PHONOCARD BTK12

Pour communications locales, interurbaines et internationales

- Carte à codage optique, format carte de crédit ISO
- Possibilité d'utiliser également les cartes de crédit magnétiques
- Programme de test et diagnostic automatique incorporé
- Affichage permanent du solde restant sur la carte
- Carte prépayée codée optiquement

1. INTRODUCTION

1.1 General

PHONOCARD is a public card telephone developed by Landis & Gyr in collaboration with european telephone administrations. The main characteristics of the PHONOCARD payphone are : a higher degree of security, a more economic operation and a simplified maintenance.

PHONOCARD makes telephoning simpler by enabling to call without needing of coins. It makes possible an optimum settlement of charges and reduces the risks of vandalism to steal money or the damage by exasperated users who have been cut off.

Its prepaid decremental value card which is manufactured using advanced optically methods ensures high security and reliability. It can be neither copied nor recharged and is protected against all types of counterfeiting.

The optically encoded credit is carried on a card of international format (ISO standard 2894) and is progressively reduced as the user makes use of his card. The card is not affected by electric or magnetic fields and can only be used once.

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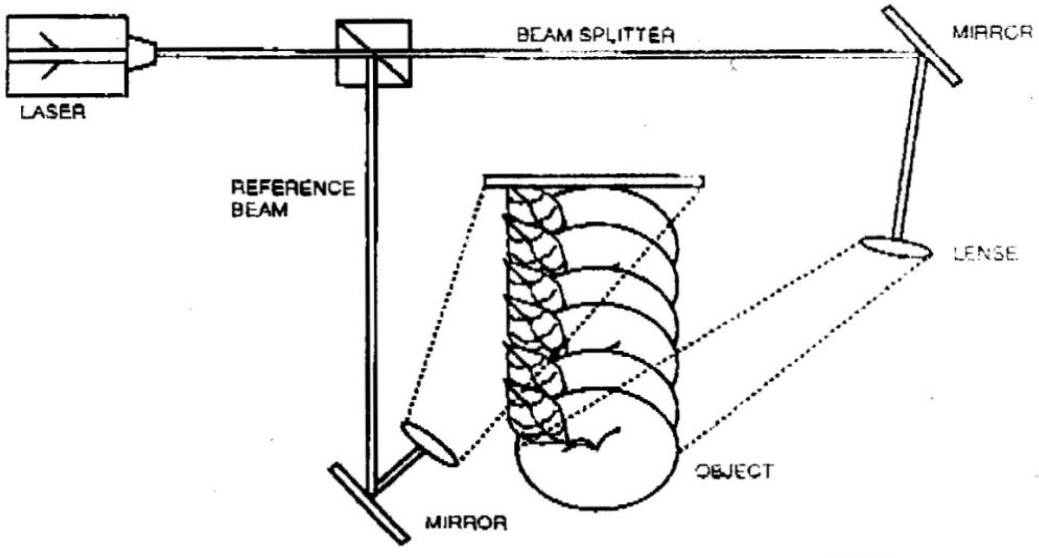
1.2 Holography and optically coded cards

Holography, a word derived from the greek words "HOLOS" (whole, complete) and "GRAPHEIN" (write) was first used by the british physicist Dennis Gabor in 1947 to describe a method to register and reproduce three dimensional pictures. However, real holograms were first produced after the invention of a coherent light source called LASER in 1962 by the american physicists E. Leith and J. Upatnieks.

The creation of holograms is fairly simple and is effected by recording on a photographic plate the interference of the reflected spherical waves resulting from a 3-dimensional object with the plane waves coming from the same coherent light source (LASER). Once recorded the 3-dimensional image can be viewed by applying this very LASER beam on the plate.



LASER . Light amplification by stimulated emission of radiation. Very constant light in phase and wave length.

1.3. Properties of holograms

Holograms have a whole range of very special properties. Here we will limit ourselves to mentioning those of most interest of our applications.

In the interference structure captured by a hologram, all the information relating to the object observed are present everywhere on the photograph. Thus, a small piece of the hologram alone contains all this information and by itself is capable of being used to produce an exact reproduction of the object. The recording of information by means of holograms is thus a method with a high degree of redundancy.

It follows from this property that the reproduction of a plane object (for example a configuration of points of light) is independent of the position of the hologram; the hologram may be shifted laterally but the image does not move. Thus, when reading such a hologram, there is no need for high precision in positioning.

