United States Patent

Dethloff et al.

[15] **3,678,250**

[45] **July 18, 1972**

[54] **IDENTIFICATION SWITCH**

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[73] Assignee: **Interlectron Patentverwaltung GmbH,** Munich, Germany

[22] Filed: **Sept. 15, 1969**

[21] Appl. No.: **857,957**

[30] **Foreign Application Priority Data**

Sept. 13, 1968 Austria 8917/68

[52] **U.S. Cl.** ....**235/61.11 R,** 235/61.12 R, 194/4 R, 340/149 A

[51] **Int. Cl.** **G06k 7/04,** G07f 7/00, H04q 1/02

[58] **Field of Search** ....235/61.11 R, 61.12, 61.12 C, 235/61.6 R, 61.7 B; 179/20 P, 2 CA, 63 R, 6.3 CC; 340/149 A; 315/8.5

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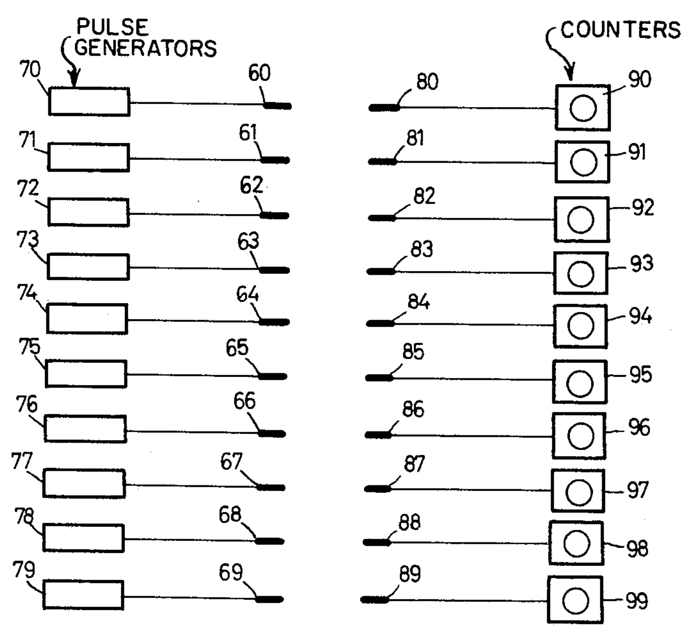
Primary Examiner—Daryl W. Cook
Assistant Examiner—Thomas J. Sloman
Attorney—John J. McGlew and Alfred E. Page

[57] **ABSTRACT**

An identificant is insertable into an identificator, and carries a number of input points and a number of output points, certain of the input points being connected with certain of the output points in accordance with a predetermined code. The code does not use binary logic but rather a translation logic. The identificator comprises a number of input pins and a number of output pins, the input pins being engageable with the input points of the identificant, and the output pins being engageable with the output points of the identificant, more specifically with strip conductors connecting respective input points to respective output points. The input pins are connected to respective pulse generators, and the output pins are connected to respective counters. The pulse generators supply a pulse sequence in which the number of pulses in a group increases by one during the sequence of checking the input points and the output points, whereby each of the counters will contain only one respective number. The identificant may be provided with a monolithic semiconductor circuit, preferably on a head at its inner end, and capable of checking with respect to counterfeiting of the identificant.

