

GAMBLING CHIP WITH INTEGRATED ELECTRONIC DATA CARRIER

The invention relates to a gambling chip with integrated electronic data carrier according to the preamble of claim 1, as well as to stations for checking such chips according to claim 15 and a means with such chips and stations according to claim 19 and a method for initializing a chip in gambling machines according to claim 22. A vital problem when using gambling chips in gambling, gaming or slot machines of any type is to be able to prevent misuse and forgeries thereof. This need for increasing security becomes ever more important and urgent with the increasing use of slot machines. In addition, it must be made possible to more securely and rationally perform other operating functions such as the identification and checking of chips, exchange, automatic sorting, etc.

Numerous proposals are known from the literature for increasing security in gambling and for improving the handling of chips. For example, EP 424 355 discloses a device for sorting chips at gaming tables, in which by an optical colour identification and reading head, e.g. using CCD sensors, the value of a chip can be established on the basis of its colour and consequently an automatic sorting is made possible. GB 2 174 228 discloses a method and a device for sorting chips, which by means of electrically conductive or magnetic material inserts in the chip generates an inductive or capacitive signal in the sorting station, which is measured there by means of a sensor. However, with such chips and sorting stations only rough distinctions of chips with respect to their value can be carried out. Forgeries are virtually undetectable. Also other markings or identifications of chips, e.g. using magnetic strips or bar codes for reading by means of a laser are unable to offer adequate security, because all these chips can be relatively easily copied and therefore forged. Moreover, such detection methods are often complicated, unreliable and susceptible to environmental influences such as dirtying and wear to the identification media, etc.

Another proposal is known from EP 436 497, which discloses a thermoplastic production process for circular chips for use in slot machines with or without an integrated transponder. The transponder-equipped version for contactless transmission of coded information has a transponder preferably with two different types of antennas, namely an electrostatic antenna and a magnetic antenna, according to US 4 818 855. This makes it possible to

read in contactless manner a chip in a slot machine and check its value. However, this requires a close and precise positioning of the chip relative to a reading station in slot machines, i.e. the positioning must be precisely defined to within a few mm. This known chip with transponder requires a relatively complicated, multipart and therefore expensive construction with support element, plastic ring, various antennas, separate transponder, connections, etc. In addition, this construction is only suitable for circular chips for feeding into slot machines and is not suitable for chips having a different size, shape and application, e.g. for flat or rectangular chips for table games and having higher values. In order to be able to universally detect and check random chips with different shapes, sizes and values in different games, it would be necessary to have a larger communications range of e.g. a few centimetres instead of only a few mm. In addition, the known chips are not really secure with respect to forgery, because the possibility still exists of monitoring a communication, followed by copying and the manufacture of forged chips therefrom (recording tape effect). This teaching in particular does not make it possible to produce forgery-proof, higher value chips. Another important disadvantage is that in the known chip with transponder a central computer unit is required, which contains the data base for checking all chips. If there is a fault to the central computer unit the complete gambling operation has to be shut down, which should not ever take place. Another limitation with respect to the chip with transponder is that its value cannot be modified, i.e. cannot be refixed. Therefore change games, i.e. those in which the value of a chip can be fixed at different levels, cannot be played. The known chip admittedly makes forgery more difficult, but it cannot bring about an effective security against forgery, especially for higher value chips.

The problem of the present invention is therefore to provide a gambling chip, which has a favourable and simple construction, which requires only little energy for low value chips, but which offers a maximum security against forgery for higher value chips. In addition, said chip is to be universally usable in all games played in a casino, so that the complete gambling operation can be carried out with such maximum forgery security chips. Thus, the chip according to the invention must be suitable for all

conventional shapes and values, it must be checkable from a certain distance and must allow a simple and rational handling in associated checking and sorting stations. It must also be possible to check the chip in decentralized manner from associated stations, without any need for a connection to a central or master computer, in order to ensure a generally high operational security, so that the gambling operation is not impaired if any failure occurs in a station and it must be implementable both for fixed value chips and variable value chips.

This problem is solved by a gambling chip according to claim 1. As a result of the construction of the chip with a highly integrated data carrier with noncopiable master data, it is ensured that the chip cannot be copied from the hardware standpoint. With the initialization of the data carrier by an authorization system necessary for serviceability it is ensured that an unauthorized functionability of a chip cannot be achieved. As a result of the communication with in each case new initialization data combined with permanently stored encoding codes, it is ensured that the communication is not recorded and transferable by copying to some other data carrier (tape effect not possible). By combination of these inventive features a maximum falsification or forgery security in all respects is achieved in a relatively simple way. The structure with only a single antenna for all functions is simple and permits a relatively large antenna surface or area in the surrounding electronically transparent casing, so that a relatively wide communications range can be obtained. The associated, decentralized read-write stations makes possible a secure, autonomous operation without any need for a connection to a central computer. Due to the possibility of writing the data carrier, value changes to the chip are possible when this is necessary. Due to these characteristics of the inventive chip, in conjunction with the associated, decentralized read-write units WR, both stations for checking according to claim 15 and stations for sorting according to claim 17 are implemented, which fulfil the described, maximum possible security requirements. The method for initializing a chip according to claim 22 is ensured by a hierarchic authorization system, so that no unauthorized or forged data carriers MI or chips can be introduced into the gambling system.

The dependent claims relate to advantageous developments of the invention, in which particularly extensive ranges can be achieved with relatively large-area antennas. By high integration on a printed circuit and the use of EEPROMs and ASICs, particularly compact, efficient and cost effective chips can be manufactured. Through a simultaneous energy and information transmission with a RF signal, a particularly efficient communication is achieved, as well as also information transmission in one direction by pulse width modulation and in the other direction by load modulation, which is particularly advantageous. Additional security aspects can be achieved by using constantly new random numbers and by integrating check sum controls. According to claim 19 complete gambling casino installations can be implemented, in that different chips are processable by various associated, autonomous, decentralized read and write stations WR and the latter can fully function in autonomous manner and are additionally connectable to a central computer, so that further additional functions and evaluations are possible. Thus, the operation of a casino is not blocked by a chance failure or fault to a central computer unit. The decentralized read and write stations ensure a continuous, unrestricted gambling operation, which is a particularly important requirement.

The invention is described in greater detail hereinafter relative to the drawings, wherein show:

- Fig. 1 Diagrammatically a gambling chip according to the invention with data carrier MI and antenna.
- Fig. 2 An associated, decentralized, autonomous read and write station WR.
- Figs. 3a, b An example of a chip with antenna in two views.
- Figs. 4 a-f Further examples of chips of different shapes and with different antenna arrangements.
- Figs. 5 & 6 The operation and sequence of the communication between a data carrier MI and a read and write station WR.

Fig. 7 A chip checking station.

Fig. 8 A chip sorting station.

Fig. 9 A chip value modification station.

Fig. 10 A gambling means with stations having different functions.

Fig. 11 A casino with different gaming locations and stations,
as well as different game types.

