

EUROPEAN QUALIFYING EXAMINATION 1994

PAPER A ELECTRICITY / MECHANICS

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INSTRUCTIONS TO CANDIDATES

You are to assume that you have received the annexed letter from your client including a description of an invention for which he wishes you to obtain a European patent together with references to the most pertinent prior art known to your client.

You should accept the facts given in the paper and base your answers upon such facts. Whether and to what extent these facts are used is your responsibility.

You should not use any special knowledge you may have of the subject-matter of the invention, but are to assume that the prior art given is in fact exhaustive.

Your task is to draft an independent claim (or claims) offering the applicant the broadest protection possible while at the same time having a good chance of succeeding before the EPO. In drafting your claim(s) you should bear in mind the need for inventive step over the prior art indicated, the requirements of the Convention, in particular as to the form of claims, and the recommendations made in the Guidelines for Examination in the EPO. Dependent claims should also be drafted so as to enable you to fall back upon them should the independent claim(s) fail and should be kept to a reasonable number.

You are also expected to draft an introduction, i.e. that part of the description which precedes the examples or the explanation of the drawings. The introduction should be sufficient to provide support for the independent claim(s). In particular, you should consider the advisability of mentioning advantages of the invention in the introduction.

You are expected to draft claims and an introduction for one European patent application only. This application should meet the requirements of the Convention as to unity. If you would in practice seek to protect further inventions by filing one or more separate applications, you should, in a note, clearly identify the subject-matter of the independent claim of such separate application(s). However, it is not necessary to draft the wording of the independent claim for the or each separate application.

In addition to your chosen solution, you may – but this is not mandatory – give, in a note, the reasons for your choice of solution, for example, why you selected a particular form of claim, a particular feature for an independent claim, a particular piece of prior art as starting point or why you rejected or preferred some piece of prior art. Any such note should however be brief.

It is assumed that you have studied the examination paper in the language in which you have given your answer. If this is not so, please indicate on the front page of your answer in which language you have studied the examination paper. This always applies to candidates who – after having filed such a request when enrolling for the examination – give their answer in a language other than German, English or French.

Client's letter

We are a firm producing telephones, in particular telephones for public use. In the past, public telephones used to include a coin cashing apparatus and a coin box. Now the general tendency is to operate public telephones by means of prepaid telephone cards thereby avoiding the necessity for a coin box. This means that there is no longer a temptation for criminals to break into the telephones, which increases the economy of public telephones.

A commonly used type of prepaid telephone card, known as a "chip card", has a tiny integrated circuit or "chip" embedded therein. This chip, which is extremely difficult to reproduce fraudulently, stores a numerical value representing a credit and is electrically connected to contact pads of the card which are flush with the surface on one side of the card so as to be exposed. A user inserts such a chip card into a reading/writing apparatus of the telephone so that the contact pads are connected through said apparatus to control circuitry of the telephone. The credit value stored in the chip of the card is read and, during a telephone call, it is continuously debited by writing in the chip. At the end of the telephone call the chip card is returned to the user.

It is desirable that, during a telephone call, the card be inaccessible from the outside of the telephone to avoid fraudulent manipulations, for example the insertion of a fake card (with no chip) whose contact pads are connected to an electronic circuit external to the card, which circuit simulates the chip of an authentic card.

Document I describes a known telephone with a chip card reading/writing apparatus having a shutter that, during a telephone call, prevents access from the outside to an inserted chip card.

It is of utmost importance to reduce further the possibilities of frauds in the use of such chip card operated telephones. We have therefore developed a new chip card reading/writing apparatus which provides increased security against frauds, for which we ask you to prepare a patent application.

The apparatus of the invention is described hereafter with reference to the appended schematic drawings, where:

Figure 1 is a plan view of a known chip card which can be used with the apparatus of the invention;

Figure 2 is a plan view, partly broken away, of the apparatus of the invention with a lid thereof removed, the apparatus being shown in a waiting position;

Figure 3 is a vertical cross-section of the apparatus of the invention, along the line III-III of Figure 2, with a partially inserted chip card;

Figure 4 corresponds with the view of Figure 2 with the apparatus in a reading/writing position, but with the chip card not being shown for reasons of clarity; and

Figure 5 is a vertical cross-section of the apparatus of the invention, along the line V-V of Figure 4, also showing the chip card.

