including various known adhesives, PVC and Polyurethane resins or other resins available to those skilled in the art.

In a preferred embodiment, each aperture and/or the electronic module located in said aperture are arranged such that a space remains in the aperture, and open on at least one side of the plate. The card or intermediate product manufacturing process then includes a step where a filling material is introduced into this space remaining in the apertures.

Assembling the plate pierced with apertures and electronic modules in a preliminary step of the card manufacturing method has numerous advantages and answers the aforementioned problem. The fact that a material connection is made between the electronic module and the plate means that the assembly can be handled, in particular, via the plate, in order to implement subsequent steps in the card manufacturing method. The assembly according to the disclosure resolves the problem of holding the electronic modules in the apertures of the plate, when the plate and electronic modules are brought into an installation where a resin is added in accordance with the card or intermediate product manufacturing method of the disclosure.

In the preferred embodiment, wherein a space remains in the apertures of the pierced plate after the assembly according to the disclosure has been assembled, the spaces remaining in the apertures are generally filled with a filling material or a resin by applying pressure, particular using a press or a roller that spreads out the filling material or resin. If no particular precautions are taken, this step may move the electronic modules relative to the frame. The assembly according to the present disclosure resolves this problem in an advantageous manner, by maintaining the modules in a precise position during the entire card manufacturing method; both in the general plane of the plate and along the axis perpendicular to the general plane.

The present disclosure also concerns an intermediate product of the card manufacturing process, which comprises an assembly according to the aforementioned preferred embodiment, and a filling material, which fills at least most of the space remaining in the plate apertures where the electronic modules are situated. The top and bottom surfaces of this intermediate product are preferably more or less flat. In a first variant, the thickness of the intermediate product is approximately the same as said plate, the filling material being essentially provided in the spaces remaining in the plate apertures. In a second variant, the filling material is formed by a

resin, which covers at least one of the top and bottom surfaces of the plate. In this latter case, the intermediate product has improved rigidity, because the resin covers at least one side of the plate and preferably both sides.

If the resin covers both sides of the plate and the electronic modules, the intermediate product can already be used as a card, when the outer surfaces are approximately flat. However, there are several advantages to making the intermediate product according to the disclosure in a card manufacturing method that includes at least one further step of adding resin to both sides of the intermediate product. The present disclosure also concerns this manufacturing method. According to this method of manufacturing at least one card, an intermediate product, as defined above, is made, and then the resin is deposited on at least one of the top and bottom surfaces of the intermediate product. Finally, pressure is applied to the deposited resin, which is then in a non-solid state, to form at least one card that has a flat outer surface, since the resin deposited on the intermediate product fills in any variations in thickness in the intermediate product. The resin deposited on the intermediate product preferably forms a thin layer. The resin can be added in a single step or in several successive steps to further improve flatness.

This method is particularly advantageous for obtaining cards which have a perfectly flat surface and which incorporate a relatively large electronic module that has variations in thickness and is formed of various elements. In fact, when the electronic module is formed of various elements, made of different materials and with different levels of thickness and empty intermediate zones, the filling material or resin added to the remaining space in the plate aperture is distributed in an irregular manner, with variations in thickness. When the filling material or resin hardens, shrinkage, and thus a variation in thickness, may occur in the resin, which then generates a surface with slight hollows or bumps. The surface state of the intermediate product generally does not meet the bankcard standards, but the variations in thickness can be removed, by subsequently depositing

a resin film on both sides of the intermediate product, when the finished cards are formed. The cards then have perfectly flat outer surfaces.

Generally, the disclosure concerns a method of manufacturing at least one intermediate product or at least one card including the following steps:

- making an assembly according to the preferred embodiment of the disclosure described above, said assembly including a plate that has at least one aperture and at least one electronic module arranged, at least partially, in said aperture, said plate and said at least one electronic module being assembled, before a filling material is added to the remaining space in said at least one aperture, in a sufficiently rigid manner to hold said at least one electronic module in said at least one aperture, in a substantially fixed position relative to said plate, prior to and during the following step of:

- adding a filling material and introducing said filling material in a viscous liquid state into said remaining space in said at least one aperture;
- solidifying said filling material.