Figs. 12a, b The hierarchic authorization concept of the system for all
chips and all associated read-write stations WR with
organization levels.

Fig. 13 The uncopyable production of chips with data carrier MI.

Fig. 1 diagrammatically shows an inventive gambling chip 1 with integrated passive data carrier MI, whose operating energy is emitted by the read and write station WR and is received by means of a RF antenna 15. The data carrier MI has a highly integrated special chip (ASIC) with a processor 11, a data memory 12 (e.g. in EEPROM form), as well as a control electronics 13 with processor for controlling the complete external and internal data exchange, for encoding the transmission data and decoding the data received and containing the entire high frequency part for the supply of the antenna 15, including the clock preparation and synchronization for the reception of energy and data from the transmission station WR.

The antenna 15 can e.g. be in two parts as in fig. 1 or only comprise a single loop, such as is e.g. shown in fig. 3b. A support capacitor 17 (which can also be integrated into the special chip) is used for bridging transmission intervals of the read and write station WR. The arrow 20 illustrates the RF communication with the read and write station WR (cf. fig. 2). The data carrier MI contains an invariable system program with security functions such as a check sum control CRC and encoding algorithms 22, as well as invariable master data permanently stored in a data memory

part 12.1 and having a unique record number 14. The memory 12 also contains a part 12.2 freely programmable for desired applications, as well as a variable value memory part 12.3. Due to this construction, the gambling chip with data carrier MI according to the invention cannot be read out or modified and cannot be hardware copied.

Fig. 2 diagrammatically shows an autonomous, decentralized, fully functional read and write station WR for the contactless communication with the chip 1 and which is associated with the latter. The read and write station has a security module 25, a separate transmitting and receiving antenna 24, a power supply and an additional interface to a master computer 65. The security module 25 contains all the communications functions with the data carriers MI of the chip. This includes the RF preparation, encoding and checking the data for correct transmission (CRC), checking the read and write authorization of a specific chip by said read and write station, as well as communication with a master computer. The security functions cover the encoding and decoding 22, 23 of data, identification of the data carrier MI, checking the writing authorization, as well as calculating and monitoring check sums (CRC) for the faultfree data transmission. The communication sequence between data carriers MI and read and write stations WR is explained in greater detail hereinafter relative to fig. 6.

Figs. 3a and 3b show in two views the structure of an inventive chip 1 with a data carrier MI, an antenna 15 and a support capacitor 17. These elements are preferably in one piece, the data carrier MI with support capacitor and antenna is e.g. placed on a printed circuit 16. As is apparent from fig. 3, the antenna area can be particularly large. In principle, virtually the entire chip surface is available for this purpose. The antenna 15 is surrounded on both sides by an electromagnetically transparent casing part 2. As has been stated, with the inventive chip only one RF antenna is required enabling all the functions to be performed, i.e. receiving energy and information, as well as transmitting information to the read and write station WR. Thus, said antenna can be constructed in a relatively random and in particular very large surface manner, in principle using the entire chip surface. For this purpose two important characteristics are achieved, namely a wide range R of several cm up to several dm due to the large

antenna, as well as a large solid angle range W in which the communication can take place, as well as a substantially independence of the relative positioning of chip 1 and associated read and write station WR.

This is in complete contrast to the prior art of EP 436 497, where use is made of a transponder with two antennas, an electrostatic and a magnetic antenna and which in each case must be very closely and accurately positioned with respect to its counterpart and in fact accurate to mm in order to permit a communication. This is only possible in slot machines, where only circular, rotationally symmetrical chips and antennas of a specific size and a precisely defined location have to be read, so that here in each case the two antennas must be very accurately and closely positioned. However, said known transponder and antenna construction cannot be used for other chip types with different shapes and sizes and in particular not for table games.

Figs. 4a to 4f show examples of possible different chip shapes, i.e. circular, rectangular, round or polygonal chips and having different antenna arrangements 15. It is always possible to integrate a relatively large-area antenna 15 into the chip, so as to permit a wide communications range. As shown in figs. 4a and 4b, preferably the minimum antenna diameter DA or $DA1$ in the rectangular case is at least half as large as the minimum diameter DJ or $DJ1$ of the chip. Preferably said minimum antenna diameter DA , $DA1$ is min 20 mm. In fig. 4c the antenna area FA , which is covered with the antenna loop 15, is shown in relation to the chip surface FJ . Preferably the antenna area FA is at least half as large as the chip surface FJ .

Fig. 5 illustrates the communication 20 between a read and write station WR with security module 25 and a data carrier MI or chip 1. The necessary electromagnetic RF field energy 20a (e.g. with a carrier frequency of 13 MHz) together with the modulated information 20b from the read and write station WR is transmitted to the data carrier MI, where the field energy is received by the antenna 15 and used for operating the passive data carrier MI and for transmitting encoded information 20b to WR. A particularly rational performance of an information transmission consists of modulating

the carrier frequency in one direction e.g. from the read and write station WR to the data carrier MI by pulse modulation and by load modulation in the opposite direction (from MI to WR).

Fig. 6 illustrates the interceptionproof sequence of said communication between the read and write station WR and a data carrier MI. As soon as a data carrier MI enters the field of a read and write station WR automatically the sequence of synchronizing WR and MI commences. For each new identification process the read and write station WR produces new initialization data 21 (e.g. in the form of random numbers) and transmits same to the data carrier MI (20.1). Here there is a combining of said initialization data 21 with a permanently stored encoding code (22) of the data carrier. The coded result (a code word) is then transmitted back to the read and write station (20.2). This information is decoded in the security module 25 and checked (23), i.e. is decoded with the code (22) also stored in WR and compared with the original, random initialization data 21. On the basis of this result WR can establish the type of medium MI involved. Subsequently and without interruption there can be a synchronized communication (20.3) between the read and write station WR and the data carrier MI.

With this method the clock generators and code generators of WR and MI are synchronized. After concluding or breaking off a communications process, each new communication must recommence with new initialization data 21. A recording of the transmitted data and subsequent feeding back into the field is consequently impossible, because the original initialization data 21 are no longer valid. Thus, no functioning chip forgeries are possible.

In addition, the transmitted data as a result of CRC, in connection with the useful data are combined with master data of the data carrier MI. Thus, faulty data transmissions are excluded. This is particularly important if value changes authorized by a read and write station are written into a data carrier MI and the new recorded data must be checked before they receive their validity. With this communications sequence of the inventive chip it is ensured that there can be no interception of the communication for forging chips.

Fig. 7 shows a check station 30, which is formed by a decentralized, autonomous read and write station WR and an individualizing or separating device 35. In the individualizing device 35 randomly supplied chips 1 are individually separated and then each chip is individually detected and simultaneously read and checked by the read and write station. As a result of this check the chips are given one of the three following categories: correct (31), incorrect (32) or no (33) identification response. Categories 32 and 33 can for security purposes be checked again and it can then be clarified whether a forgery or attempted forgery is involved, or whether there is a defect of the chip data carrier MI, so that the corresponding measures can be taken. Importance is also attached to the attainable large communication range R (cf. fig. 3a) within which the secured communication takes place between the antennas 15 and 24 of chip 1 and WR. It can be several dm, e.g. 20 to 80 cm.