Although it is necessary to dispose of highly sophisticated equipment to produce a hologram, which is both expensive and delicate - in particular, laser equipment - and to make use of advanced knowledge of the optics of coherent light, the reproduction of a basic hologram by printing processes similar to those used for banknotes is possible and allows the mass production of faithful replicas of the basic hologram at a reasonably low cost (of the same order of magnitude as the cost of producing banknotes).

Finally, provided the images are relatively simple, it is possible to reconstitute them from holograms, under certain conditions, by means of non-coherent light sources, i.e. compact inexpensive sources.

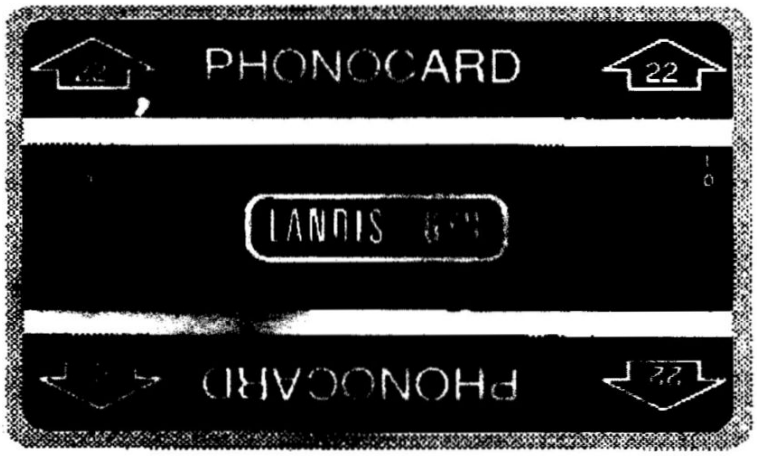
The above considerations thus show that the technique of recording information by means of holograms that are difficult to create, impossible to imitate, readily mass produced and easy to read is ideally suited to our aims and permits the realization of high security value-cards.

2. DESCRIPTION OF THE OPTICALLY CODED CARDS

2.1. General

The PHONOCARD value cards are prepaid decremented cards, i.e. the value contained in a card's track(s) is steadily reduced during the telephone call. The user is constantly informed on the display as to the credit or number of value units remaining on the card, an optical and acoustical signal will warn him some 20 seconds before the credit runs out in which care he will have the possibility to prolong the call by introducing another card.

The PHONOCARD value-bearing cards are made of a special plastic, their external dimensions are in conformity with the ISO standard 2894 (85.6 x 54.1 x .75 mm). Actually, the PHONOCARD cards are made a little thinner than the standard in order to avoid the insertion of regular credit cards.



A very fine optical structure which carries the information is embedded in the form of one or two tracks in the value card and presents three kinds of information :

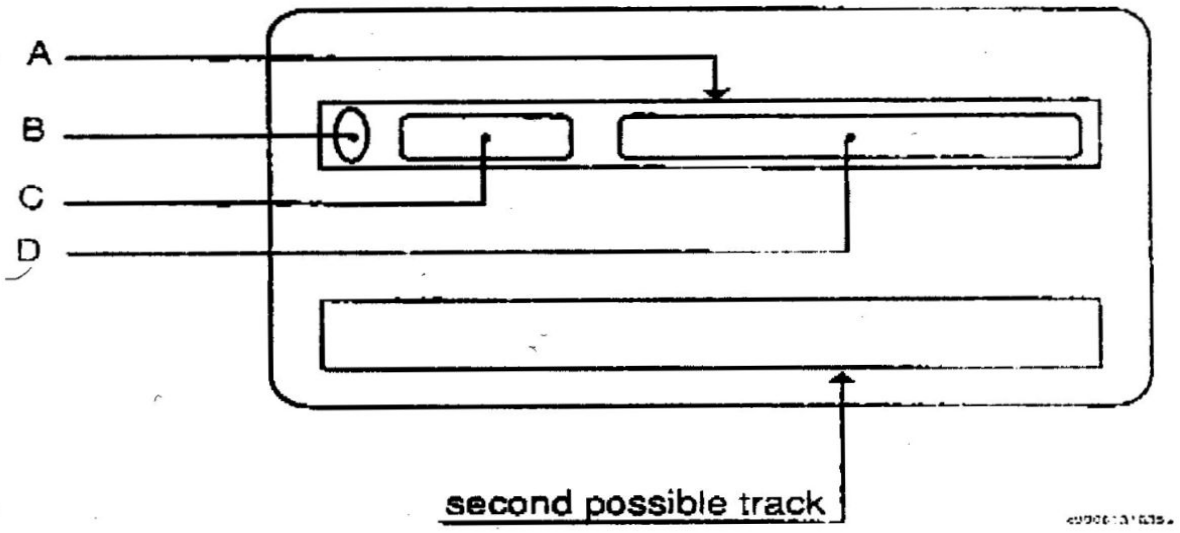
- The optical track is divided into value units or bits.
  They are invisible to the human eye and are read and erased by the reader unit successively during the telephone conversation. The value-units are physically destroyed by heat once the value has been consumed.