According to a preferred variant, the method is characterized in that a resin is deposited over at least one of the bottom and top surfaces of said plate, at least on the side where the filling material was introduced into said at least one aperture in said plate. According to a preferred variant, the filling material is identical to the resin and is added simultaneously.

According to a particular feature of the method described above, the resin is spread out using at least one roller or one blade, which moves relative to the plate-electronic module assembly. An intermediate product or card with more or less flat outer surfaces is thus obtained.

In accordance with one aspect, there is provided an assembly produced during the manufacture of cards and including at least an electronic module and a plate, having at least one, at least partially through aperture, said electronic module being electrically independent of said plate and at least partially housed in said at least one aperture, this assembly being intended to be brought in an installation where a resin is added to at least one side of said electronic module, said plate forming a positioning structure for said electronic module, wherein

before said assembly is brought to said installation, said plate and said at least one electronic module are assembled to each other in a sufficiently rigid manner for said at least one electronic module to remain in said at least one aperture in a substantially defined position relative to said plate until it is brought in said installation, and afterwards during said resin is added.

In accordance with another aspect, there is provided an intermediate product produced during the card manufacture, wherein the intermediate product is formed by an assembly as disclosed herein, said assembly including a plate with at least one, at least partially through aperture and at least one electronic module, which is housed at least partially in said at least one aperture, and by a filling resin, which fills at least most of the remaining space of said at least one aperture.

In accordance with another aspect, there is provided a method of manufacturing an intermediate product or at least one card including the following steps:

- making an assembly as disclosed herein;
- adding a filling resin and introducing this filling resin in a viscous liquid state in the remaining spaces of the apertures in the plate of said assembly, and
- solidifying said filling resin.

In accordance with another aspect, there is provided a method of manufacturing at least one card including the following steps:

- making an intermediate product as disclosed herein;
- depositing a resin over at least one of the top and bottom surfaces of said intermediate product, and
- applying pressure on said resin, which is deposited on said intermediate product and which is then in a non-solid state to form at least one card with a flat external surface, said resin compensating for variations in thickness in said intermediate product.

SUMMARY OF THE INVENTION

The present invention thus also proposes to answer this latter problem, in order to simplify the provision of electronic modules, while
5 ensuring that the electronic modules are held in the apertures of a positioning structure and to facilitate assembly of the various elements and materials provided for manufacturing the cards.

Therefore, the present invention concerns, firstly, an assembly produced during the manufacture of cards, which each include an electronic
10 module. The card manufacturing process includes the provision of a plate, which has at least one, at least partially through aperture, and at least one electronic module, which is electrically independent of said plate and housed, at least partially, in said at least one aperture, in an installation where a resin is added to at least one side of said electronic module, said
15 plate forming a positioning structure for said electronic module. This assembly includes said plate and said at least one electronic module and is characterized in that, before said assembly is brought to said installation, said plate and said at least one electronic module are assembled in a sufficiently rigid manner for said at least one electronic module to remain in
20 a substantially defined position relative to said plate, firstly until the resin is added, and subsequently during said resin is added.

It should be noted that the resin could be added in various forms and in various states. The term "resin" should be understood in a broad sense, including various known adhesives, PVC and Polyurethane resins or
25 other resins available to those skilled in the art.

In a preferred embodiment, each aperture and/or the electronic module located in said aperture are arranged such that a space remains in the aperture, and open on at least one side of the plate. The card or intermediate product manufacturing process then includes a step where a
30 filling material is introduced into this space remaining in the apertures.

Assembling the plate pierced with apertures and electronic modules in a preliminary step of the card manufacturing method has numerous advantages and answers the aforementioned problem. The fact that a material connection is made between the electronic module and the plate means that the assembly can be handled, in particular, via the plate, in order to implement subsequent steps in the card manufacturing method. The assembly according to the invention resolves the problem of holding the electronic modules in the apertures of the plate, when the plate and electronic modules are brought into an installation where a resin is added in accordance with the card or intermediate product manufacturing method of the invention.