Another important function is fulfilled by an automatic sorting station 40 according to fig. 8. A small quantity of supplied chips 1 of different types and with different values are first individualized (35) according to fig. 7 and checked by a read and write station WR and any incorrect chips (32, 33) are detected and separated. The correct, valid chips (31) are subsequently conveyed on into a sorting device 45, where each chip, in accordance with a predetermined value, is placed in an associated stack 46.1, 46.2, 46.3. Using said station 40 it is possible to rapidly and automatically sort chips with different values and shapes, e.g. maintaining uninterrupted gambling on tables with a large chip circulation.

Fig. 9 shows a value modification station 50 comprising an individualizing device 35 and a special read and write station WR with value modification competence for associated, special chips, which are also programmed for value changes and consequently have a variable value memory 12.3, which is writeable by authorized value modification stations 50 (with a variable value).

Although in games use is mainly made of chips with a clearly defined, visible, fixed value, applications exist for value changes of chips, which offer large advantages and can cover additional applications.

1. Fixed value chips, which must clearly maintain their value for the player during the casino opening hours, can be checked on return to the cash desk and subsequently set to zero during storage and conversely are only loaded to the fixed value on issue. Thus, such fixed value chips only receive their valid value during regular gambling operations and outside these are invalid and consequently valueless. Any theft of such chips rendered invalid, e.g. from the strongroom, would consequently be pointless from the outset.

2. Another application consists in value change games, in which e.g. chips of one particular colour are allocated to each player and he can check the value of his chip colour for each new game and also with a new value. In this case the value (1.0, 1.1, 1.2, 1.3) is rewritten into the value memory 12.3 of a chip by the value modification station 50.

3. Another application relates to chips as value cards or chips, which are loaded with a specific monetary value and can be consumed down to the value zero at consumption points (65, fig. 11) for acquiring different services. In casinos these are e.g. restaurants, bars, kiosks, shops, cosmetics, etc.

4. Another variant as an "account value chip" in value gaming areas 66 consists of the value memory 12.3 constantly tracking this account chip by special value modification stages 50 in a continuous manner by debiting game uses and credit notes in the case of winning. An access condition to such value game areas 66 (fig. 11) must be an adequate account rating of the value memory 12.3, which at least corresponds to the game use. Advantageously for the value memory 12.3 an admissible value range is predetermined and only positive values are allowed (no debts) up to a given maximum value.

In principle, the higher the value of a chip or the higher the possible maximum value in a variable value memory 12.3, the greater the security demands made with respect to forgery and falsification attempts.

However, most chips have a low value. Most chips circulate, e.g. in slot

machines, for the lowest value stage. A major problem in the case of the present invention was to create a new chip system with which all types and values of chips are possible in all applications and which are universally usable in all casinos. The chips for the lowest values must be as easily and inexpensively manufacturable to ensure that their manufacturing costs are no higher than the lowest chip value, but which still fulfils such high security requirements that forgery-proof chips of the highest value stage can be produced. This is possible for the first time with the chip according to the invention.

It is consequently also possible, according to the same principle, to have chips of a low value class 1a for lower chip values and chips of a higher value class 1b for higher values, the higher value chips 1b being additionally equippable with larger memories, additional and more complicated codes, larger antennas, etc. and which can also be more sharply monitored by the associated, correspondingly programmed read and write stations WR, which further increases security against forgery.

Fig. 10 shows a gambling means 60 with chips 1 and numerous autonomous, central read and write stations WR used in different functions, namely in check stations 30.1, 30.2, 30.3, in sorting stations 40.1, 40.2 and 40.3 and in value modification stations 50.1, 50.2, including debiting stations 55. In addition to said central function said stations or the read and write stations WR are also connected to a master computer 75. Thus, additional functions are possible for inputting further programs, for the detection, evaluation and further processing of the operating data of the different read and write stations WR and also the chips 1 used. These functional stations 30, 40, 50 are used according to fig. 11 at different locations in a casino 60, i.e. at entrance cash desks 61, at chip and coin cash desks 62, at gambling tables 63, at slot machines 64 and at various consumption points 65 with debiting stations 55. As an example is illustrated here that chips of two different classes can be used, namely low value chips 1a on slot machines 64 and higher value chips 1b at gambling tables 63 (with grand jeu) and in the form of value card chips 1c at consumption points 65 and in value game areas 66. It is again illustrated that the inventive chip 1, 1a, 1b, 1c can be universally used throughout

casinos and gaming installations, which was not possible with chips up to now.

Fig. 12a illustrates the hierarchic authorization concept A valid for all data carriers MI and for all read and write stations WR, as well as for all authorization data carriers AMI and all programming stations WRI of the system and which has hierarchic organization stages or levels OL0, OL1, OL2, OL3, OL4, etc.

The higher stage of organization level OL0 corresponds to the system stage, i.e. the owner IO of the complete system.

The next lower stage OL1 corresponds to various, independent users IO1, IO2, IO3 of the system, e.g. different casino companies.

The next lower stage OL2 corresponds to different applications IO1.1, IO1.2 of a user IO1, e.g. different casinos of the company IO1.

The next stage OL3 corresponds to different areas of a use or application, e.g. area IO1.11 of casino IO1.1 and areas IO1.21, IO1.22 of casino IO1.2 in the form of different stations, game types, etc. within a casino.

The next stage OL4 corresponds to different subareas of IO1.21, IO1.22 (= OL3), e.g. IO1.211, IO1.221 (in OL4), etc.

With this hierarchic authorization system it is ensured that in no way can different users IO1, IO2, IO3 influence one another, but still a user, e.g. IO1 can freely establish the organization in his area, i.e. as from OL2. Thus, the authorization system A must be necessarily maintained up to at least stage OL1. This is illustrated by the separation line 70 in fig. 12. This guarantees that no misuse of any type is possible from this side, e.g. with chips of a different casino company (because chips of IO1 are not generally authorized in IO2 and IO3).

With each step downwards by an organization stage from OLn to OLn+1 in this authorization system, the authority of the data carrier is limited, so that

it can only be valid downwards, i.e. for organization stages with a higher number.

Thus, in the data carrier MI of a specific organization stage are necessarily written, i.e. virtually bequeathed all the permanently fixed data of the higher organization stages, as is illustrated in fig. 12b. For each lower organization stage $OLn+n$ an additional memory part is permanently written in the memory 12 and simultaneously all the data of the higher organization stage OLn are taken over, i.e. successively e.g. 10, 101, 101.1, 101.11 are written into the memory parts of organization stages OL0, OL1, OL2, OL3.

