(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 385 583 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **90301020.5**

(51) Int. Cl.5 **B42D 15/02**

(22) Date of filing: **31.01.90**

(30) Priority: **31.01.89 JP 23494/89**

(43) Date of publication of application:
05.09.90 Bulletin 90/36

(84) Designated Contracting States:
DE FR GB

(71) Applicant: **SHARP KABUSHIKI KAISHA**
22-22 Nagaike-cho Abeno-ku
Osaka 545(JP)

(72) Inventor: **Komaki, Shigeki**
3-9-9, Saikujo-cho
Nara-shi Nara-ken(JP)

(74) Representative: **Brown, Kenneth Richard et al**
R.G.C. Jenkins & Co. 26 Caxton Street
London SW1H 0RJ(GB)

(54) A method of forming an embossed character on an IC card.

(57) A method of forming an embossed character on an IC card, comprising the steps of: applying a viscous resin, which adheres to the surface of the IC card and hardens when exposed to ultraviolet light, onto the surface of the IC card while forming a desired character with the resin; and projecting ultraviolet light onto the surface of the IC card so as to harden the resin applied in the form of the desired character.

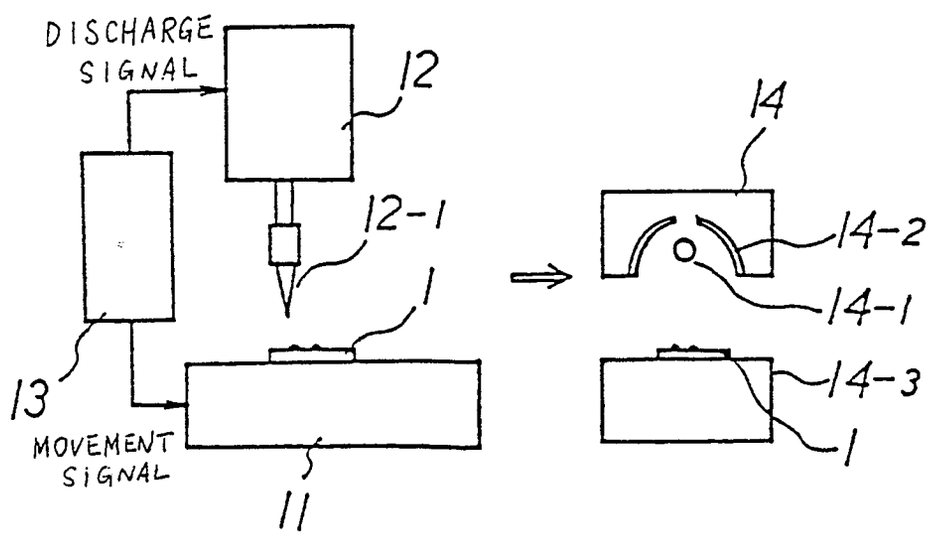

Fig. 2

EP 0 385 583 A2

A METHOD OF FORMING AN EMBOSSED CHARACTER ON AN IC CARD

BACKGROUND OF THE INVENTION

1. Field of the invention:

This invention relates to a method of forming an embossed character on a portable-type medium in the form of a card such as an IC card.

2. Description of the prior art:

Previously, an embossing apparatus which is called an embosser has been used to form an embossed character on an IC card.

Figure 6 shows a process of forming an embossed character by the use of such a conventional embosser. The embosser comprises a male die 10 provided with a projection in the form of a certain character and a female die 9 provided with a recess in the form of the same character into which the projection of the male die 10 is fitted. In the process of forming an embossed character, an IC card 1 is placed between the male die 10 and the female die 9, and then both the dies 9 and 10 are pressed against the IC card 1 so that the projection of the male die 10 cuts into the plastic substrate of the IC card 1. As a result, the plastic substrate is deformed so as to have an embossed character 8-1 thereon.

In such a method, however, since the plastic substrate of the IC card is subjected to stress when the male and female dies are pressed against it, electronic components embedded therein are damaged if an embossed character is formed on the portion of the card where the components are embedded. Even when an embossed character is to be formed on the portion where no electronic components are embedded, the stress applied to the portion is often applied also to the electronic components during the process, which causes damage to the electronic components.

Figures 3a and 3b show a multi-functional IC card with a display. The IC card **1** is provided with a display section **3-1** and input/output keys **7-2** on its rear side as shown in Figure 3b, and also provided with a magnetic stripe **9**, embossed characters **8-1**, and external terminals **3-6** through which electric signals are input or output on its front side, as shown in Figure 3a.