- A second type of information contained in the tracks is a particular structure which represents a characteristic configuration of points of light. This information is used by the reader to identify a card as valid. This will ensure highest security since a reproduction of such configurations is virtually impossible.

- Finally a third type of information may be obtained by the erasing of a certain number of bits at the beginning of the track. This information is used to classify the cards into different categories or type codes.

The PHONOCARD cards are manufactured using a very complex technology which involves the use of holographic methods to achieve the different microstructures. Once a card has been "printed" with the information it is then covered by a lacquer coating providing an optimal protection against forgeries and fraudulent manipulation.

The information contained on the Card's track is described as follows.



A. Family structure code : this code enables the card reader to identify a card as valid and to distinguish it from non-valid cards. It is based on a unique optical microstructure which is obtained from a characteristic configuration of points of light. This code is fixed once when the cards are manufactured.

B. Start bit : each track contains a start bit requested to start reading process. It is used for the correct positioning of the read/erased head of the card reader.

C. Customer or type code : this track zone comprises 7 bits and it is used to differentiate between cash cards using the same family structure. it is obtained when the cards are manufactured by erasing of certain bits in accordance to a 4 out seven coding system. This procedure prevents any fraudulent manipulation of the codes.

The 4 out of 7 coding systems allows to obtain 35 different customer codes.

D. Value units : the value zone of the card consists of up to 120 units according to the selling price of the card. These value units are erased one by one each time a metering pulse is received during the telephone call.

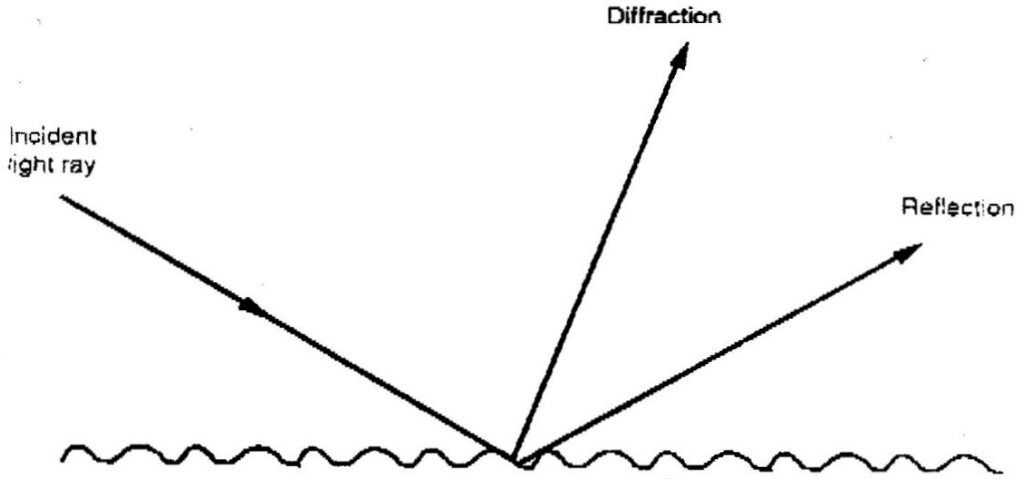
The erased part of the track is visible to the user by means of a little dark mark on cards' scale, it enables him to evaluate the remaining on the card . Another way to check the value remaining on the card is to insert the card without lifting the handset; the stored value will be displayed for approx. 2 seconds.

2.2. Layout

The card's layout is made according to the wishes of the PTT. Printing is made in silk-screen or offset-printing which allows promotional printing on several colours.

2.3. Characteristics of the optical track

The microstructure of the optical track is special in that an incident light ray is diffracted in a direction that is determined by the physical characteristics of the microstructure itself. The optical effect is that of a diffraction grating and the coding is termed optical coding because of the techniques used in the production process.



Diffraction of light at the surface of a diffraction grating

Referring to the above figure, for a given microstructure (diffraction grating), the incident light beam is diffracted in a given direction. The detection of this ray is referred to as being in order 1.