This principle is made clear in fig. 13, which illustrates the production or initialization of chips with data carriers MI. All the system data carriers must be produced as a slave medium 72 by means of a master medium 71 (as the authorization data carrier AMI) and a special programming read and write station WRI. Onto a new, as yet unwritten data carrier MI of the system is necessarily additionally transferred, i.e. bequeathed or imprinted a non-erasable basic data set of the master medium 71 on the slave medium 72. This also takes place according to the rules of the hierarchic authorization system A. The produced data carrier MI (as slave medium 72) is also initialized by the master medium 71 as the authorization data carrier AMI. This initialization is the prerequisite for the authorization for use of the data carrier and therefore the chip 1 in the system. Only initialized data carriers MI are authorized as valid by the system read and write stations WR.

The maximum possible security level achieved with the inventive chip can be summarized as follows:

Each gambling chip with data carrier contains a fixed programmed, non-copyable and nonreadable program with coding algorithms, as well as non-copyable and invariable master data with a unique record number.

The data carriers MI cannot be copied, the copying of all data from one data carrier to another is not possible and imitation of a data carrier is

impossible.

Data transmission from the read and write stations WR to the data carriers MI is protected by the nonreadable and noncopiable encoding algorithms.

A recording of the transmitted data and subsequent feeding in again is impossible, because new random sequences are produced for each identification process.

The consistency of the data is ensured, because transmission errors are detected by check sum control CRC and newly written in data are checked by an acknowledge announcement.

As a result of the hierarchic authorization system it is ensured that different users of this system can in no way influence one another.

This leads to a forgery-proof, but still very cost effective gambling chip, which is universally usable in gambling installations of all types and which guarantees troublefree operation.



CLAIMS

1. Gambling chip (1) with integrated electronic data carrier, characterized in that the chip has a passive data carrier MI with processor (11), control electronics (13) and memory (12), as well as an antenna (15) for transmitting RF signals (20) surrounded on both sides by an electromagnetically transparent casing part (2), the memory having invariable, non-copiable master data with a unique record number (14) and that with the chip is associated at least one decentralized, autonomous read and write station WR, with which the data carrier MI can be read and written, the data carrier MI being initialized by an authorization system, and that for contactless communication between the data carrier MI and read and write station WR, the latter producing new initialization data (21) for each identification process and same are transmitted to the data carrier MI (20.1), which is combined with a permanently stored encoding code (22) of the data carrier MI and in said coded form are returned (20.2) to the read and write station, where said information is decoded and checked (23) in a security module (25) of the read and write station WR and subsequently there is a synchronized communication (20.3) between the read and write station WR and the data carrier MI.
2. Chip according to claim 1, characterized in that the minimum diameter DA, DA1 of the antenna is at least half as large as the minimum diameter DJ, DJ1 of the chip.
3. Chip according to claim 1, characterized in that the minimum antenna diameter DA, DA1 is at least 20 mm.
4. Chip according to claim 1, characterized in that the antenna has a surface area FA at least half the covering surface FJ of the chip.
5. Chip according to claim 1, characterized in that the antenna (15) and data carrier MI are constructed in one piece.
6. Chip according to claim 1, characterized in that the antenna and data carrier MI are placed on a printed circuit (16).



7. Chip according to claim 1, characterized in that the data carrier MI has an EEPROM (12) and an ASIC (11).

8. Chip according to claim 1, characterized in that with the RF signal (20) simultaneous transmission takes place of energy (20a) and information (20b) from the read and write station WR to the data carrier MI.

9. Chip according to claim 1, characterized in that the information transmission in one direction takes place by pulse width modulation and in the other direction by load modulation.

10. Chip according to claim 1, characterized in that a new random number is produced as initialization data (21) for each identification process.

11. Chip according to claim 1, characterized in that the data carrier MI contains a check sum control (cyclic redundancy check) CRC in which useful data are combined with master data of the data carrier.

12. Chip according to claim 1, characterized in that the data carrier MI has a variable value memory (12.3), which is writeable and therefore variable by an authorized read and write station WR.

13. Chip according to claim 12, characterized in that the value memory (12.3) can be loaded with a specific monetary value by specially authorized read and write stations WR, said value being debitable by further authorized, special read and write stations WR as debiting stations (55) at consumption points (65) up to a maximum value zero.

14. Chip according to claim 12, characterized in that the value memory (12.3) is variable up to a predeterminable, maximum value by special read and write stations WR at value game areas (66) by crediting and debiting and the value of the value memory (12.3) is checked as an access condition to these value game areas.

15. Station for checking (30) chips according to claim 1, characterized in that the station has an autonomous, decentralized read and write unit WR



and an individualizing device (35), so that the chips supplied are individually detected and simultaneously read and checked by the read and write unit WR.

16. Station according to claim 15, characterized in that with the transmission takes place an association of chips in one of the three following categories: correct (31), incorrect (32) or no (33) identification response.

17. Station according to claim 15 for checking and sorting (40) chips, characterized in that the value of the chip is established in the read and write station WR and then the chips are subsequently placed in a stack (46) with the same value by means of a sorting device (45).

18. Station according to claim 15, characterized in that the read and write unit WR has a value modification competence in a predetermined value range.

19. Installation (60) for gambling casinos with several chips according to claim 1 and with several associated, autonomous, decentralized read and write stations WR connectable to a master, central computer unit (75) and evaluatable by the latter.

20. Installation according to claim 19, characterized in that the read and write stations WR are used at several points such as entrance cash desks (61), chip and coin cash desks (62), gambling tables (63), slot machines (64) and consumption points (65) and are used with different functions, namely as checking stations (30), sorting stations (40) and/or value modification stations (50).

21. Installation according to claim 19, characterized in that the chips (1) are subdivided into a higher value class (1a) and a lower value class (1b), the higher value chips (1a) having data carriers MI with larger memories (12), antennas (15) and more complicated codes (22) and consequently a higher forgery security than the lower value chips (1b).

22. Method for initializing a chip according to claim 1, characterized in that a hierarchic authorization system A valid for all the data carriers MI