4 Claims, 49 Drawing Figures



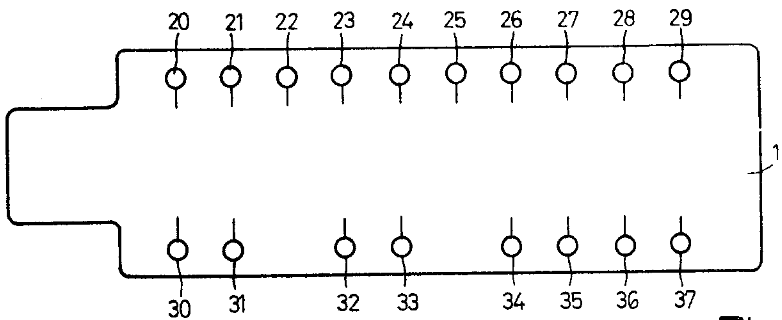


Fig.1

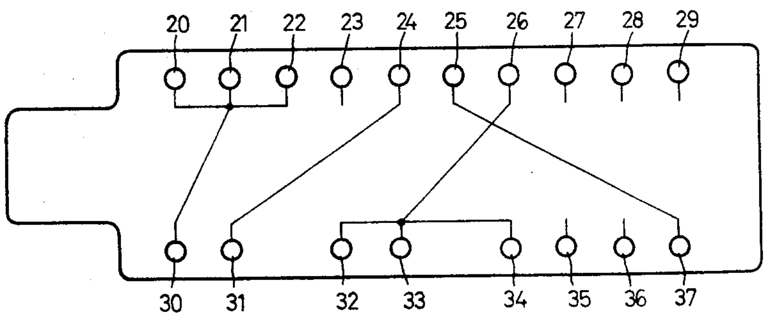


Fig.2

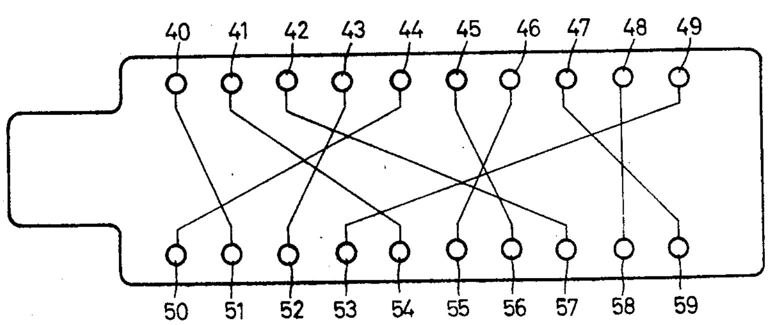


Fig.3

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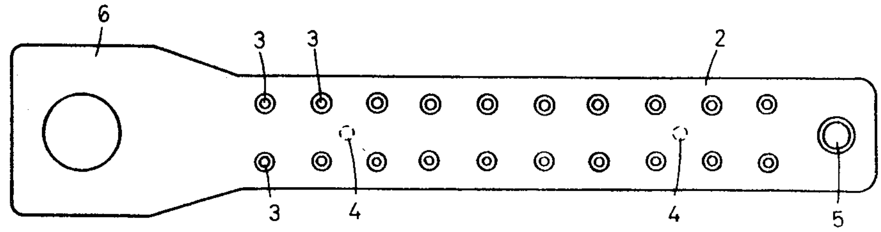

Fig.4

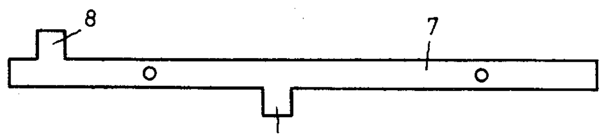

Fig.5

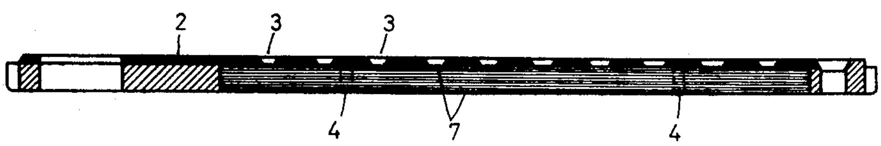

Fig.6

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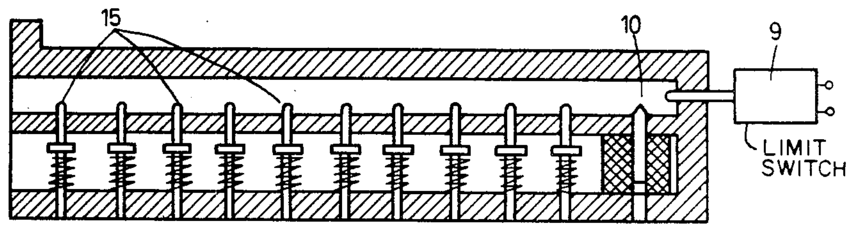

