

The present invention has as its object an automatic system for printing an administrative form such as a medical prescription or a medical action payment sheet. It has as its purpose to simplify the operations of transcribing the necessary data to a medical form so as to render the written data more legible while limiting the risks of fraud.

There does not currently exist any device permitting the automatic printing of medical forms. It will be recalled that on such a form must appear on the one hand the name of the doctor as also his references of qualification to practise medicine. On the other hand, the name of the patient must appear, if possible his address and possibly even his identification number with respect to a social cover organisation. Text processing systems are known with which it would be possible to compose the text of a form. Once the text is composed, it is possible to cause it to be printed by a printer connected to a microprocessor implementing the text processing. However such an apparatus has the disadvantage of being relatively costly and bulky on the doctor's desk. Furthermore, the constraints of keyboard acquisition of the patients' references are tedious, so that in a general way such printed forms are not used.

Another problem to be solved is that of fraud resulting from theft of the pre-printed forms or prescriptions which the doctors have at their disposal. Ill-disposed persons appropriate such books of prescriptions and write prescriptions for themselves enabling them to acquire prohibited medicines or to benefit from illicit reimbursements. A text processing system is little protected against such attempts, in view of the fact that, with it, the defrauders can draw up as many prescriptions as they wish.

US-A-4,709,136 discloses a system for processing medical data comprising two smartcards with chip (doctor/patient) which are inserted simultaneously into a reader. For reasons of security data are written only simultaneously on the two cards and can be read out only if the security codes are valid for the two cards.

The invention has as its object to remedy these disadvantages by proposing a much more ergonomic and much simpler system, having however

all the required functionalities.

The principle of the invention consists in having available a reader of smartcards with chip, hereinafter termed smartcards, connected to a printer. At the moment of its electrical connection the smartcard reader is not configured, is not set. The doctors are provided with doctor-type smartcards and the patients are provided with patient-type smartcards. In order to prepare a prescription with the system, it is necessary on the one hand to configure the reader by inserting therein firstly a doctor's card. In this case the data relating to this doctor are taken from these doctor's smartcards and stored in a first zone of a volatile memory of the reader. When a patient presents himself, he gives his patient-type smartcard which is also inserted into the apparatus. At this moment, the data relating to this patient are transferred by the apparatus to the printer which prints them, like the references of the doctor, in appropriate places. It will be shown that by acting in this manner it is possible to have an inexpensive apparatus capable of being adapted easily to all sorts of situations.

The invention therefore has as its object an automatic system for printing a medical form, comprising the features of Claim 1.

The invention will be better understood by reading the following description and by examining the figures which accompany it. The latter are given only as a by no means limitative indication of the invention. The figures show:

- Figure 1: a system according to the invention;
- Figures 2 to 4 : a set of programs put into operation by the system of the invention in order to bring about the printing and to guarantee its security.

Figure 1 shows a system according to the invention. The latter comprises a printer 1 intended to print on sheets 2 forms or prescriptions. This printer is connected to a smartcard reader 3. The reader 3 is provided with a microprocessor 4, with a program memory 5 and, in a volatile memory, with at least one first zone 6. The microprocessor 4 executes the instructions contained in the program memory 5 with a view to printing on the prescription 2 data, in part contained in the first volatile memory zone 6. The reader 3 also comprises

a slot 7 through which can be inserted smartcards such as 8, 9 or 10. The system in its minimum version, comprises at least one smartcard 8 reserved for a doctor and a smartcard 9 reserved for a patient. There are as many doctor's smartcards as there are doctors to be equipped. There are as many patient's smartcards as there are patients to be equipped. The cards bear the holder's name.

In use, the reader 3 is placed at the surgery, as is the printer 1. Each patient is provided with his patient-type smartcard. The cards of doctor-type or of patient-type are both legible by the reader 3. The smartcards comprise in a conventional manner a set of metallic connections such as 11 to 12 which permit the outside world to enter into electrical communication with an electronic memory 13 contained in the chip of the card. A doctor-type card 8 comprises in its memory 13 an address decoder 14 connected to the memory cells of the memory by bit lines and word lines. The memory 15 comprises in the doctor card at least two non-erasable zones, for example constructed with EPROM type memory cells. A first zone 15, here termed the header, relates to the capacity of the holder of the card 8: to his capacity of doctor. A second zone 16 comprises the data relating to its holder, that is to say essentially the name of the doctor as also possibly his professional practice number.