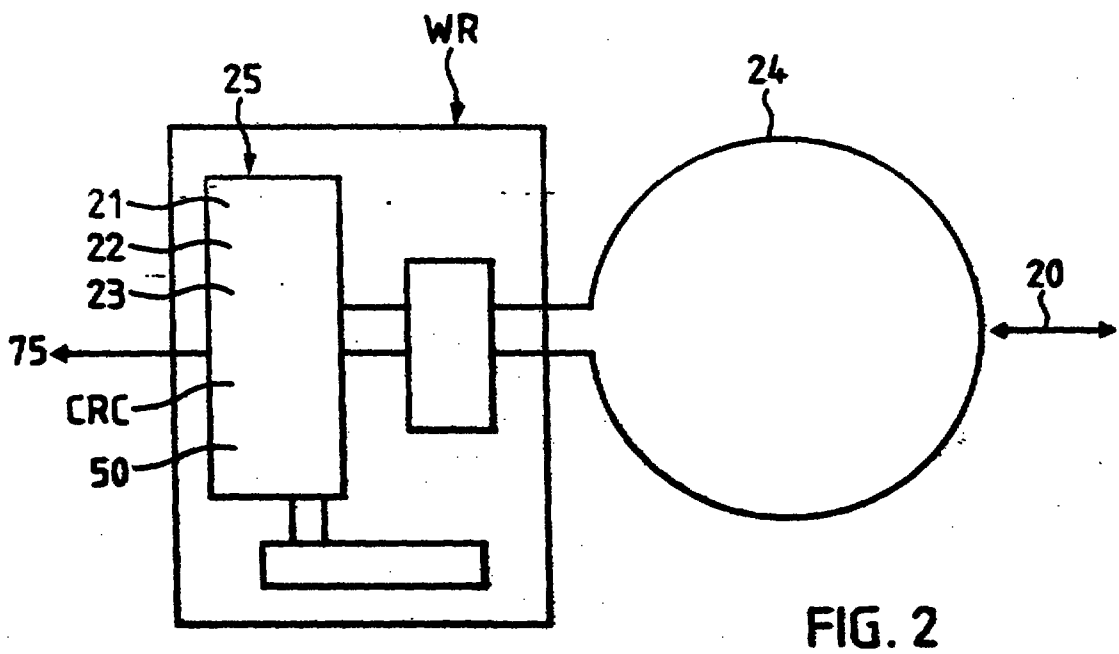
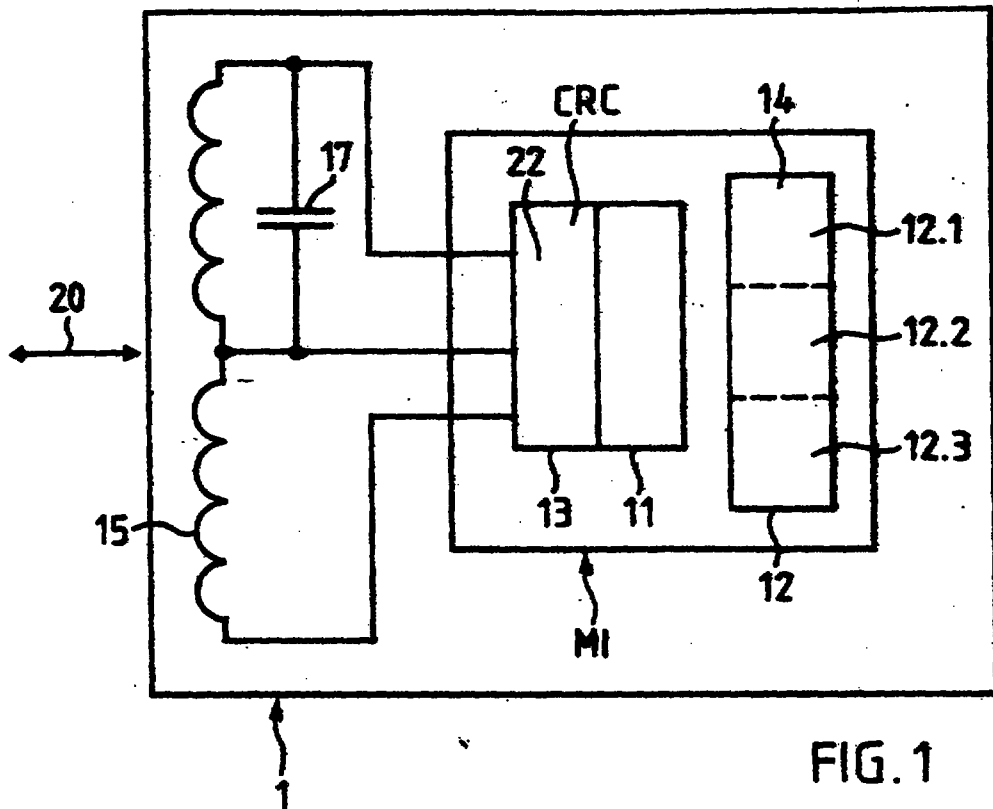
of the chips and for all the read and write stations. WR is established and prior to use each data carrier MI must be initialized, so that it is recognized as valid and authorized in the read and write stations WR and in which the data carrier MI is initialized by means of a special authorization data carrier AMI and a special programming read and write station WRI.

23. Method according to claim 22, characterized in that each data carrier MI of the system must be produced as a slave medium (72) by means of a master authorization-data carrier AMI as the master medium (71), necessarily a no longer variable basic data set of the master medium being transferred (bequeathed) to the slave medium.

ABSTRACT

The gambling chip (1) has an integrated electronic data carrier with processor (11), memory (12) and antenna (15) for transmitting RF signals (20) and which is surrounded by an electromagnetically transparent casing (2). The memory contains invariable, noncopiable master data (14). With the chip is associated a decentralized, autonomous read and write station WR with which the data carrier MI can be read and written. The data carrier MI is initialized by an authorization system and for communication purposes during each identification process new initialization data (21) are produced by the read and write station WR and transmitted to the data carrier MI, are combined there with an encoding code (22), transmitted back to the read and write station, where decoding and checking take place. This leads to a forgery-proof chip, which can be universally used in all types of gambling installations and which guarantees a troublefree operation.

(Fig. 1)