The chip card C shown in Figure 1 is made of a plastic laminate carrying eight distinct metallic contact pads CP which are flush with the surface on one side of the card so as to be exposed. The contact pads CP are separated from each other by narrow insulating spaces or gaps. A chip (not shown) is embedded in the plastic laminate in the region under the contact pads CP.

As shown in Figures 2 to 5 the reading/writing apparatus of the invention comprises a housing formed by a casing 2 and a lid 3. The casing 2 and the lid 3 are configured to provide a slot 1 in a front wall of the housing for the insertion of a chip card. As is usual in apparatus of this kind, the slot 1 is an opening having dimensions which substantially correspond to the cross-section of a chip card so that the slot 1 is just large enough to allow insertion of an authentic chip card. This makes it impossible to insert a fake card having an electronic circuit attached thereon as they would not pass through the slot 1.

Means for transporting a chip card C beyond the slot 1 to a reading/writing position shown in Figures 4 and 5 are provided inside the housing. The transporting means includes a carriage 10 which is movable within the housing in the direction of insertion of a chip card. The carriage 10 comprises a substantially rectangular frame 11 guided by a pair of bars 12 mounted in the casing 2.

A resilient member 13 is screwed on the top of the frame 11 to form therewith a pocket which receives an edge of a chip card C as shown in Figures 3 and 5. When this edge is inserted in the pocket, the chip card C is frictionally clamped between the resilient member 13 and the frame 11 of the carriage 10.

The frame 11 of the carriage 10 carries a projection 14 which is detected by an optical sensor 15 when the carriage 10 arrives at the reading/writing position shown in Figures 4 and 5.

Furthermore the frame 11 of the carriage 10 surrounds a contact member 20 that is vertically movable therein. The contact member 20 carries eight contact pins 21 extending from the top thereof. Each of said contact pins 21 is vertically movable in the contact member 20 and is provided with a spring (not shown) at the root thereof. In this way, the contact pins 21 are upwardly urged to make good electrical contact with the contact pads CP of a chip card C in the reading/writing position of the carriage 10. A flat flexible cable 22 connects the contact pins 21 to a connector 23 to allow connection of the contact pins 21 to control circuitry (not shown) of a telephone.

A pair of inclined ramps 24 provided on the bottom of the casing 2 cooperate with the contact member 20 to raise it vertically during movement of the carriage 10 in the direction of insertion of a chip card. In order that the contact member 20 may be stably vertically moved relative to the frame 11, the contact member 20 is provided with a pair of lugs 25 received in a pair of vertical grooves 17 formed in opposite walls of the frame 11 of the carriage 10. Two springs 26, each of which is fixed at one end on the frame 11, engage, at the other end, with the lugs 25 to urge the contact member 20 downwards on the inclined ramps 24. In the waiting position of the carriage 10 shown in Figures 2 and 3, the contact pins 21 are separated from a chip card C inserted in the pocket. During the transport of the chip card C to the reading/writing position shown in Figures 4 and 5, the contact member 20 is raised vertically to apply the contact pins 21 against the contact pads CP of the chip card C.

To ensure good electrical contact between the contact pins 21 and the contact pads CP of a chip card C, a protrusion 27 is provided on a wall of the contact member 20, a corresponding recess 16 is formed in the frame 11 of the carriage 10 and the vertical grooves in the frame 11 of the carriage 10 are arranged to guide the lugs 25 with some play. When the carriage 10 arrives at a position close to the reading/writing position and the contact pins 21 are already applied against the contact pads CP of the chip card C, the protrusion 27 engages in the recess 16 and a small relative movement occurs between the contact pins 21 and the contact pads CP to clean them and hence improve contact between them. The dimensions of the protrusion 27 and the corresponding recess 16 are such that each contact pin 21 slides only on its corresponding contact pad CP during their relative movement. Since the contact pins 21 never come into contact with the plastic laminate of the chip card C, the reliability of the apparatus of the invention is increased. In particular this avoids the accumulation of dirt which has been observed in apparatus such as the one disclosed in Document I where contact blades slide on the plastic laminate of the chip card during its insertion. Furthermore, since the contact pins 21 do not slide on the insulating spaces between the contact pads CP of the chip card C, there is no danger of bringing conductive material, in particular metallic particles from the contact pads or pins, into these spaces. This reduces the risk of short-circuits between the contact pads CP of the chip card C.