The smartcard 9 reserved for a patient itself also contains in its non-volatile memory 13, a header 17 and a zone 18 for storage of data relating to this patient. For example these data are the name of the patient, as also his address and possibly his number of affiliation to a social cover organisation. The headers 15 and 17 are essentially different from one another. Their binary coding may be over any number of bits: for example even on a single bit, the bit 1 being considered the bit characteristic of the doctors, whereas the bit 0 would be characteristic of the patients. In practice, in order to give more flexibility to the system, and in a preferred variant, cards of pharmacist or other type will also be created in which case the header will comprise over several bits an indication according to which the card is a pharmacist's or other card.

The use of the system is as follows. Each morning, the doctor puts the reader 3 and the printer 1 electrically into service. At this moment, the reader

starts up by a bootstrap program contained in the memory 5. This starting up may be comparable to the starting up of a microprocessor. Then it executes an instruction through which the reader 3 emits an error or alarm signal. In one example this error is materialised by the flashing of a lamp 21 of red colour, situated for example on the front face of the reader 3. In this case, Figure 2, the reader is in ERROR state. Then the doctor inserts his card in the slot 7. Having arrived at the end of this slot 7, the end 22 of the card there presses on an end-of-travel switch (not shown) of known type which triggers the execution of a first test program of the card.

The test program mainly has the purpose of determining whether the card is a doctor's card. In practice, the content of the memory 13 of the card 8 will be read by the reader 3. The content of the header 15 will be compared with a pre-recorded parameter in the program of the memory 5. If there is agreement of the header and of the parameter, the test is positive, and the data relating to the doctor, contained in the zone 16 of his smartcard 8, are transferred into the first volatile zone 6 of the reader 3. During this transfer, the lamp 21 stays on continuously. Once this has been effected, the microprocessor 4 of the reader 3 places itself in a stand-by situation. This stand-by situation permits the microprocessor 4 quite simply to designate another instruction, STAND-BY, of the program contained in the memory 5. At the end of the test, when it is positive, the red lamp 21 has gone out. On the other hand, if the card 8 has not been recognised by the reader as being a doctor's card, this leads to the initial situation: ERROR.

When a patient presents himself, normally the reader 3 is on stand-by. The patient's card is inserted. Another test, also itself comparing the header value 17 with a patient-type parameter contained in the program 5 permits recognition or non-recognition of a patient's smartcard. During this other test operation, a second lamp 23, preferably of green colour, flashes. When the other test is finished, and if it is positive, the green lamp stays on. In this case, the data contained in the zone 18 of the memory 13 of the card 9 will have been transferred with an instruction 24 of the program, Figure 3, into a second volatile

zone 25 of the volatile memory of the reader 3. The lit green light is equivalent to validation of the printing.

When the doctor wishes to print the form or the prescription, and when the green lamp 23 is on, he can press a control button 26 which constitutes a final order to trigger the printing. This order 26 causes the microprocessor 4 to execute part of the program 5 consisting in actually printing the prescription. This program 5 is of conventional type. It comprises essentially instructions to put paper in place in the printer, feed and character designation instructions, carriage return instructions and instructions to eject the paper on completion. Of course, this program comprises, like any text processing, the sending preferably in an ASCII code form of the data relating to the doctor and to the patient and which should be printed on the prescription 2. The second zone 25 is not indispensable if it is chosen to authorise the printing when the patient card is in the reader 3. The printing may then be direct. As a variant, the insertion of the card in the reader brings about the printing on completion. This makes it possible to simplify the apparatus by eliminating the button 26. In this case the insertion of the card brings about in sequence the recognition of the patient card, the transfer into volatile zone 25, and then the actual printing of the prescription.