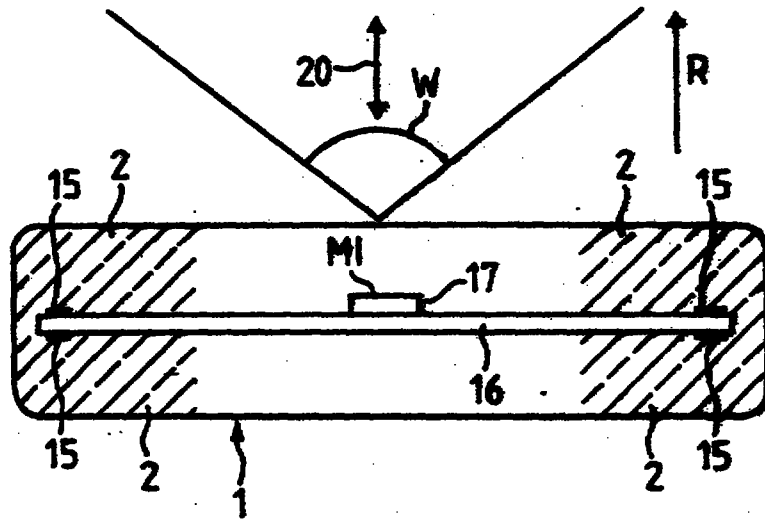


FIG. 3a

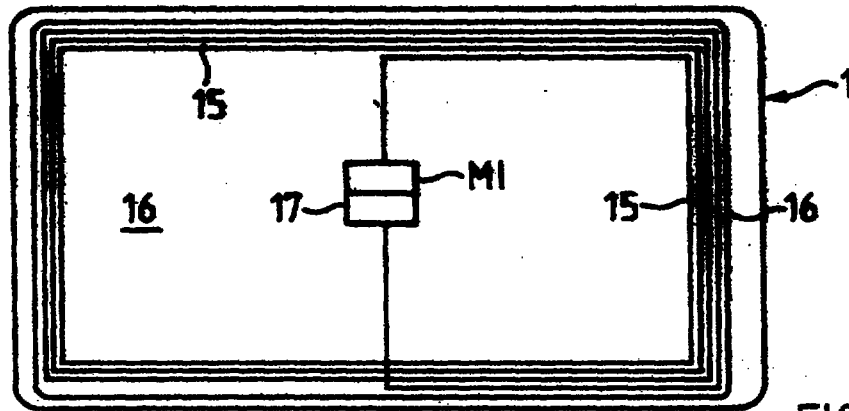


FIG. 3b

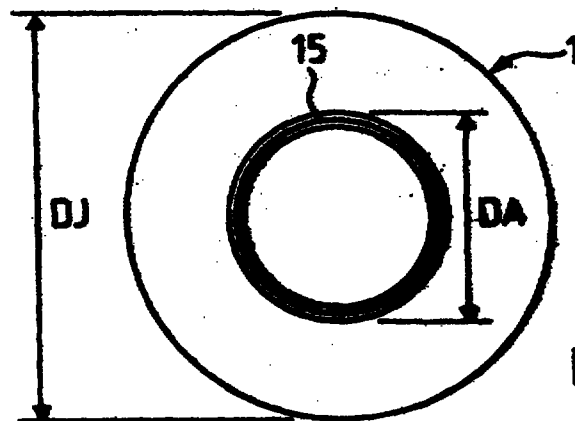


FIG. 4a

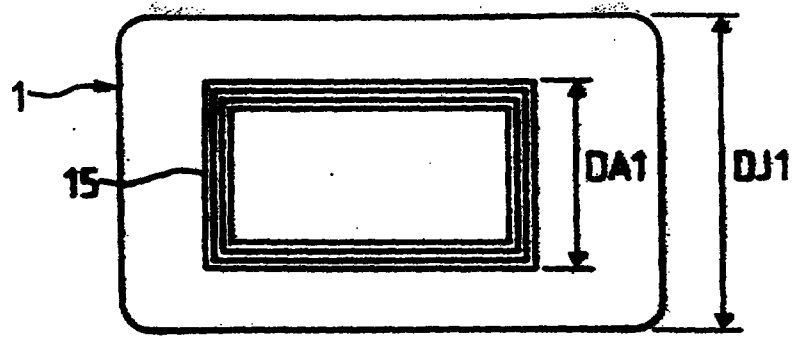


FIG. 4b

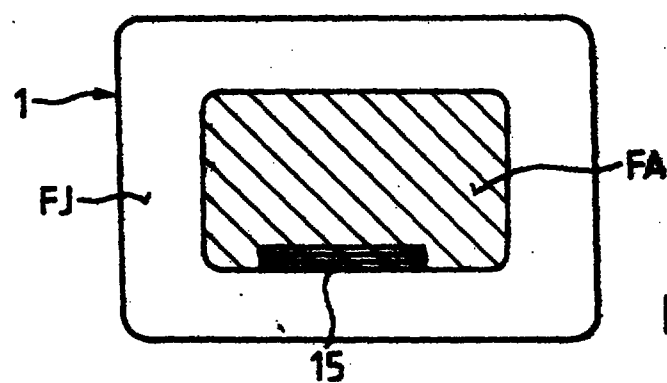


FIG. 4c

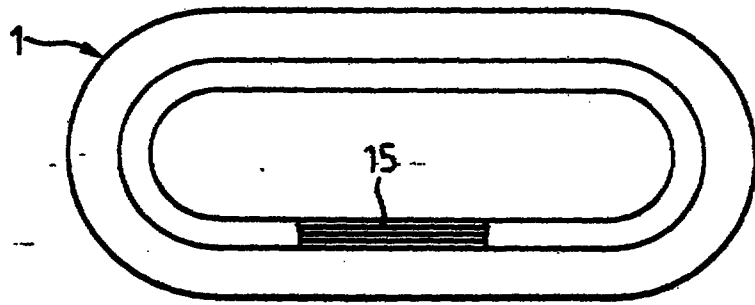


FIG. 4d