The carriage 10 is driven by an actuation rod 30 which extends parallel to the guide bars 12 in the casing 2 and consequently in the direction of insertion of a chip card. One end of the actuation rod 30 protrudes through an aperture in the front wall of the housing for actuation by a user while its other end is mechanically

connected to the carriage 10 so as to transmit the movement of the actuation rod 30 to the carriage 10. The chip card C which is clamped on the frame 11 by the resilient number 13 follows the movement of the carriage 10. The actuation rod 30 is guided by two headed pins 31, 32 fixed to the bottom of the casing 2. A first, relatively strong, helical spring 33 (shown schematically only), having one end attached to the actuation rod 30 and the other end to the casing 2, tends to return the actuation rod 30 and thus the carriage 10 to the waiting position shown in Figures 2 and 3. Alternatively, it would be possible to connect the ends of the spring 33 to the frame 11 of the carriage 10 and the casing 2 respectively.

A robust closure member 4 pivots around an axis 5 and, in its closed position, as shown in Figures 4 and 5, isolates an inserted chip card C from the slot 1.

A second rod 40 drives the closure member 4 through a link lever 41 which pivots around a pin 42 fixed to the casing 2. The second rod 40 is disposed on the top of the actuation rod 30 and is connected thereto by a second helical spring 43 (also shown schematically only) which is considerably weaker than the first helical spring 33. The second rod 40 is guided by the two headed pins 31, 32 so as to be longitudinally movable between two positions: a first position shown in Figure 2; and a second position shown in Figure 4.

The position of the second rod 40 is controlled by a latch lever 44, which pivots around the headed pin 31 and has one downwardly bent end that cooperates with an aperture 45 in the second rod 40. The aperture 45 is divided into a right-hand portion and a left-hand portion by a protrusion 46. When the end of the latch lever 44 is located in the right-hand portion of the aperture 45, the second rod 40 is latched in the position shown in Figure 2 and the closure member 4 is held open. When the end of the latch lever 44 is located in the left-hand portion of the aperture 45, the second rod 40 is latched in the position shown in Figure 4 and the closure member 4 is held closed.

The latch lever 44 is pivoted counterclockwise as seen in Figures 2 and 4, against the force of a spring 47, upon energisation of a solenoid 48 which acts on the other end of the latch lever 44. Thus, when the solenoid 48 is energised, the latch lever 44 clears the protrusion 46 thereby allowing movement of the second rod 40. Since the solenoid 48 acts only on the latch lever 44 and does not provide the force necessary to move the closure member 4, its energisation only requires a very low energy. This is advantageous since, generally, the electric power available in a public telephone is limited.

The reading/writing apparatus of the invention operates as follows:

In the waiting position shown in Figures 2 and 3, the first helical spring 33 urges the actuation rod 30 out of the casing 2 and holds the carriage 10 against an abutment plate 6 provided in the casing 2. The plate 6 also provides some guidance for the chip card C during its insertion. The contact member 20 is urged downwards by the springs 26. The closure member 4 is locked open by the latch lever 44 which latches the second rod 40 in the position of Figure 2. In this waiting position of the apparatus, a user can insert a

chip card C through the slot 1 so that an edge of the chip card C enters the pocket formed between the frame 11 and the resilient member 13 of the carriage 10.

The user then pushes the actuation rod 30 to move the carriage 10 and the chip card C towards the reading/writing position. During this movement, the first and second helical springs 33 and 43 are loaded and the contact member 20 is raised towards the chip card C.

When the carriage 10 arrives at the reading/writing position shown in Figures 4 and 5, the projection 14 on the carriage 10 is detected by the optical sensor 15. The simultaneous presence of the signal from the sensor 15 and a signal from the control circuitry of the telephone indicating that a valid chip card is in the reading/writing position causes a brief energisation of the solenoid 48 to pivot the latch lever 44 so that it clears the protrusion 46. This allows the second rod 40 to move to the position shown in Figure 4 owing to the force of the second helical spring 43. The movement of the second rod 40 thus brings the closure member 4 to the closed position shown in Figures 4 and 5 provided a valid chip card was inserted. The closed position of the closure member 4 is detected by an optical sensor (not shown), similar to the sensor 15, which cooperates with a projection 7 on the closure member 4.