When the button 26 has been pressed once, the green lamp goes out, and another prescription cannot normally be drawn up with insertion of the same patient card. The printed form may nevertheless comprise several pages. The purpose of this single printing is to prevent defrauders, drug addicts, from making out several prescriptions in their name using this system. Once a prescription has been printed, normally the system is blocked. To this end, if the patient's card is re-inserted once again into the reader, it will be read once again. The program contained in the memory 5 comprises a series of instructions in order to verify whether the patient's card has just been used recently. The verifications of this recent use can take various forms. For example, at the moment of the loading of the data relating to the patient into the second non-volatile zone 25, it is possible to look and see whether a sufficient time has elapsed (for example at least several hours) between the first and the second presentation. If the second presentation

is too close to the first and if the name to be written is the same as the preceding name, validation of the printing is refused and the reader puts itself back on stand-by.

In order, however, to allow a doctor who so wished to deliver two prescriptions or two forms for the same patient, provision has been made for this doctor to be capable of reinserting his personal card into the reader a second time. In this case, not being recognised as a patient card, this card will be recognised in a following test as a doctor card. This recognition will be capable of bringing about, as previously, the transfer of the data relating to the doctor into the first zone 6 of the volatile memory of the reader 3. But it also brings about the erasure of the data contained in the second zone 25 of the volatile memory. After this reinsertion of the doctor smartcard, the same patient's smartcard can be reinserted once again. This procedure may of course be reiterated.

In the case where the doctor were to forget to disconnect his reader when leaving his consulting room in the evening, the program contained in the memory 5 also comprises a periodic test, Figure 4, whereby the duration between the present time and the time when the last operation was carried out is tested. This is possible for example with a time indication stored opposite the zones 6 and 25 of the volatile memory. These time data are naturally available because the microprocessor comprises a temporal clock of the same type as that which is found in a quartz watch. As long as this duration is less than a chosen time T the reader is maintained on stand-by. As soon as it exceeds this time T , the reader is placed in error mode, erasing beforehand the content of the zones 6 and 25 of the volatile memory. In this case the red lamp 21 starts to flash again.

In another solution, much further improved, the reader 3 is connected to a microprocessor 27, provided with a keyboard, with a screen and with a mass memory, for example a hard disc. In this mass memory has been stored the inventory of all of the prescriptible medicaments, as also all the possible and advisable modes of taking them. With the keyboard, the doctor can call up on his screen a list of particular prescriptible products and can select those which he wishes to prescribe with the dosage. He can inject these data into the reader 3 so

that they are also printed on the bottom of the prescription. As a variant, it is the data from the volatile memories 6 and 25 which are transmitted to the microprocessor, the latter undertaking to print the prescription with a printer which is connected to it.

In this other solution, the reader 3 places itself under the authority of the microcomputer 27. The latter may also be capable of writing the content of the prescription into the patient's smartcard 10 in a memory 28 which is also of the non-volatile type, but preferably erasable electrically. For example this additional memory 28 is of the EEPROM type. With such a card the patient can then go to a pharmacist who also possesses a reader 3 also connected to a microprocessor 27 so as to display the electronic prescription and to verify that, moreover, nothing has been falsified between the electronic content stored in the smartcard 9 and the printed prescription 2 which is shown to him.

The pharmacist acts in the same way as the doctor: every morning he inserts his smartcard 10 into his reader 3. The latter then recognises, Figure 2, that the card is a pharmacist's card (the header is specific to this profession). In these conditions the part of the program contained in the memory 5 and specific to this profession brings about a potential validation of the erasure of the prescriptions. Subsequently, when a patient provided with his smartcard 10 in which the prescription is recorded presents himself at the pharmacy of this pharmacist, this card 10 is recognised by the pharmacist's reader 3. Because this reader is installed precisely at a pharmacy it will be possible to erase the electronic prescription. This authorisation is materialised by the green lamp 23 staying on continuously. When the pharmacist presses the button 26, the microprocessor 4 initiates a program contained in the memory having the purpose of erasing the electronic prescription stored in the electrically programmable part 28 of the memory of the 9. This has three advantages, on the one hand it prohibits anyone ill-disposed from resupplying himself at several pharmacies from the same electronic prescription. Furthermore, it simplifies the operations of handling the prescriptions in the memories of the smartcards which are despite everything of fairly reduced capacity. Lastly the pharmacist can use these data

directly in order to manage his stocks.