Figure 5 shows a sectional view of an IC card of this type. The IC card **1** comprises an IC module **3** disposed between metallic panels **5** and **6**, and the spaces between the upper panel **5** and the IC module **3** and between the lower panel **6** and the IC module **3** are filled with adhesive **4**. To the upper panel **5** is attached a rear face panel **7** provided with key contacts **7-1**, and to the lower panel **6** is attached a front face panel **8** on which embossed characters **8-1** are previously formed. These components are supported together by a frame **2**.

Figure 4 is a perspective view of the above-mentioned IC module **3**, which comprises an LCD display device **3-1**, an LSI chip **3-3**, the external terminals **3-6**, a sheet-type battery **3-2**, a key contact pattern **3-5**, and the like, all incorporated into a substrate **3-4**. The size of the IC module **3** is substantially the same as that of the IC card. This means that the electronic components are embedded in the entire region of the IC card. Thus, when embossed characters are to be formed on any portion of such an IC card by means of a conventional embosser, the embedded components will surely be damaged by the stress applied by the embosser. In order to avoid this problem, embossed characters are previously formed on the front face panel alone and then the front face panel with the embossed characters is used in the assembly of the IC card.

Therefore, embossed characters are formed in the production process of an IC card, so that the issuer of an IC card should select the characters to be formed before the production process starts.

SUMMARY OF THE INVENTION

The method of forming an embossed character on an IC card of this invention, which overcomes the above-discussed and numerous other disadvantages and deficiencies of the prior art, comprises the steps of: applying a viscous resin, which adheres to the surface of the IC card and hardens when exposed to ultraviolet light, onto the surface of the IC card while forming a desired character with said resin; and projecting ultraviolet light onto said surface of the IC card so as to harden said resin applied in the form of said desired character.

In a preferred embodiment, the step of applying said resin to the surface of said IC card is performed by the use of a resin-application device comprising a discharging unit with a nozzle for discharging said resin, an X-Y table which is disposed below said nozzle and moves in the directions of X and Y with respect to said nozzle, and a control unit which controls said discharging unit and said X-Y table.

In a preferred embodiment, the IC card includes an IC module comprising a substrate into which an LCD display device, an LSI chip, external terminals, a sheet-type battery, a key contact pattern, and the like, are incorporated.

In a preferred embodiment, the size of said IC module is substantially the same as that of said IC card, said IC module being interposed between a pair of metallic panels.

In a preferred embodiment, each of said metallic panels is provided with a face panel attached thereto.

Thus, the invention described herein makes possible the objectives of (1) providing a method of forming an embossed character on an IC card, in which an embossed character can be formed without applying any stress on the IC card so that the electronic components embedded therein are not damaged, thereby improving the reliability of the IC card; (2) providing a method of forming an embossed character on an IC card, in which an embossed character can be formed without interfering with the inside structure of the IC card, so that the embossed character will not impose any restriction on the layout of the electronic components embedded within the IC card; (3) providing a method of forming an embossed character on an IC card, in which an embossed character can be formed on a completely-manufactured IC card with a display, so that it is not necessary to form any embossed characters during the production process of the IC card, resulting in a reduced production cost of the IC card, and so that an embossed character can be formed on the IC card at any time after the production of the card; (4) providing a method of forming an embossed character on an IC card, in which resin with viscosity is used to form an embossed character, so that the embossed character formed with the resin has a fixed height from the surface of the IC card; and (5) providing a method of forming an embossed character on an IC card, in which resin having adhesion to the surface of the IC card is used to form an embossed character, so that there is very little possibility that the embossed character formed with the resin will be separated from the card.

BRIEF DESCRIPTION OF THE DRAWINGS

This invention may be better understood and its numerous objects and advantages will become apparent to those skilled in the art by reference to the accompanying drawings as follows:

Figure 1 is a sectional view of an IC card on which embossed characters are formed by a method of the invention.

Figure 2 is a schematic diagram of an apparatus for forming an embossed character on an IC card, which is used in the method of the invention.

Figure 3a is a perspective view showing the front side of a multi-functional IC card with a display.

Figure 3b is a perspective view showing the rear side of the multi-functional IC card of Figure 3a.

Figure 4 is a perspective view of an IC module of a multi-functional IC card with a display.

Figure 5 is a sectional view of an IC card on which embossed characters are formed by a conventional method.