If the light beam encounters a reflecting surface (mirror), direct reflection takes place. The detection of this ray is referred to as being of order 0.

A light beam incident on a diffraction grating is characterized by the reception of a signal corresponding to the order 1 and the absence of a signal corresponding to the order 0.

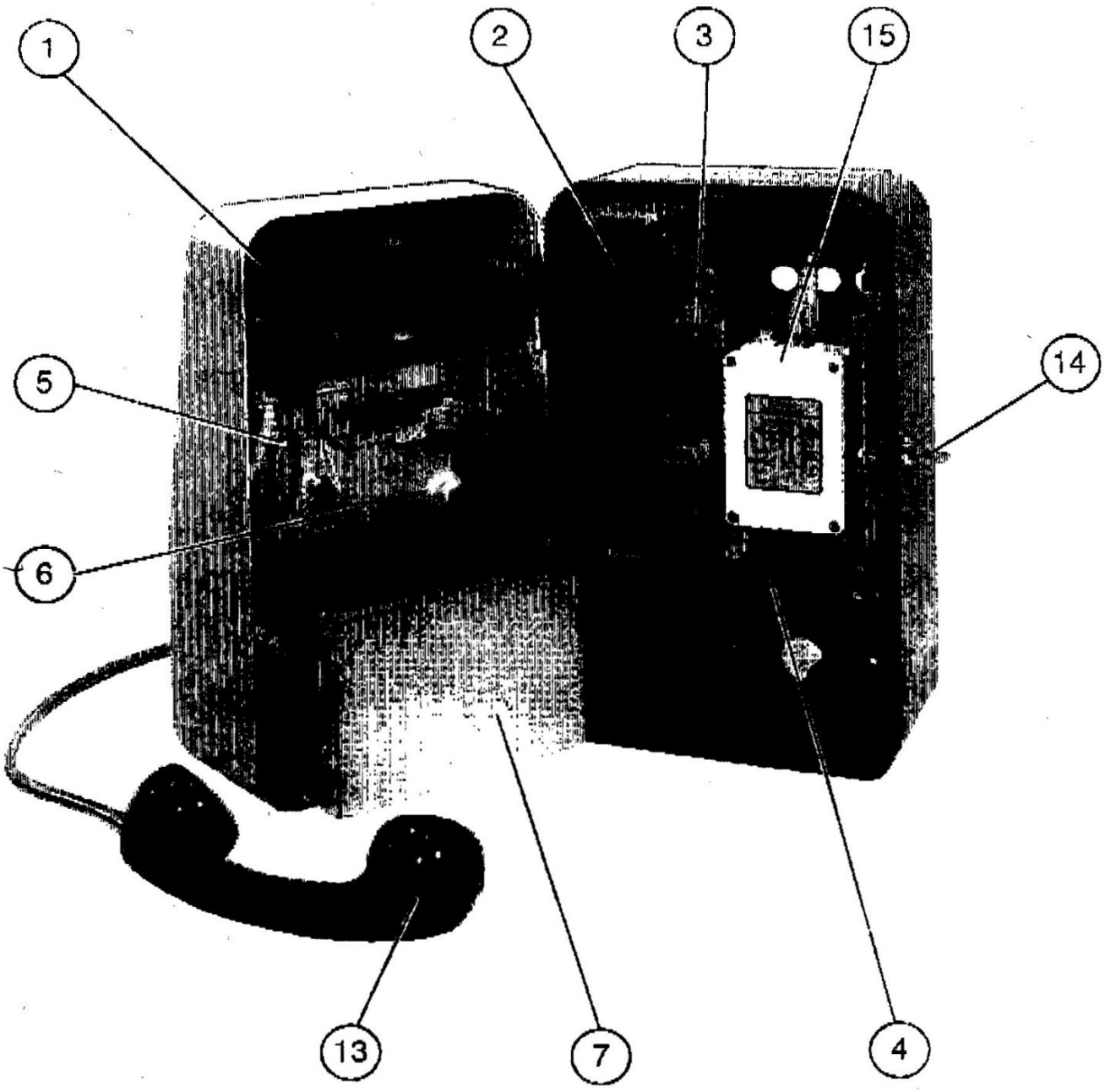
A light beam incident on an "intermediate" surface (matt, rough, erased grating, different types of grating) to the orders 1 and 0.