As shown in Figure 5, the closure member 4 is locked closed by the latch lever 44 and thereby retains, through the chip card C, the carriage 10 in the reading/writing position. The user can therefore now release the actuation rod 30.

As can be seen from Figure 5, only a relatively small portion of the closure member 4 is accessible from the outside in the closed position thereof. Thus it is much more difficult to tamper with the closure member 4 of the apparatus according to the invention than

with the shutter of Document I which, when closed, has a relatively large exposed surface. In particular it is much more difficult to pierce the closure member 4 of the invention to provide a passage for conductors connecting the contact pads of an inserted fake card to an external electronic circuit.

Furthermore, the arrangement of the slot 1 and the closure member 4 makes it impossible to bring a fake card associated with an external electronic circuit into the reading/writing position and then to bring the closure member 4 to the closed position. This also increases security with respect to the apparatus of document I where an external electronic circuit could be arranged in the recess between the shutter and the insertion slot.

In the reading/writing position of the carriage 10, the contact pins 21 of the contact member 20 are urged against the corresponding contact pads CP of the chip card C. A telephone call can be started as soon as the sensors detect that the carriage 10 is in the reading/writing position and the closure member 4 is closed. As already mentioned, the force of the first helical spring 33 is transmitted through the carriage 10 to the chip card C which presses against the closure member 4 thus tending to open the closure member 4. The closure member 4 is however locked in its closed position by the latch lever 44 acting through the second rod 40 and the link lever 41.

When the telephone call has been completed, the solenoid 48 is briefly actuated so that the latch lever 44 clears the protrusion 46 whereby the closure member 4 is opened. This is caused by the action of the first helical spring 33 which applies a force to the closure member 4 which is sufficient to counter the force of the second helical spring 43 and return the closure member 4 and the second rod 40 to the position shown in Fig. 2. Upon opening of the closure member 4, the chip card C is ejected through the slot 1 due to the action of the first helical spring 33 which biases the carriage 10 towards the slot 1.

CLIENT'S DRAWINGS

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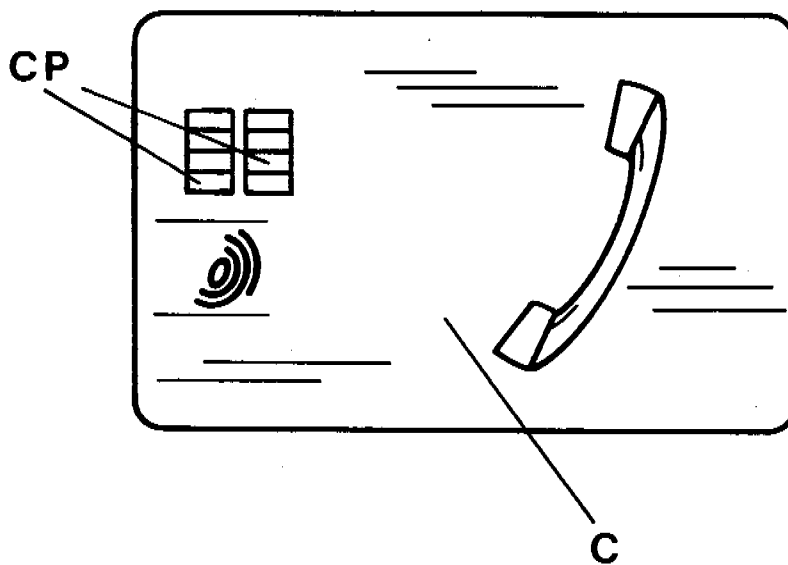