In the preferred embodiment, wherein a space remains in the apertures of the pierced plate after the assembly according to the invention has been assembled, the spaces remaining in the apertures are generally filled with a filling material or a resin by applying pressure, particular using a press or a roller that spreads out the filling material or resin. If no particular precautions are taken, this step may move the electronic modules relative to the frame. The assembly according to the present invention resolves this problem in an advantageous manner, by maintaining the modules in a precise position during the entire card manufacturing method; both in the general plane of the plate and along the axis perpendicular to the general plane.

The present invention also concerns an intermediate product of the card manufacturing process, which comprises an assembly according to the aforementioned preferred embodiment, and a filling material, which fills at least most of the space remaining in the plate apertures where the electronic modules are situated. The top and bottom surfaces of this intermediate product are preferably more or less flat. In a first variant, the thickness of the intermediate product is approximately the same as said plate, the filling material being essentially provided in the spaces remaining in the plate apertures. In a second variant, the filling material is formed by a

resin, which covers at least one of the top and bottom surfaces of the plate. In this latter case, the intermediate product has improved rigidity, because the resin covers at least one side of the plate and preferably both sides.

If the resin covers both sides of the plate and the electronic modules, the intermediate product can already be used as a card, when the outer surfaces are approximately flat. However, there are several advantages to making the intermediate product according to the invention in a card manufacturing method that includes at least one further step of adding resin to both sides of the intermediate product. The present invention also concerns this manufacturing method. According to this method of manufacturing at least one card, an intermediate product, as defined above, is made, and then the resin is deposited on at least one of the top and bottom surfaces of the intermediate product. Finally, pressure is applied to the deposited resin, which is then in a non-solid state, to form at least one card that has a flat outer surface, since the resin deposited on the intermediate product fills in any variations in thickness in the intermediate product. The resin deposited on the intermediate product preferably forms a thin layer. The resin can be added in a single step or in several successive steps to further improve flatness.

This method is particularly advantageous for obtaining cards which have a perfectly flat surface and which incorporate a relatively large electronic module that has variations in thickness and is formed of various elements. In fact, when the electronic module is formed of various elements, made of different materials and with different levels of thickness and empty intermediate zones, the filling material or resin added to the remaining space in the plate aperture is distributed in an irregular manner, with variations in thickness. When the filling material or resin hardens, shrinkage, and thus a variation in thickness, may occur in the resin, which then generates a surface with slight hollows or bumps. The surface state of the intermediate product generally does not meet the bankcard standards, but the variations in thickness can be removed, by subsequently depositing

a resin film on both sides of the intermediate product, when the finished cards are formed. The cards then have perfectly flat outer surfaces.

Generally, the invention concerns a method of manufacturing at least one intermediate product or at least one card including the following steps:

- 5 - making an assembly according to the preferred embodiment of the invention described above, said assembly including a plate that has at least one aperture and at least one electronic module arranged, at least partially, in said aperture, said plate and said at least one electronic module being assembled, before a filling material is added to the remaining space in said
- 10 at least one aperture, in a sufficiently rigid manner to hold said at least one electronic module in said at least one aperture, in a substantially fixed position relative to said plate, prior to and during the following step of:

- adding a filling material and introducing said filling material in a viscous liquid state into said remaining space in said at least one aperture;
- 15 - solidifying said filling material.

According to a preferred variant, the method is characterized in that a resin is deposited over at least one of the bottom and top surfaces of said plate, at least on the side where the filling material was introduced into said at least one aperture in said plate. According to a preferred variant, the

20 filling material is identical to the resin and is added simultaneously.

According to a particular feature of the method described above, the resin is spread out using at least one roller or one blade, which moves relative to the plate-electronic module assembly. An intermediate product or card with more or less flat outer surfaces is thus obtained.