Figure 6 is a schematic sectional view showing a process of forming an embossed character on an IC card by the use of a conventional embossing apparatus.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A method of forming an embossed character on an IC card of this invention comprises two processes. One is a resin-application process in which a viscous resin that can adhere to the surface of an IC card and will harden when exposed to ultraviolet light is applied to the IC card while a desired character is being formed with the resin, and the other is a UV radiation process in which the resin thus applied in the form of the desired character to the surface of the IC card is irradiated with ultraviolet light so as harden.

Figure 2 shows an apparatus for forming an embossed character on an IC card, which is used in the method of this invention. The apparatus comprises a resin-application device including a discharging unit **12**, an X-Y table **11** and a control unit **13**, for performing the above-mentioned resin-application process, and also comprises a UV radiation device **14** for performing the above-mentioned UV radiation process.

Referring to Figure 2, a viscous resin is contained in the discharging unit **12** which includes a pump for discharging the resin through the nozzle **12-1** with a fixed pressure for a predetermined period of time according to a discharge signal delivered from the control unit **13**. This construction is known in the prior art. The nozzle **12-1** faces an IC card **1** which is temporarily fixed on the X-Y table **11** so that the resin discharged from the nozzle **12-1** can be applied to the surface of the IC card **1**.

The X-Y table **11** can be horizontally moved in the directions of X and Y (the direction X is parallel

to a pair of parallel sides of the rectangular IC card, while the direction Y is parallel to another pair of parallel sides thereof and is perpendicular to the direction X). The distance and direction in which the X-Y table **11** moves is determined by a movement signal delivered from the control unit **13**.

The control unit **13** is substantially the same as a control unit of a conventional numerically controlled machine. As described above, the control unit **13** controls the period in which the discharging unit **12** discharges the resin and also controls the distance and direction in which the X-Y table **11** moves, in such a manner that a desired character, letter or figure can be formed with the resin discharged onto the IC card **1** fixed on the X-Y table **11**. For that purpose, the control unit **13** is provided with a plurality of programmed sequences of discharge and movement signals, and the like, each sequence corresponding to a character, letter, figure, etc. The user, selects the appropriate sequences corresponding to desired characters to operate the apparatus.

For example, when a figure "1" is to be formed on the IC card **1** with the use of the above-mentioned apparatus, the X-Y table **11** is first moved so that the nozzle **12-1** is located just above the starting point of the figure "1" to be formed on the IC card **1**. Then, the pump of the discharging unit **12** is driven to discharge the resin through the nozzle **12-1** onto the surface of the IC card **1**. At the same time, the X-Y table **11** moves in the direction of Y so as to allow the resin to be applied in the form of a straight line along the direction of Y onto the surface of the IC card **1**. After a predetermined period of time has passed, the X-Y table **11** stops, followed by the suspension of the operation of the pump, which stops the application of the resin. In this way, the resin in the form of a line of a predetermined length is applied to the surface of the IC card **1**, resulting in an embossed figure "1". Since the resin has viscosity, the resin thus applied has a fixed height from the surface of the IC card **1**.

The IC card **1** on which a desired character has thus been formed is then subjected to a UV radiation process by the use of the UV radiation device **14**, which comprises a UV lamp **14-1**, a reflecting plate **14-2** and a table **14-3**. The IC card **1** on which the resin in the form of the desired character has been applied is temporarily fixed on the table **14-3**, and then exposed to ultraviolet light emitted from the UV lamp **14-1**. As a result, the resin in the form of the desired character hardens.

According to the invention, since the resin adheres to the surface of the IC card, there is very little possibility that the resultant embossed character will be separated from the card.

Figure 1 is a sectional view of a multi-functional IC card with a display, on which embossed characters are formed by the method of the invention. The IC card **1** comprises an IC module **3** disposed between two metallic panels **5** and **6**, and the spaces between the upper panel **5** and the IC module **3** and between the lower panel **6** and the IC module **3** are filled with adhesive **4**. To the upper panel **5** is attached a rear face panel **7** provided with key contacts **7-1**, and to the lower panel **6** is attached a front face panel **8**. These components are supported together by a frame **2**. Embossed characters **8-2** are formed on the surface of the front face panel **8** of the completely-manufactured IC card **1** by the method of the invention.