Fig. 1

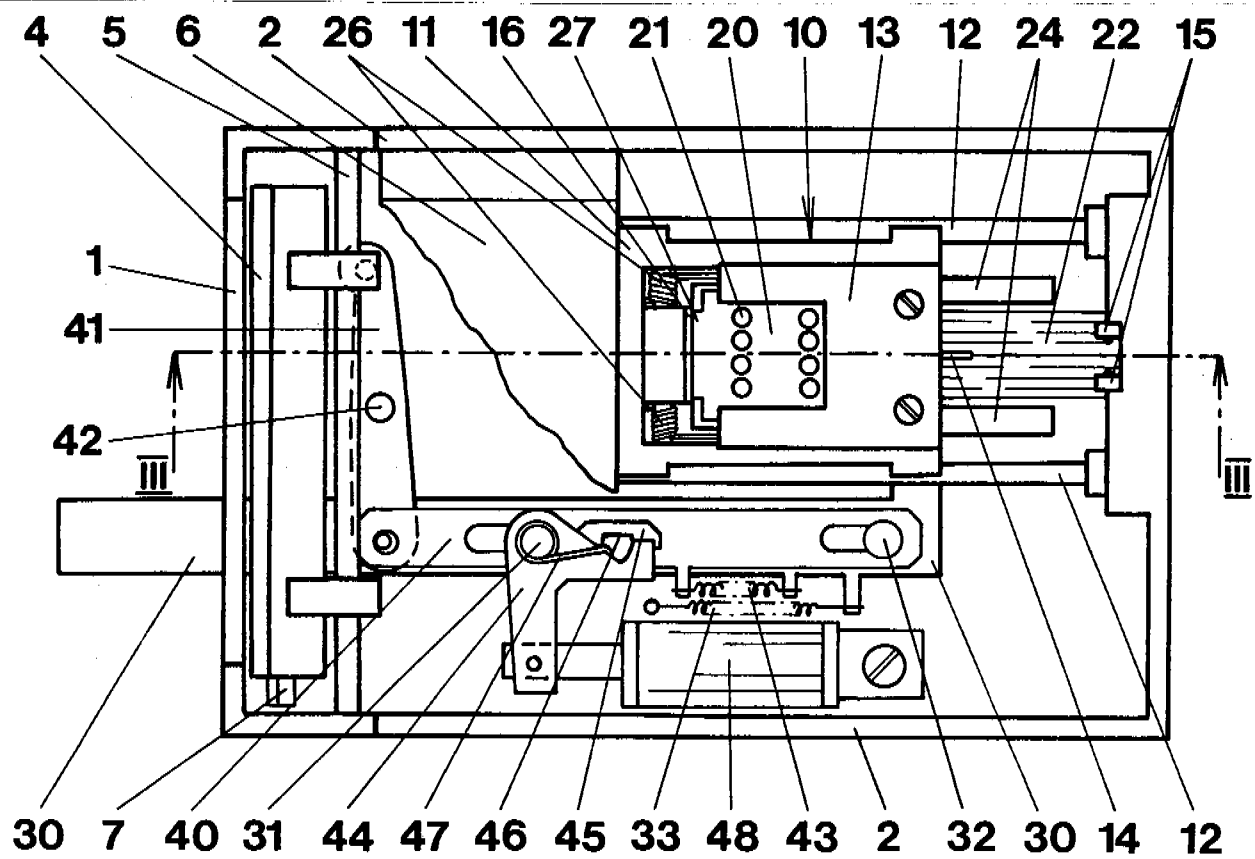


Fig. 2

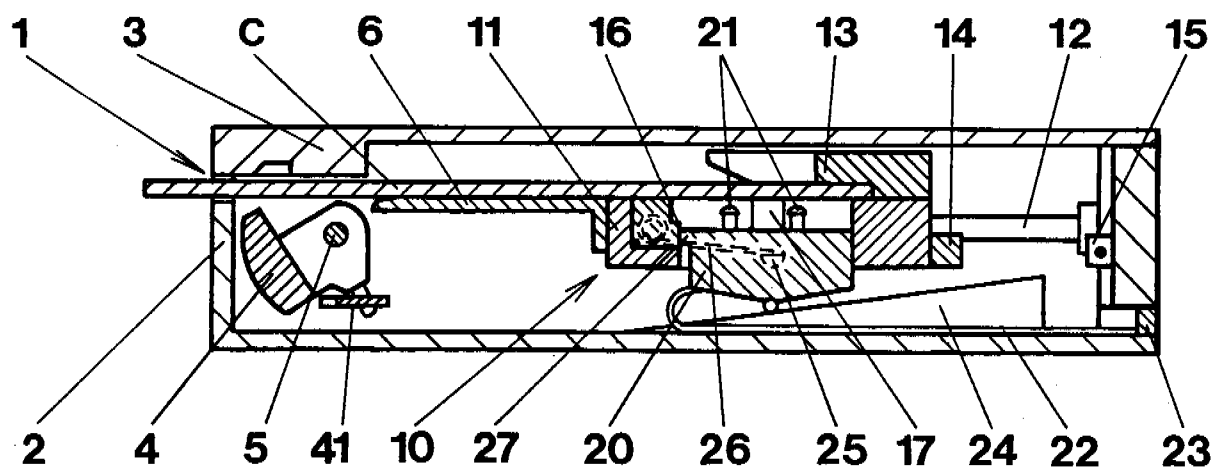


Fig. 3

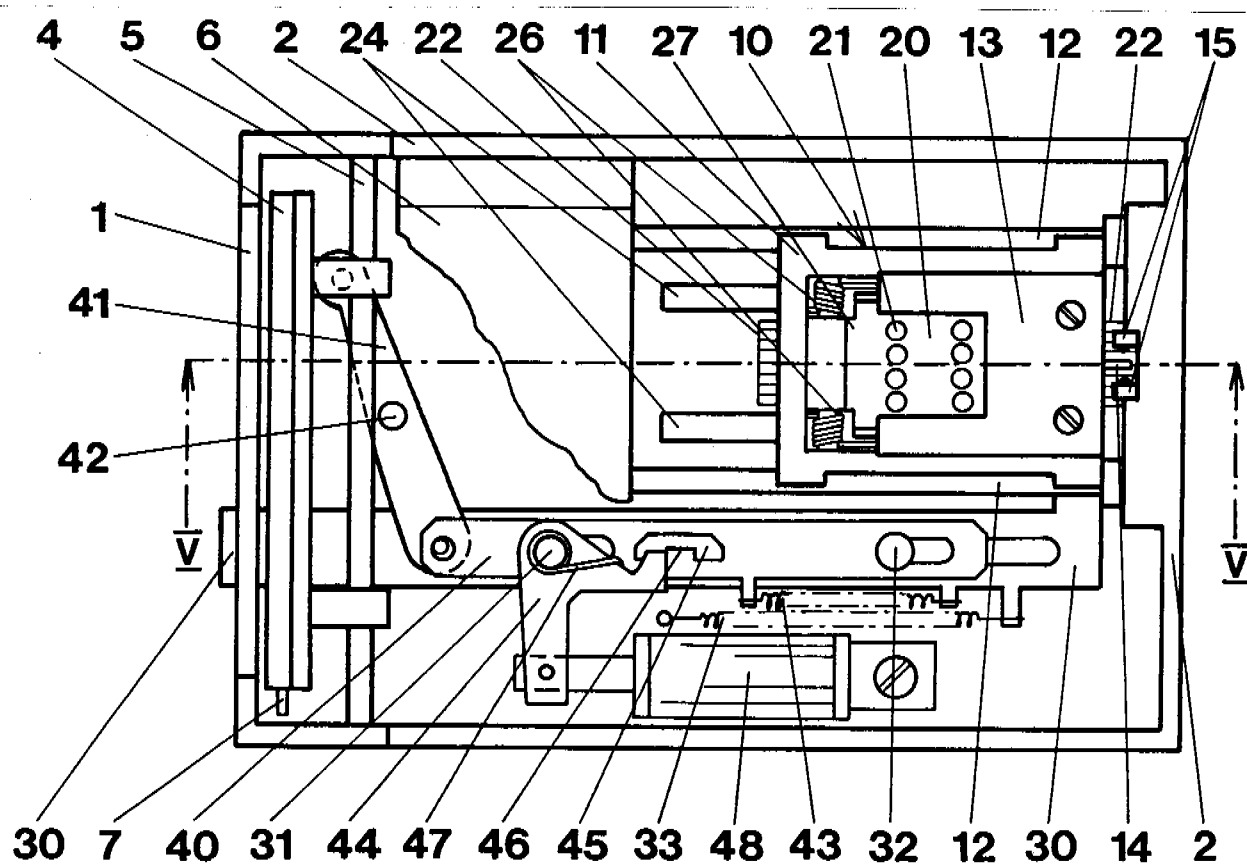


Fig. 4

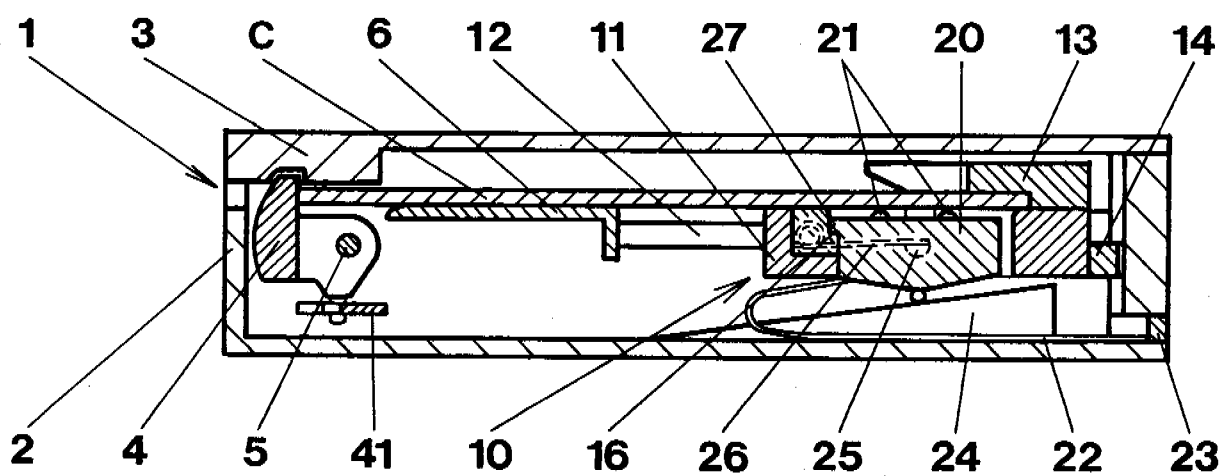


Fig. 5

DOCUMENT I (State of the Art)

This document relates to a telephone having a chip card reading/-writing apparatus which prevents fraudulent manipulations.

The Figure is a longitudinal section showing part of the apparatus.

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In the drawing, the housing of the apparatus is indicated by reference numeral 10 and has a slot 2 for the insertion of a chip card 1. The insertion slot 2 opens in a recess 8 which is provided in the front wall of the housing 10 and is shaped, for example, as