3. CONSTRUCTION OF THE PHONOCARD BTK12

3.1. General

The PHONOCARD BTK12 is built in two parts (case and cover) of die carst aluminium construction, which are hinged on the left-hand side of the device, it is closed by means of a lock situated on the right-hand.

Beyond the motherboard fixed in the case, and the credit display mounted in the door the electronic circuits comprise the analogic and logic PCBs carried in guides in the rear case.



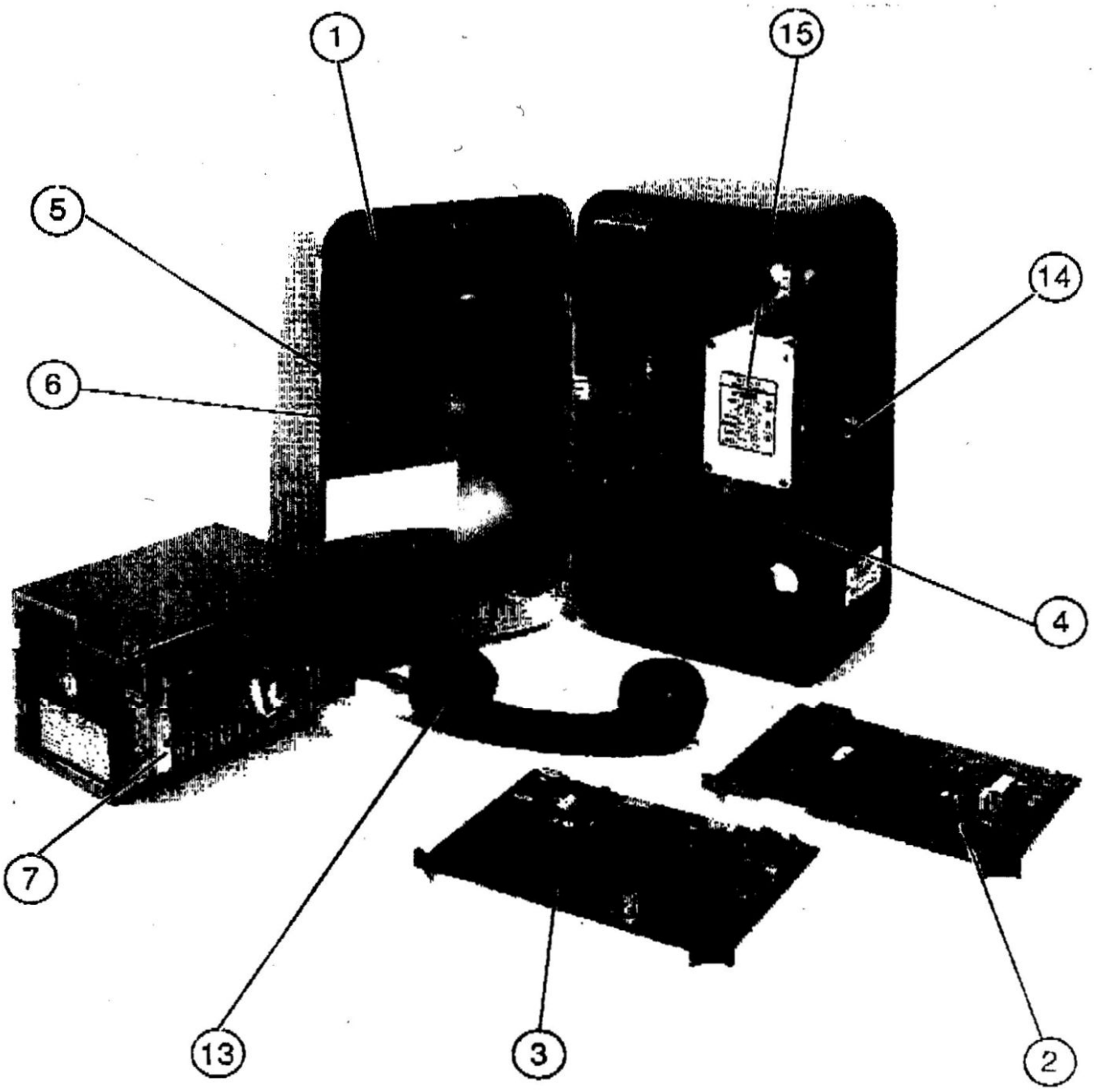
The case of PHONOCARD BTK12 is fitted with the following parts.

- A motherboard, mounted in the rear case. This provides connection for the different electronic circuits of the PHONOCARD (logic, analogue, display, reader) and connections for telephone line, handset and power.