Fig.7

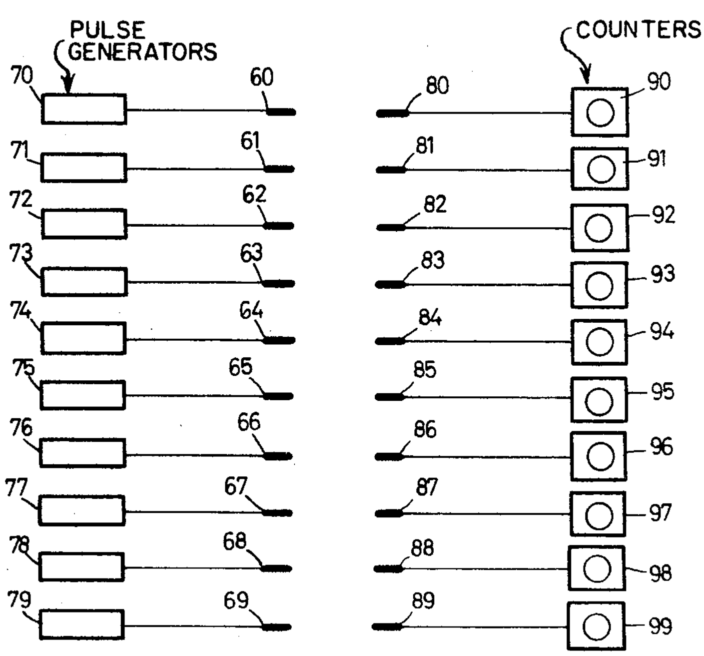

Fig.8

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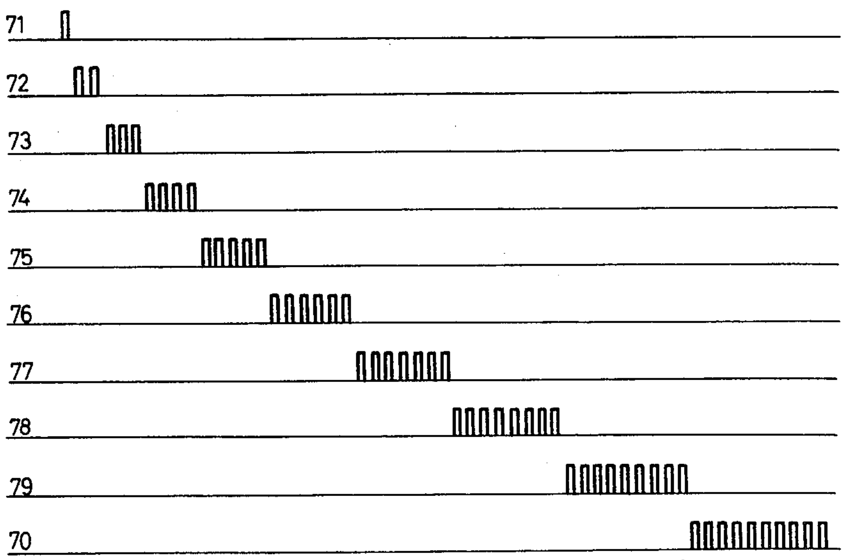

Fig. 9

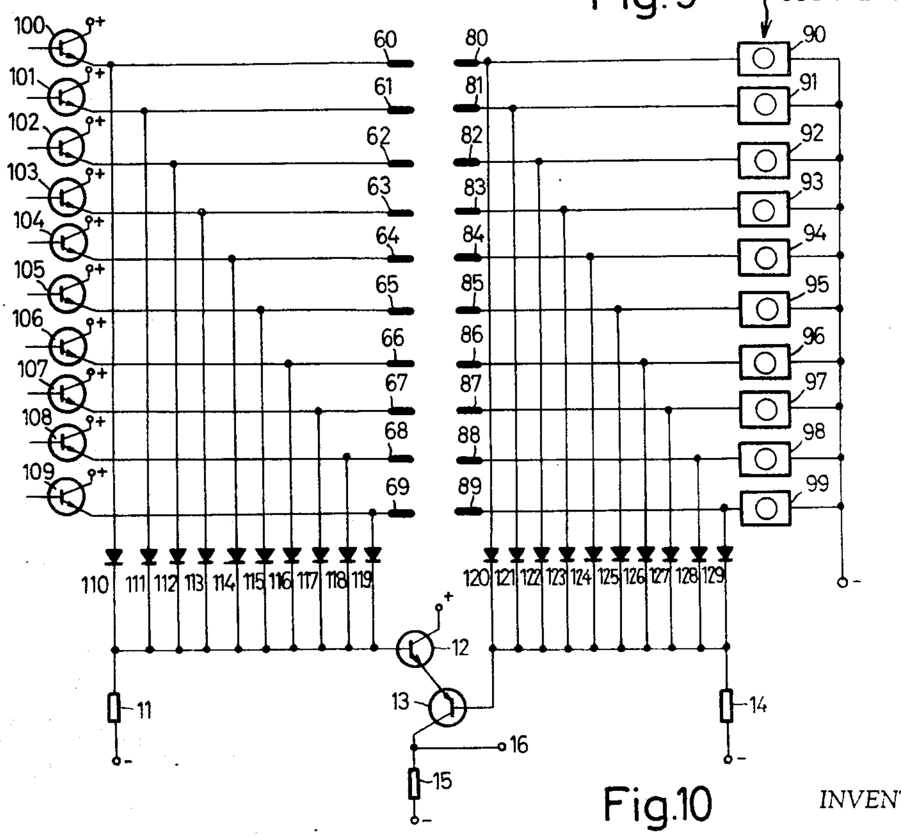

Fig. 10

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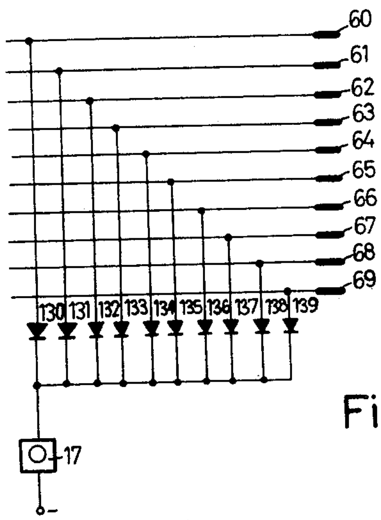

