

## Antenna circuits for RFID to prevent improper detachment



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Etched aluminium antenna circuits

### 【 1. Introduction 】

RFID cards are used in a wide range of applications, including as transportation related contactless cards for Japan Railways and as finance related contactless cards for payment in convenience stores and elsewhere. In recent years, they have also been extended to applications such as merchandise control and bank cards.

RFID have the large advantage that data can be exchanged by simply placing them near to the reader/writer device. Their convenience has led to their adoption in many sectors. For example, in merchandise control, it is possible to read the data for multiple products at one time, which is not possible with bar codes. Also, when used to handle money, it is not necessary to take out small change from bags and purses.

On the other hand, there have been great concerns about the security of RFID and, as the use of RFID spreads, there have been demands for further improvements to their security performance.

The “Antenna circuits to prevent improper detachment” introduced here were developed as a solution to that issue. They are antenna circuits for RFID with high level security.

### 【 2. Method for security performance improvement 】

The structure of an IC card is as shown in Figure 1. The antenna circuits, which have a communications function, are protected on both sides by the attachment of a cover film. Also, as shown in Figure 2, in merchandise control applications, instead of the attachment of a cover film on both sides of the antenna circuits,

there is adhesive used to directly attach the circuits to the product.

Measures taken in the communications technology between the RFID and the reader/writer device have meant that it is difficult to read the data from the states on the right in Figures 1 and 2. However, it is possible to retrieve the data if special techniques are used to remove the cover film and expose the antenna circuits. Furthermore, in merchandise control RFID, the attachment of the RFID to the product shows the normality of the item, but there is concern about misuse if it is removed from the product and attached to a forged item.

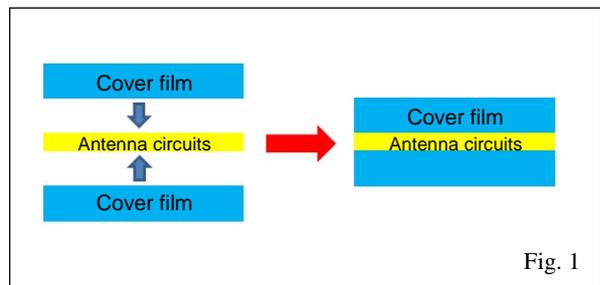


Fig. 1

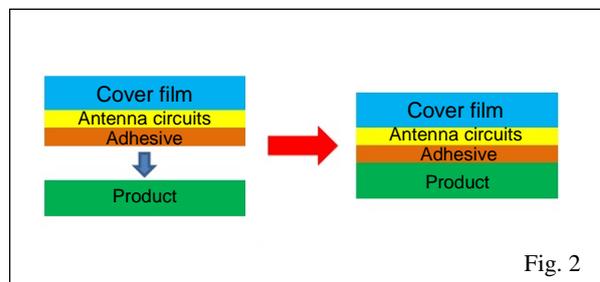


Fig. 2

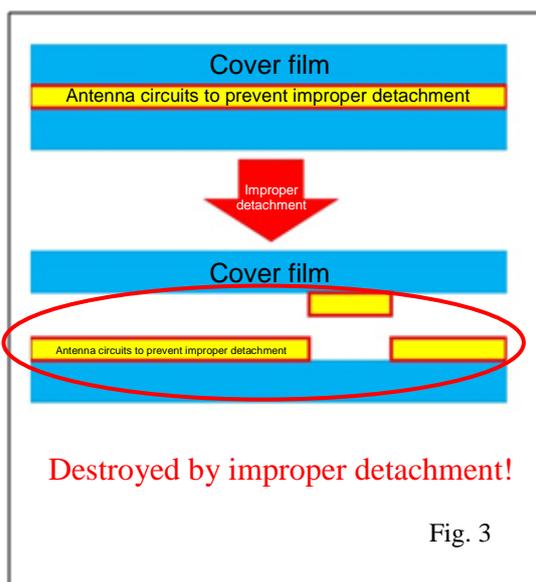
Toyo Aluminium has succeeded in making adaptations to the antenna circuits to develop antenna circuits that can prevent any misuse

due to improper detachment as described above.

### 【 3. The quality of antenna circuits to prevent improper detachment 】

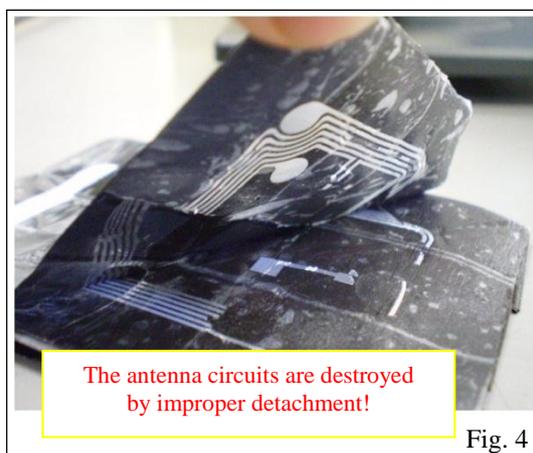
In order to prevent the removal of the cover film or the removal of the circuits from a product, as described above, it was decided to add a function to the antenna circuits that means that the antenna circuits are destroyed if there is any improper detachment.

In the case of normal antenna circuits, there is a risk of misuse because it is possible to remove the normal antenna circuits without damaging them if a special technique is used to remove the cover film. However, as shown in Figure 3, when the cover film is removed from these antenna circuits to prevent improper detachment, the design means that the antenna circuits are destroyed. As can be seen in the photograph in Figure 4, when the improper detachment of the cover film is attempted, the antenna circuits are destroyed.



It therefore becomes difficult to remove the cover film or remove the RFID from a product without destroying the antenna circuits and it is possible to prevent the retrieval of the data or the misuse of the RFID on a forged item.

Although the circuits should be destroyed when improper detachment occurs, they must not be damaged when the item is being used normally. In order to achieve both of these contradictory qualities, the antenna circuits to prevent improper detachment are produced with technology newly developed for this application. The techniques used for improper detachment and the burden on the circuits in normal use will vary depending upon the application for which the RFID is being used. However, it is possible to respond to various user demands in order to ensure that the prevention of improper detachment functions normally in any application.



### 【 4. Summary 】

This product was developed by utilizing the experience and knowledge that Toyo Aluminium has cultivated so far in etching circuit products and packaging materials for food and pharmaceutical products. It is expected that it will make a big contribution to the improvement of security performance, which will be required as the demand for RFID increases in the future.

(Patent pending)