By way of additional improvement the reader 3 comprises a non-volatile memory in order to store a copy of the prescriptions delivered. Part of the program contained in the memory 5 makes it possible moreover, with the aid of the microprocessor 27, to carry out daily, monthly or annual statistical work.

Rather than defining only two categories of practitioner, it is possible to define several other categories, such as for example that of physiotherapists, of medical analysis laboratories, or even among doctors, those relating to the specialities. There may be attached to these specialities, with the lamps 21 and 23 and with the button 26, specific functionalities tending to write or erase other data in the card. For example, it can be conceived that, at a physiotherapist's, each of the ten sessions prescribed by the doctor will be obliterated from the card each time.



CLAIMS

1. An automatic system for printing a medical form (2), comprising
 - a printer (1) for printing forms,
 - a reader (3) of smart cards (8-10) with chip (13) provided with a microprocessor (4), with a program memory (5) in order to contain printing instructions executable by the microprocessor, and with at least one first zone (6) in a volatile memory, this reader being connected to this printer,
 - a smart card (8) reserved for a doctor containing, in its non-erasable memory, a header (15) representative of its holder's capacity of doctor and a zone (16) for storage of data relating to this doctor, these data being intended to be printed on the form after having been stored (6) in the first zone of the volatile memory,
 - a smart card (9) reserved for a patient containing a header (17) representative of its holder's capacity of patient and a zone (18) for storage of the data relating to this patient and intended to be printed on the form.
2. The system according to Claim 1 characterised in that the reader comprises
 - a circuit (21) for signalling, when it is energised, that the first memory zone of its volatile memory is empty, and for signalling that this first memory zone of its volatile memory is filled with the data relating to the doctor after the latter will have inserted his smart card into this reader.
3. The system according to Claim 1 or Claim 2, characterised in that the reader comprises
 - a circuit (23) for signalling, when a patient's smart card is inserted, the acceptable nature of this smart card, and for signalling the reading from this smart card of the data relating to this patient and intended to be printed on the form.
4. The system according to Claim 3, characterised in that the reader comprises at least one second zone (25) in the volatile memory, for memorising



the data relating to this patient and intended to be printed on the form.

5. The system according to any of Claims 1 to 4, characterised in that the reader comprises

- a circuit (26) provided with an action button for bringing about the printing of the form by printing in specified places of the latter data relating to the doctor and to the patient.

6. The system according to Claim 5, characterised in that the circuit for bringing about the printing of the form comprises

- a circuit for preventing the printing if the data read from the patient's smart card are the same as the data previously memorised in the second zone (25) of the volatile memory.

7. The system according to any of Claims 1 to 6, characterised in that the reader comprises

- a circuit for erasing the content of the first zone of the volatile memory after a certain time (T), preferably consecutive to a last use of the system.

8. The system according to any of Claims 1 to 7, characterised in that the reader comprises

- a real time clock for memorising the time and possibly for printing the date on the form.

9. The system according to any of Claims 1 to 8, characterised in that the reader comprises functionally

- a non-volatile memory in which are indexed prescriptible medicaments,
- a display screen for displaying these prescriptible medicaments,
- a keyboard for designating a medicament to be prescribed and its dosage,
- and circuits for printing these prescriptions on the form.

10. The system according to Claim 9, characterised in that the reader comprises

- a writing circuit for writing, in an erasable part (28) of the memory of the patient's smart card, the content of the form.

11. The system according to Claim 10, characterised in that it comprises



- a smart card (10) reserved for a practitioner containing, in its non-erasable memory, a header representative of its holder's capacity of practitioner, and

- in the reader, an erasure circuit (26) for erasing, from the erasable part of the memory of the patient's smart card, the content of the form after recognition of this practitioner's header by the reader.

12. The system according to any of Claims 1 to 11, characterised in that the reader comprises

- a non-volatile memory in which are stored all the prescriptions prescribed,

- a counter for counting these prescriptions and possibly for printing on the form an information relating to the state of this counter, or for compiling statistics.

13. The system according to any of Claims 1 to 12 characterised in that it comprises an automatic system for printing a form as soon as the patient card is inserted into it.