Fig.11

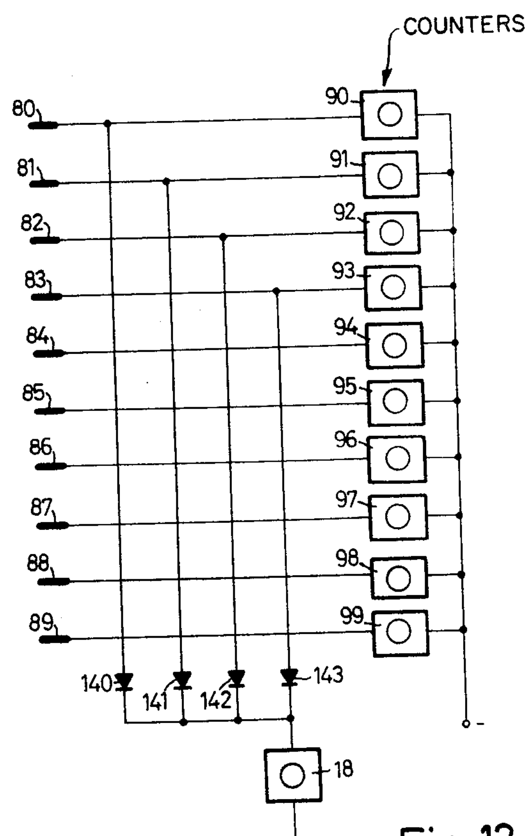

Fig.12

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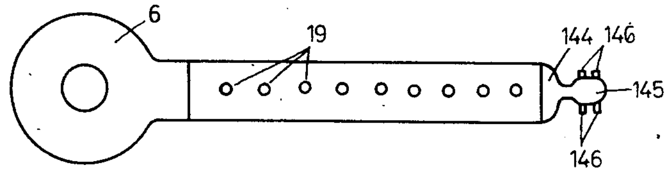

Fig. 13

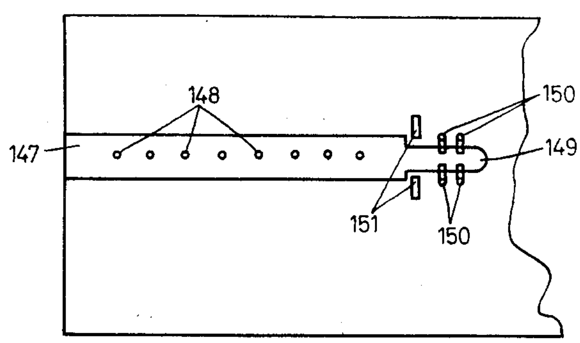

Fig. 14

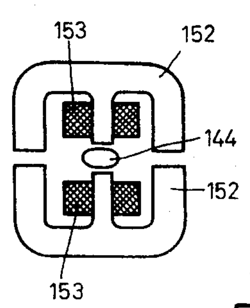

Fig. 15

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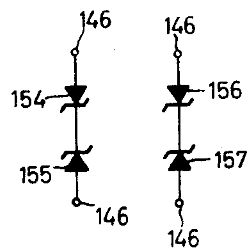

Fig.16

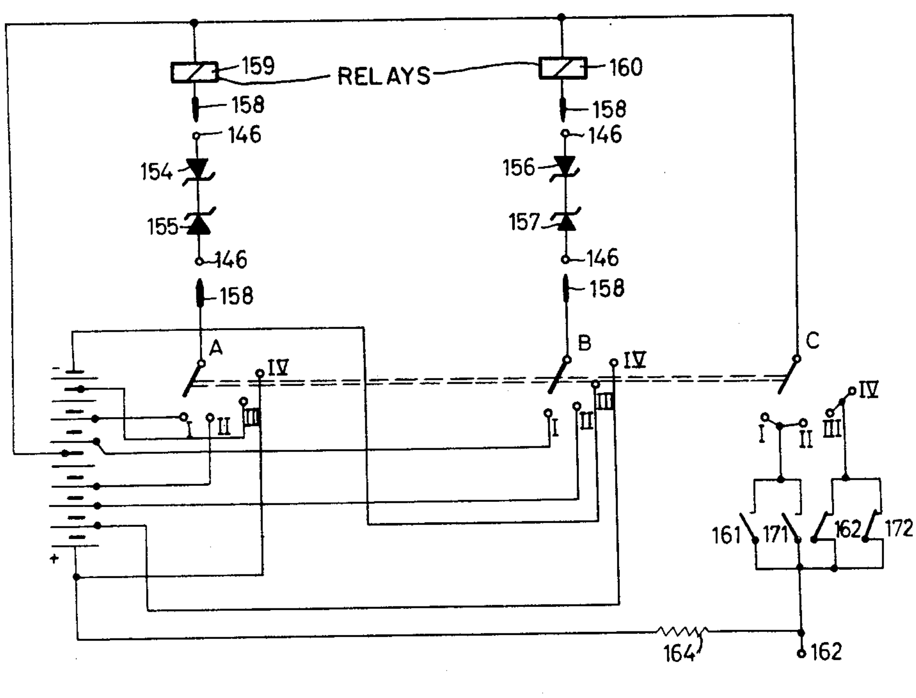

Fig.17

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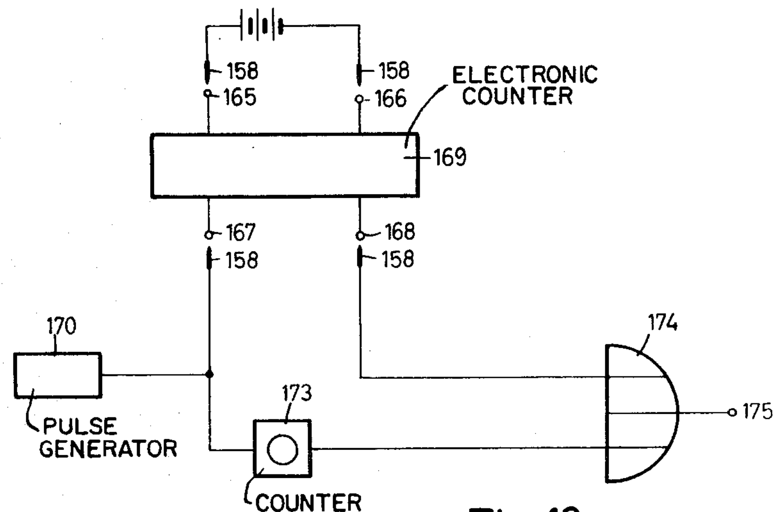