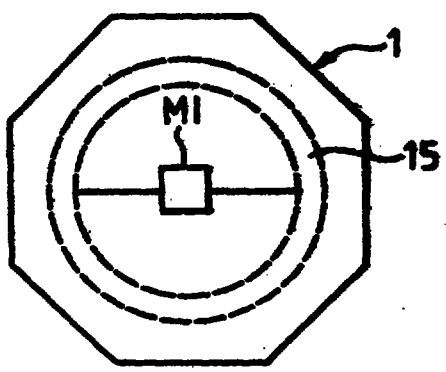


FIG. 4e

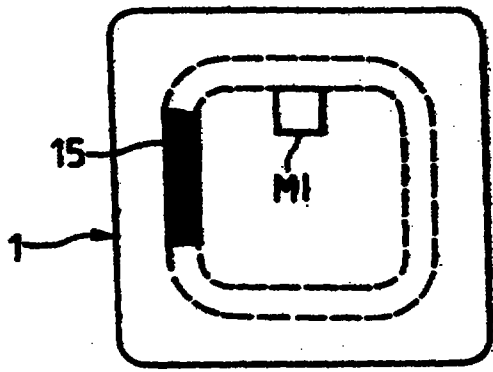


FIG. 4f

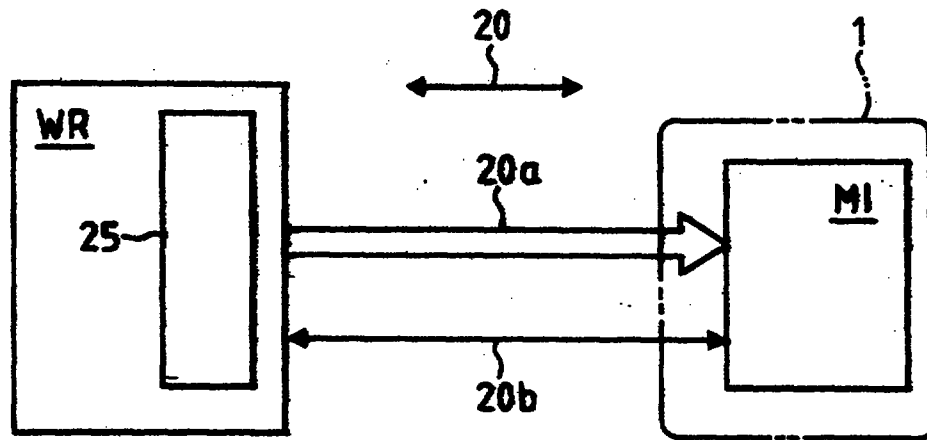


FIG. 5

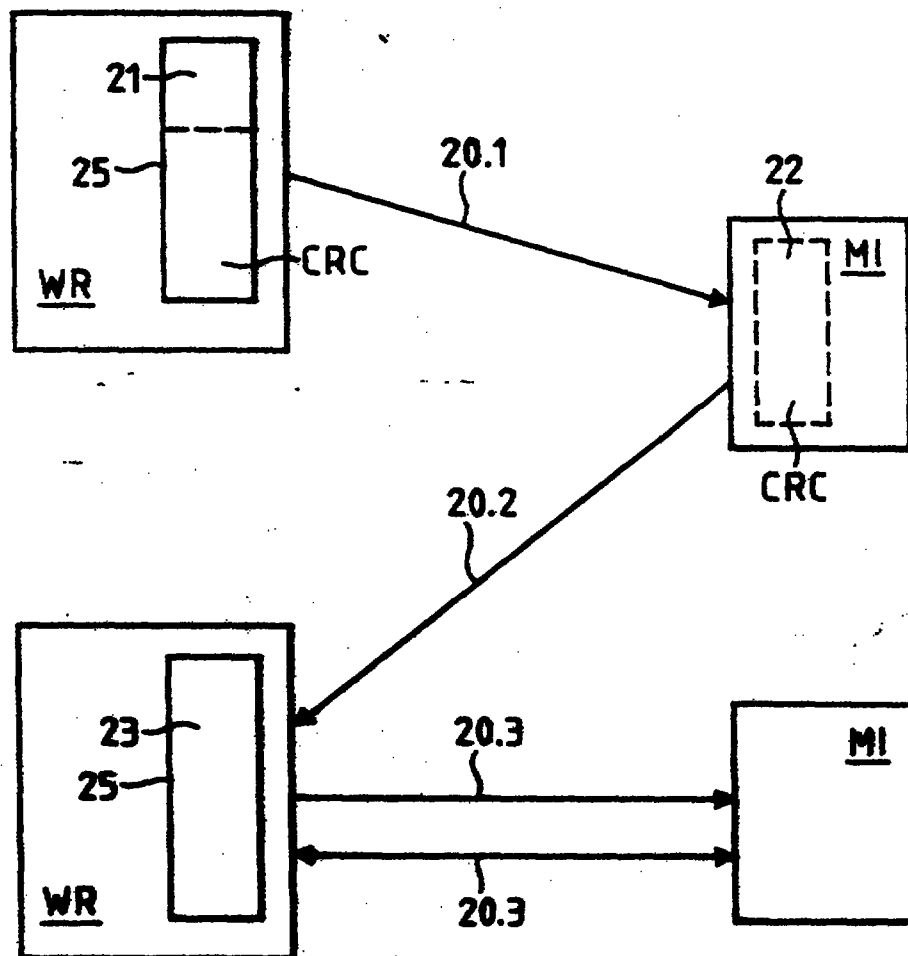
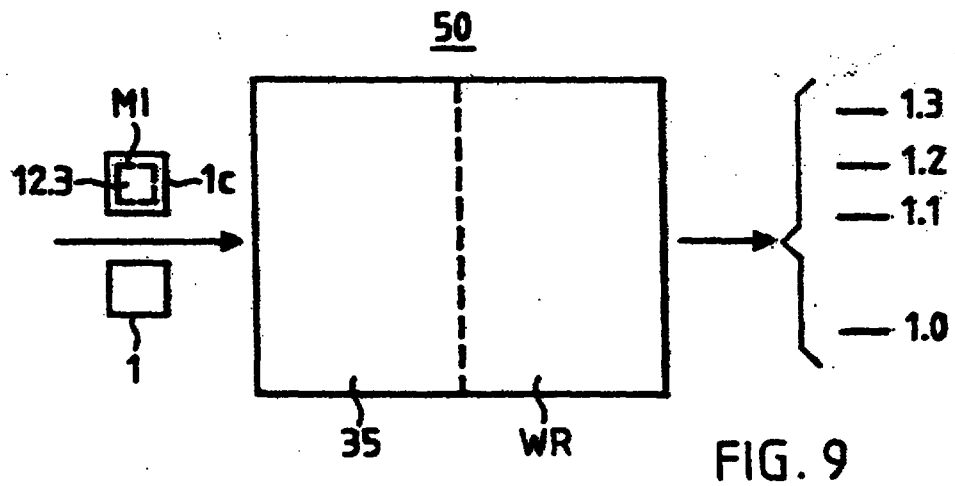
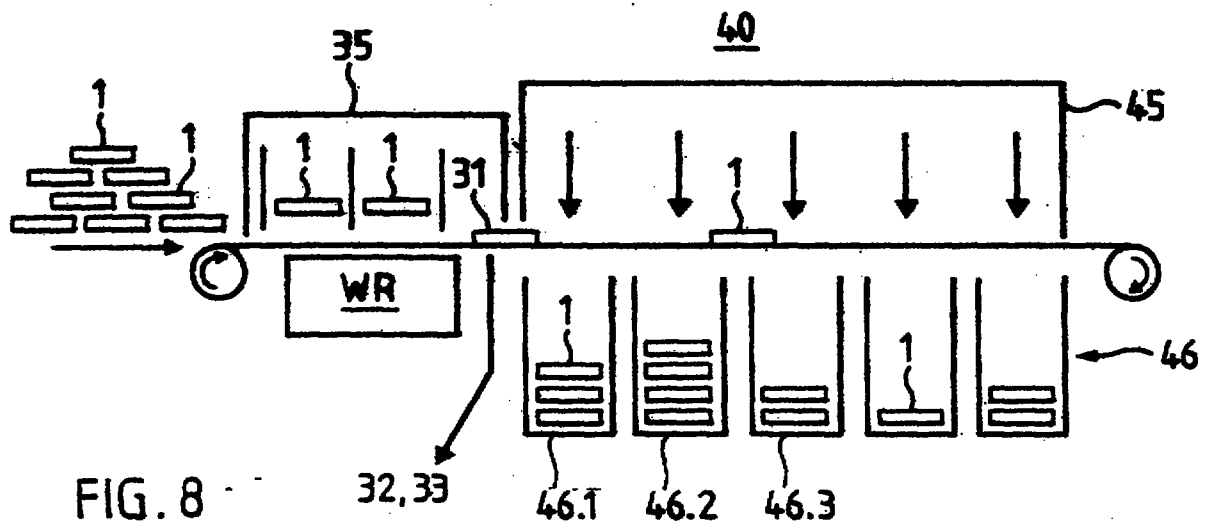
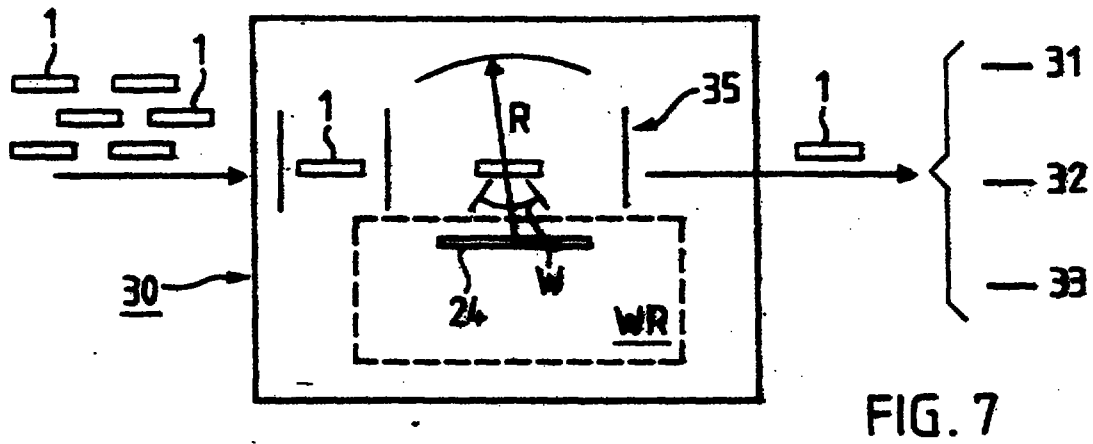