Thus, in the method of the present invention, an embossed character can be formed without applying any stress on the IC card so that the electronic components embedded therein are not damaged, thereby improving the reliability of the IC card. The embossed character thus formed does not interfere with the inside structure of the IC card, so that there is no restriction on the layout of the electronic components embedded within the IC card.

Furthermore, according to the method of the invention, an embossed character can be formed on a completely-manufactured multi-functional IC card with a display, so that it is not necessary to form embossed characters during the production process of the IC card, resulting in a reduced production cost thereof. Moreover, since the the characters to be formed need not be selected before the production process of the IC card, embossed characters can be formed at any time after the manufacture of the IC card.

It is understood that various other modifications will be apparent to and can be readily made by those skilled in the art without departing from the scope and spirit of this invention. Accordingly, it is not intended that the scope of the claims appended hereto be limited to the description as set forth herein, but rather that the claims be construed as encompassing all the features of patentable novelty that reside in the present invention, including all features that would be treated as equivalents thereof by those skilled in the art to which this invention pertains.

Claims

1. A method of forming an embossed character on an IC card, comprising the steps of:
applying a viscous resin, which adheres to the surface of the IC card and hardens when exposed to ultraviolet light, onto the surface of the IC card while forming a desired character with said resin;

and

projecting ultraviolet light onto said surface of the IC card so as to harden said resin applied in the form of said desired character.

2. A method according to claim 1, wherein said step of applying said resin to the surface of said IC card is performed by the use of a resin-application device comprising a discharging unit with a nozzle for discharging said resin, an X-Y table which is disposed below said nozzle and moves in the directions of X and Y with respect to said nozzle, and a control unit which controls said discharging unit and said X-Y table.

3. A method according to claim 1, wherein said IC card includes an IC module comprising a substrate into which an LCD display device, an LSI chip, external terminals, a sheet-type battery, a key contact pattern, and the like, are incorporated.

4. A method according to claim 3, wherein the size of said IC module is substantially the same as that of said IC card, said IC module being interposed between a pair of metallic panels.

5. A method according to claim 4, wherein each of said metallic panels is provided with a face panel attached thereto.

6. An IC card having at least one embossed character formed on a surface thereof, said character being constituted by a cured resin formed in the character shape on a flat surface portion.