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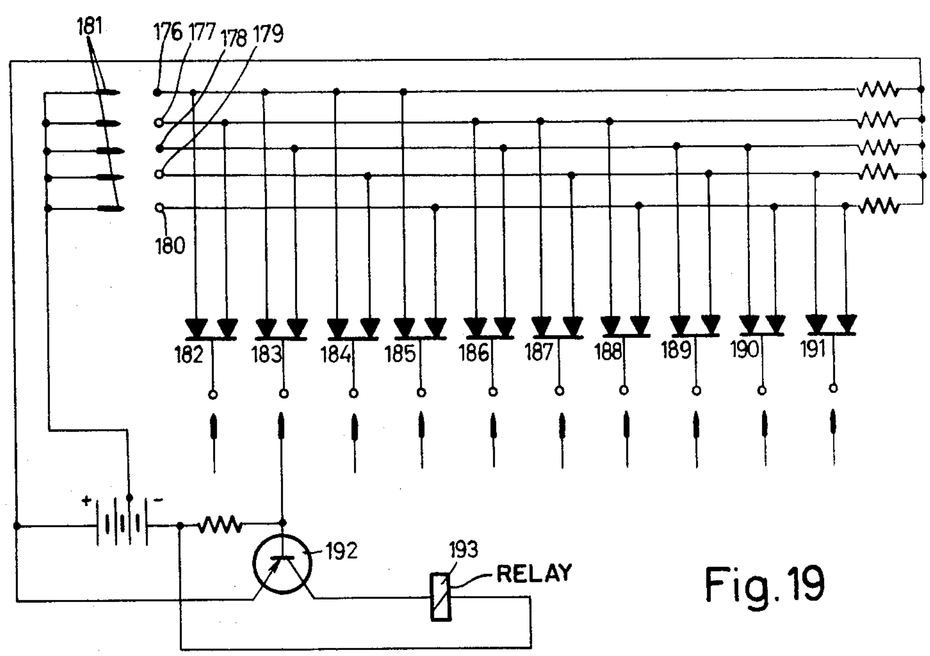

Fig.19

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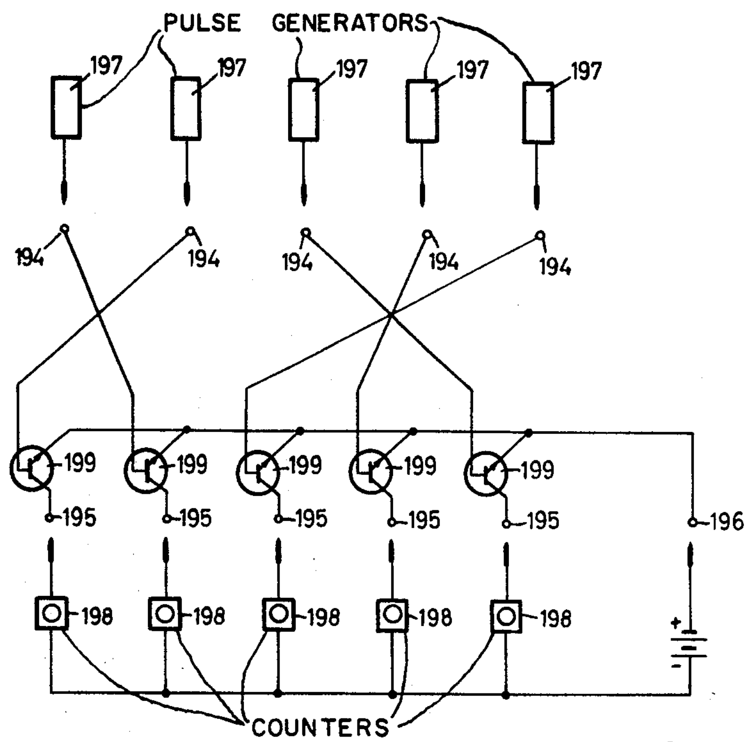