FIG. 6



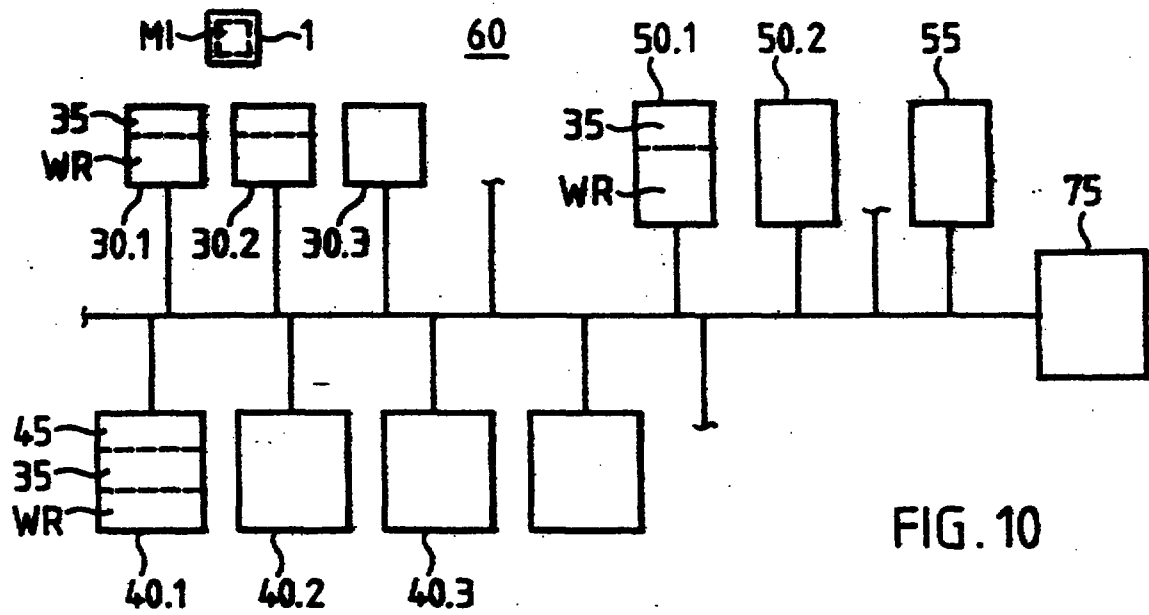


FIG. 10

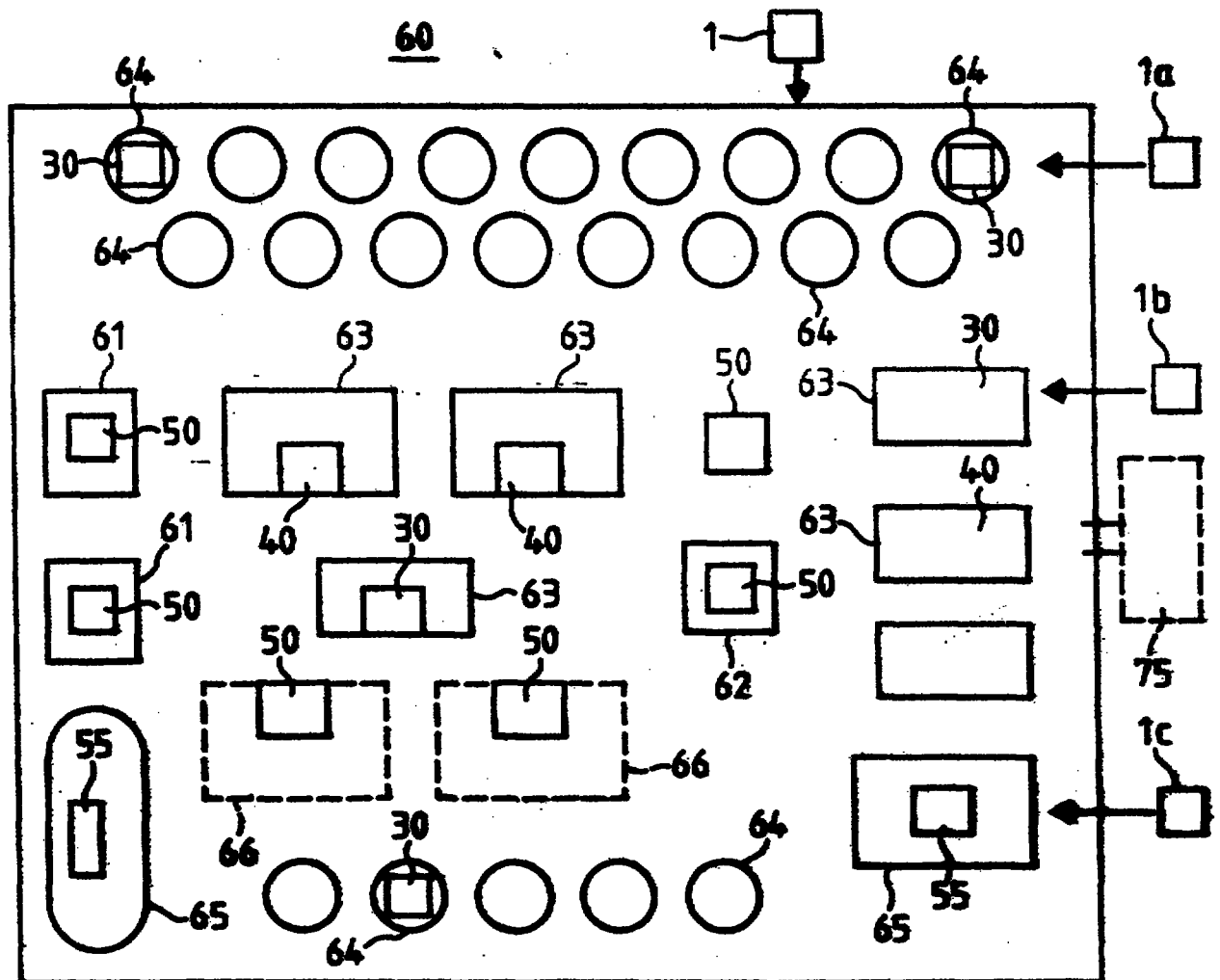


FIG. 11