- A handset with stainless steel cord fixed to the left-hand side of the body through a moving part.

- The lock on the right-hand side allows access to the electronics of the device.

- A transformer (optional) which supplies the necessary power from the network (220 or 110VAC).



The cover is fitted with the following parts .

- A handset cradle with a gravity switch allowing the switching "on" and "off" of the PHONOCARD BTK12.

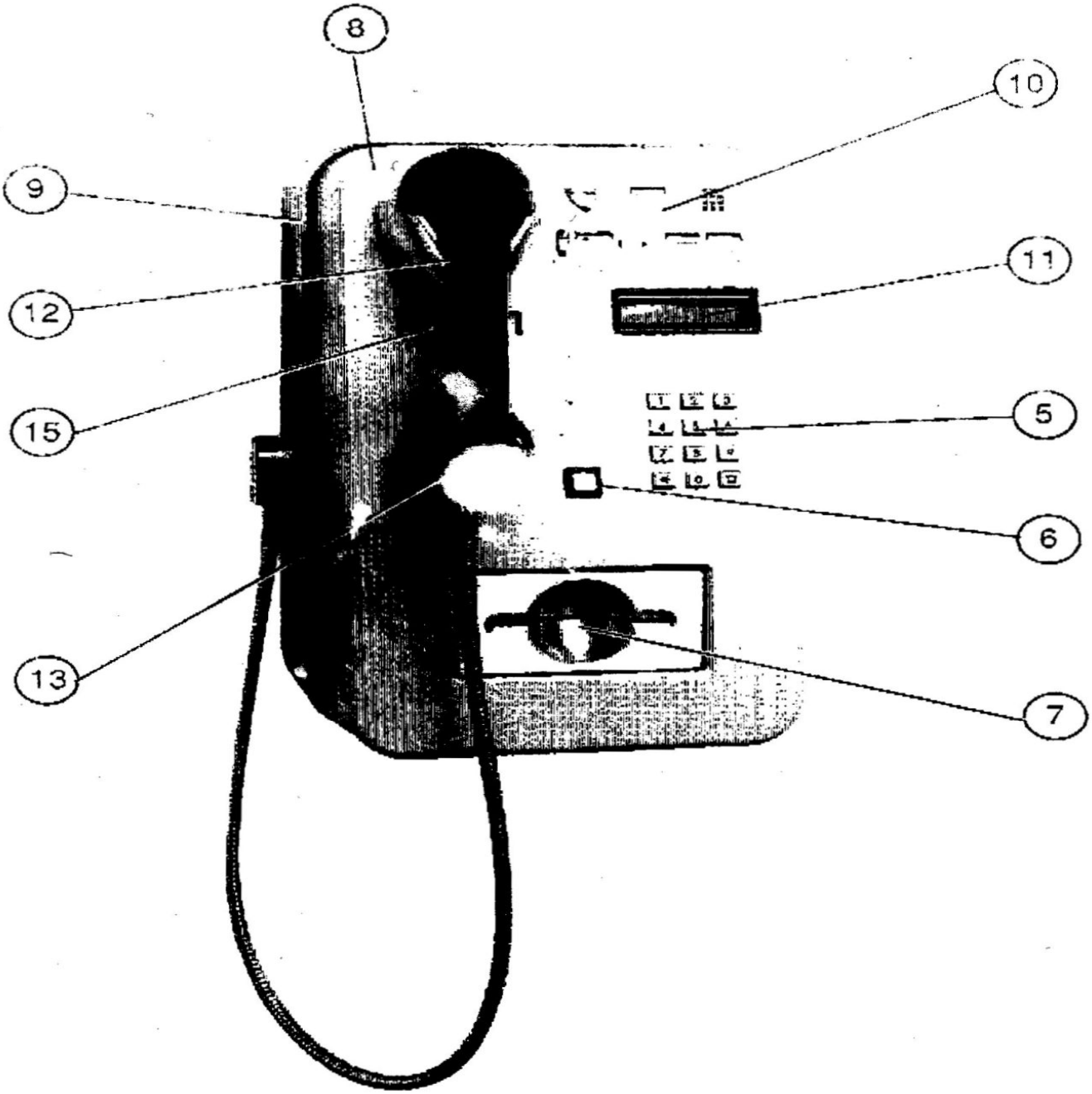
  The credit display

- A pictogram

- Metallic keyboard

- The change card's button

- Housing for BSK30 card reader



By Alain KNECHT, March 2009