Fig. 20

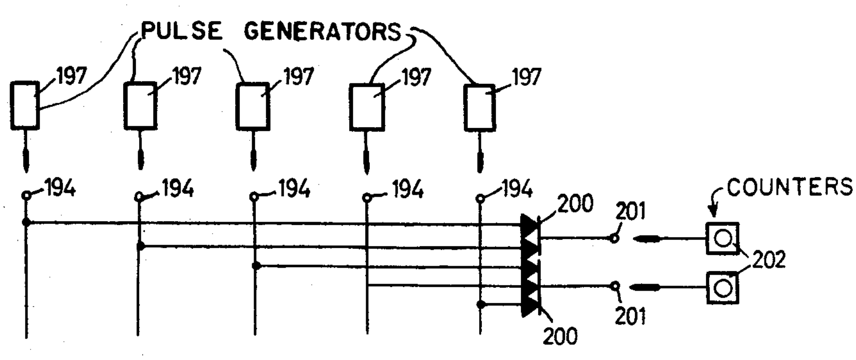

Fig. 21

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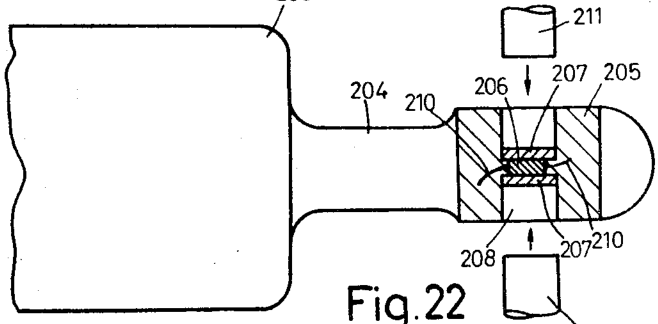
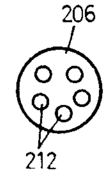


Fig.22



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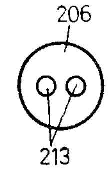

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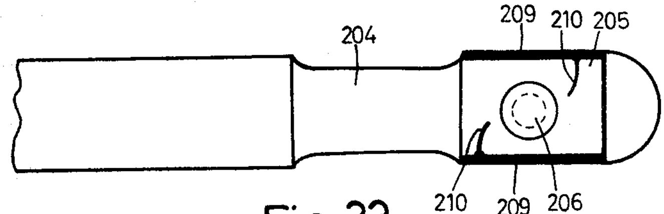

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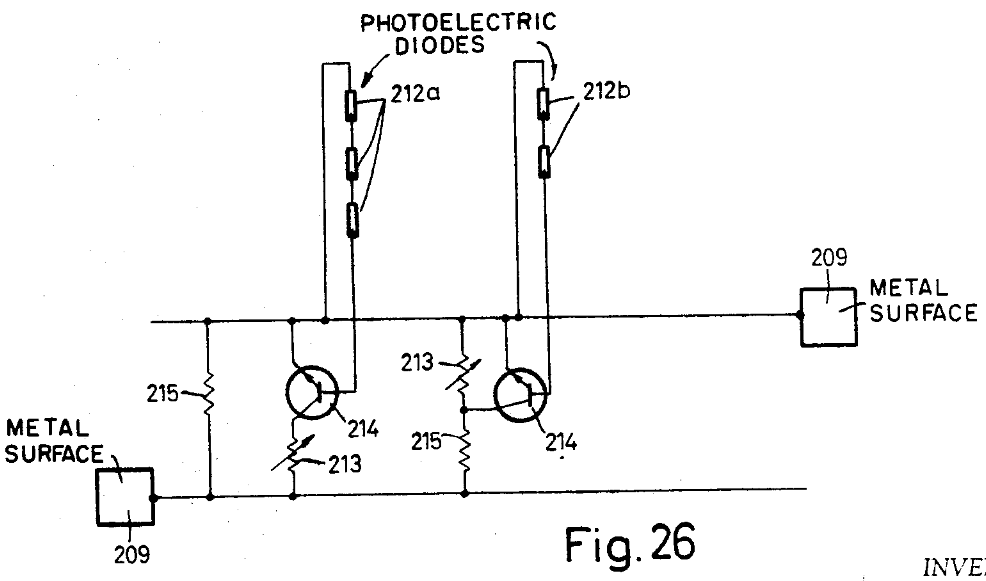

Fig.26

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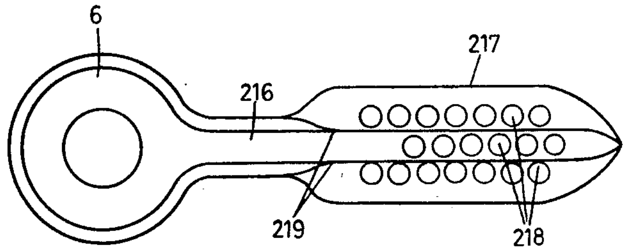
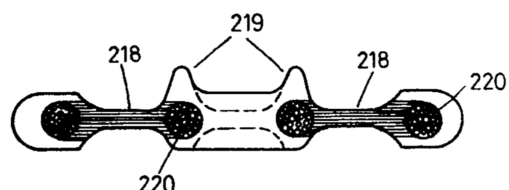


Fig. 27



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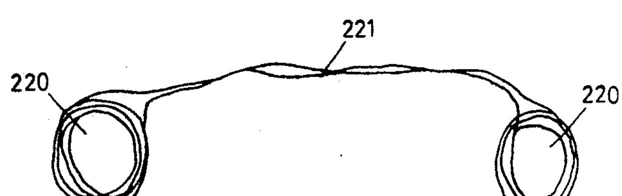