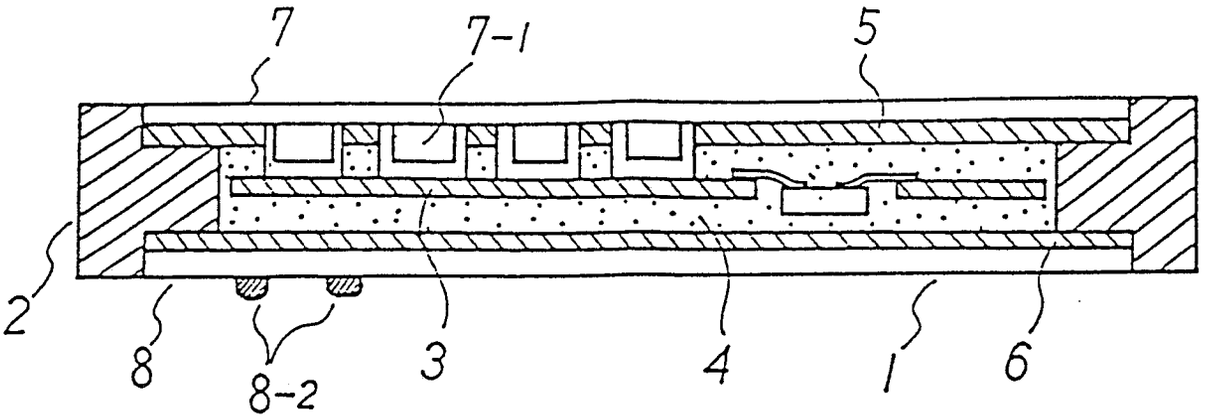
7
7-1
5
2
8
8-2
3
4
1
6

Fig. 1

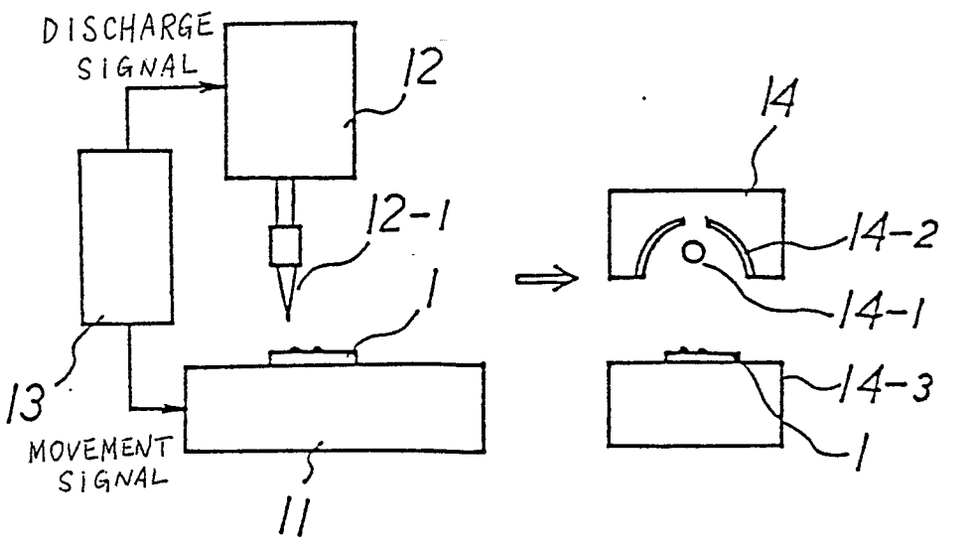
DISCHARGE SIGNAL
12
12-1
1
13
MOVEMENT SIGNAL
11
14
14-2
14-1
14-3
1

Fig. 2

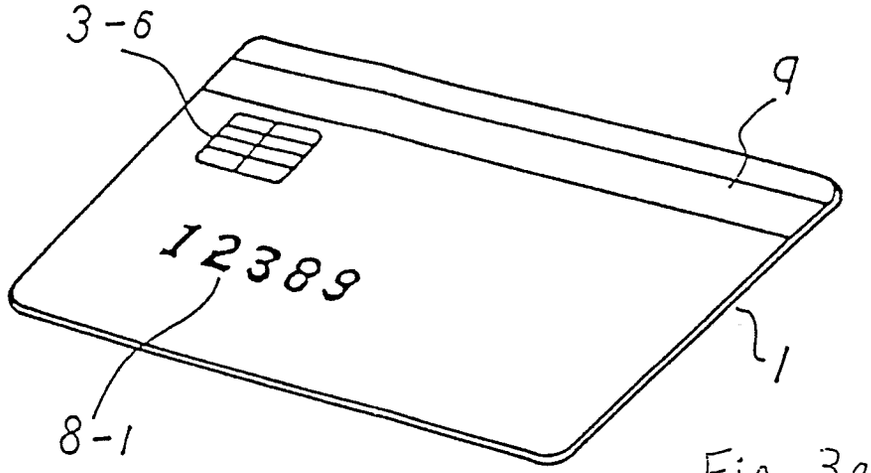