10 a half-cylinder whose axis is parallel to the insertion slot 2. A shutter 3 is provided to close the recess 8 and thereby prevent access to an inserted chip card 1 to prevent frauds. The shutter 3 slides in a guide 13 provided on the internal side of the front wall of the housing 10 and can be manually actuated by means of a
15 handle 14 provided thereon. A contact member 9 having a number of resilient contact blades is provided inside the housing 10 to connect the contact pads of an inserted chip card to electronic circuitry (not shown) which controls the various functions of the telephone.

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When the shutter 3 is open, the chip card 1 can be inserted in the insertion slot 2. Insertion of the chip card 1 causes a pair of contacts 6 to close. When the chip card 1 is completely inserted, its leading edge is located in the contact member 9 while its
25 opposite edge protrudes out of the insertion slot 2 in the recess 8. The user then manually closes the shutter 3 by means of the

handle 14 to bring the shutter into the position shown in the Figure. A further pair of contacts 5 is thereby closed to detect the closed position of the shutter 3.

- 5 A telephone call can only be carried out when the electronic circuitry detects that both pairs of contacts 5 and 6 are closed. The shutter 3 must remain closed during the telephone call; otherwise opening of the shutter 3 would be detected by the opening of the pair of contacts 5, which would cause the electronic circuitry
10 to terminate the call.

When the telephone call is completed, the user opens the shutter 3 by means of the handle 14 and can then remove the chip card by seizing it in the recess 8.

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DRAWING OF DOCUMENT I (State of the Art)