Fig. 29

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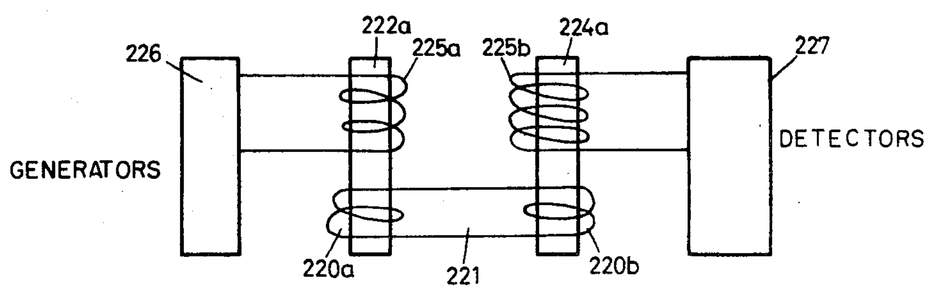

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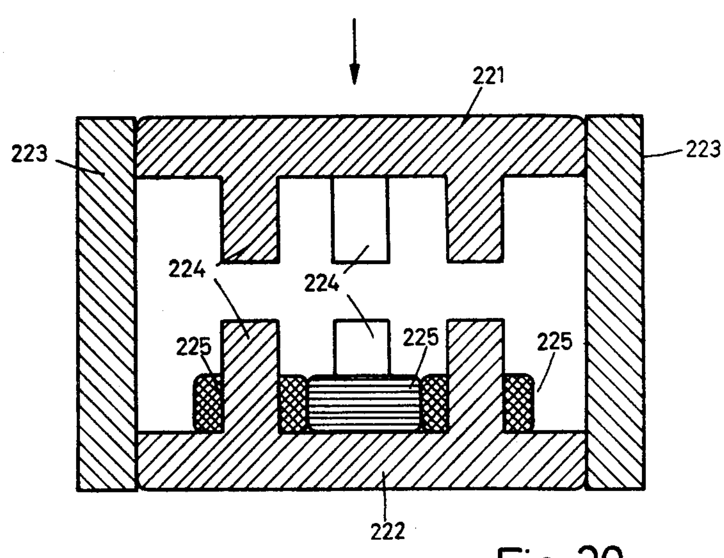

Fig. 30

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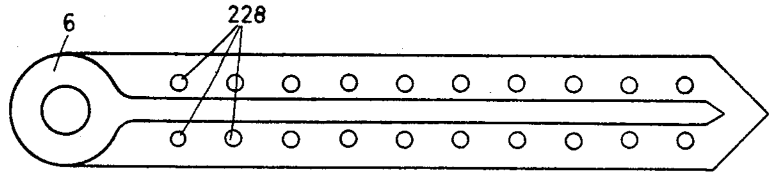

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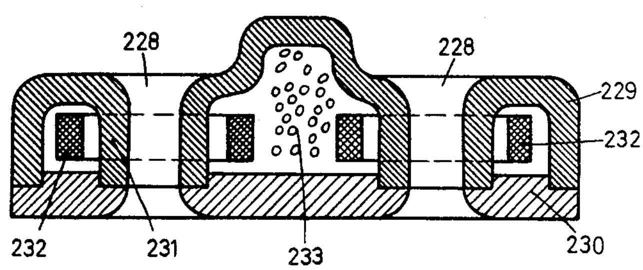

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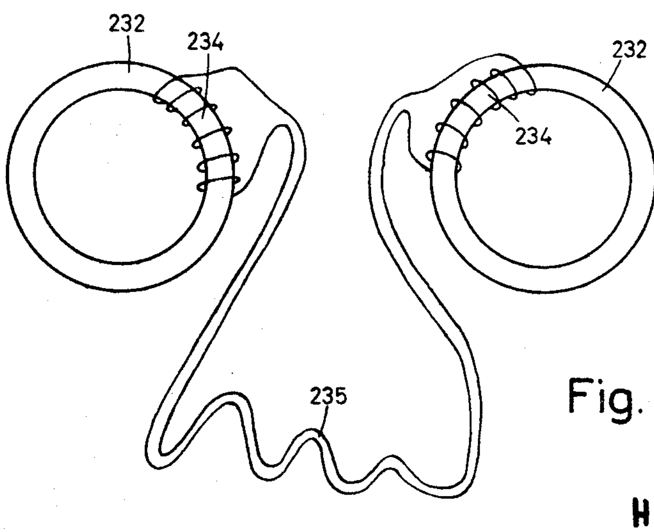

Fig. 34

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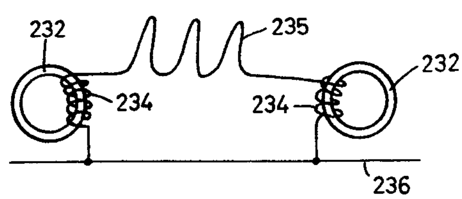