Fig. 3a

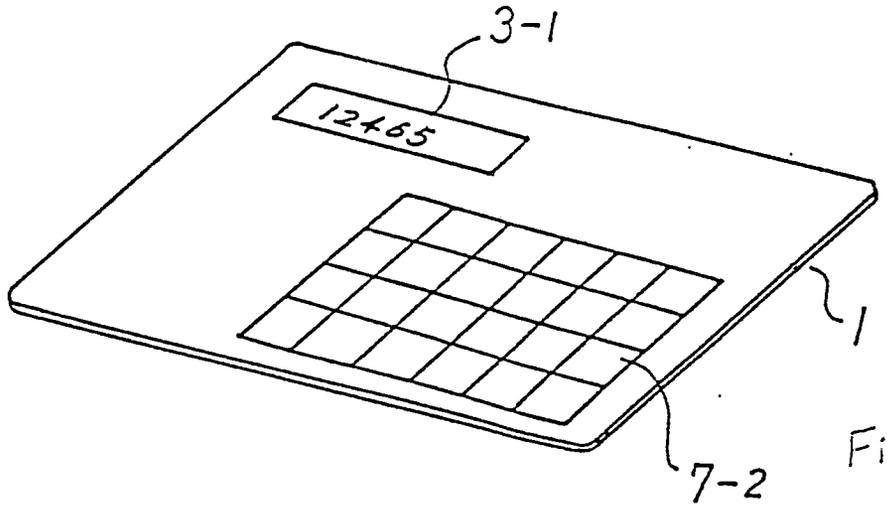

Fig. 3b

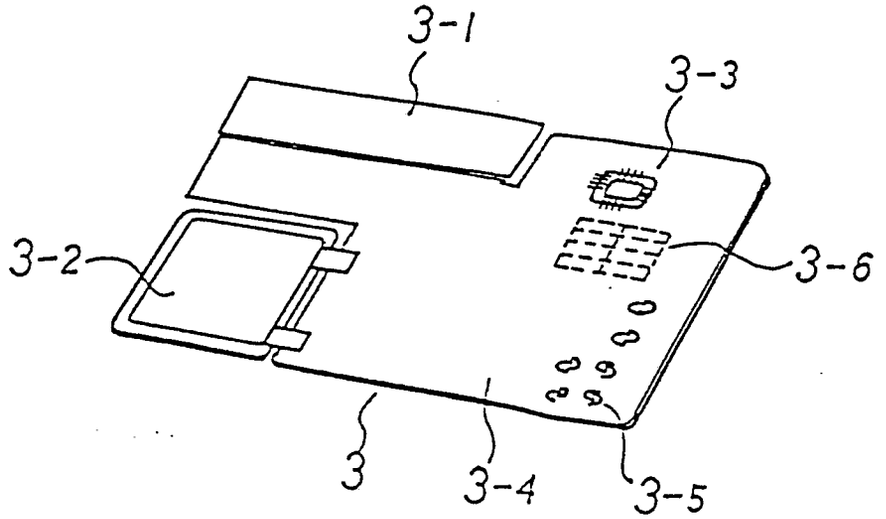

Fig. 4

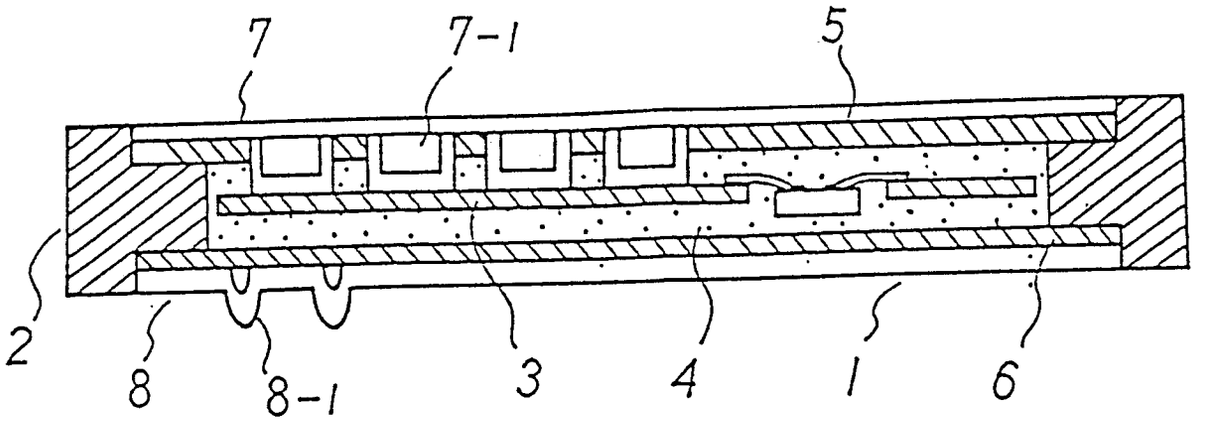

Fig. 5

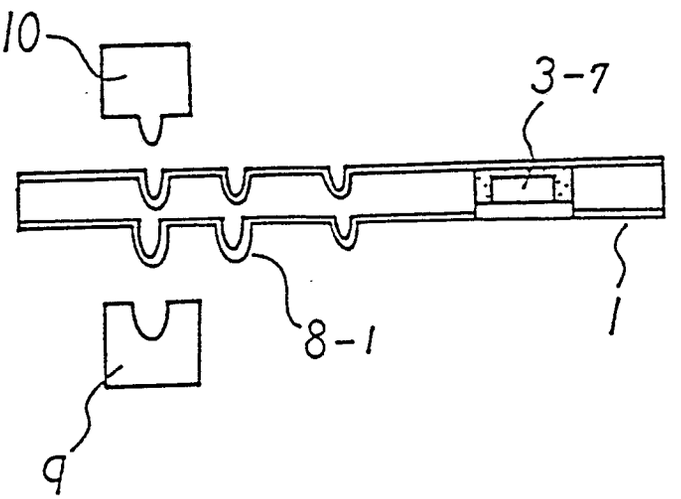

Fig. 6