Fig. 35

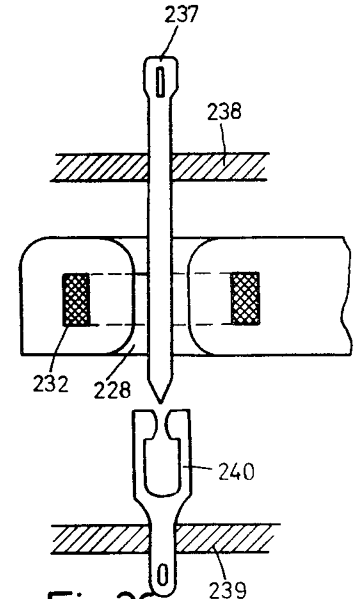

Fig.36

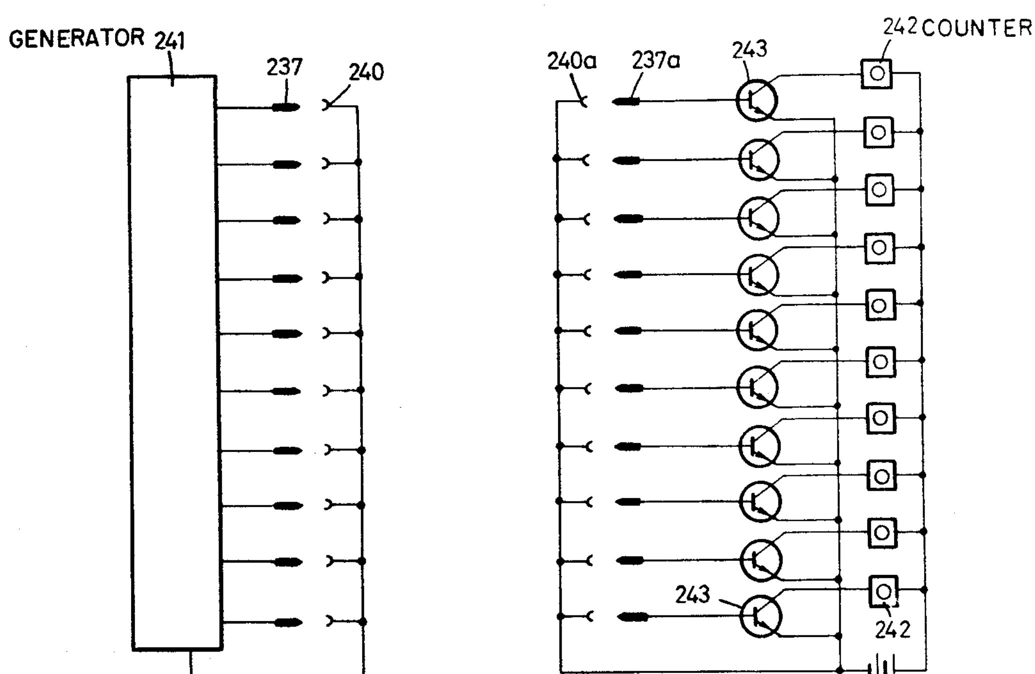

Fig.37

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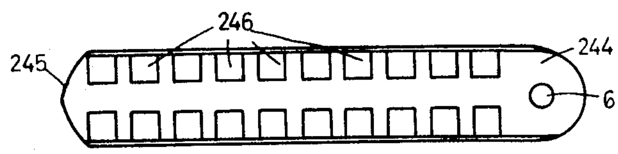

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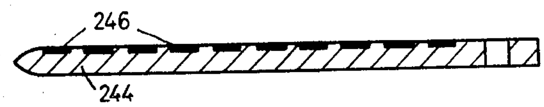

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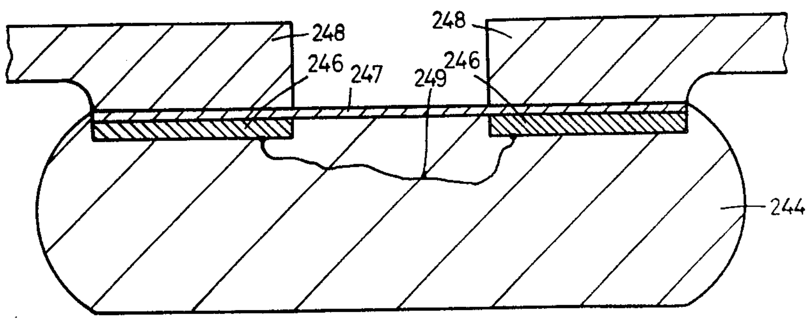

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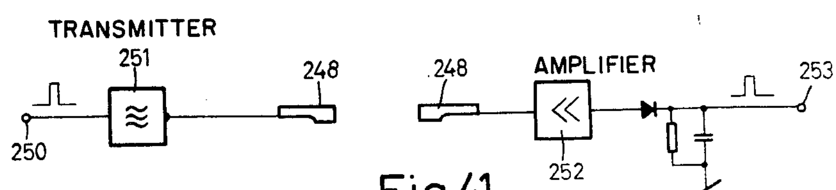

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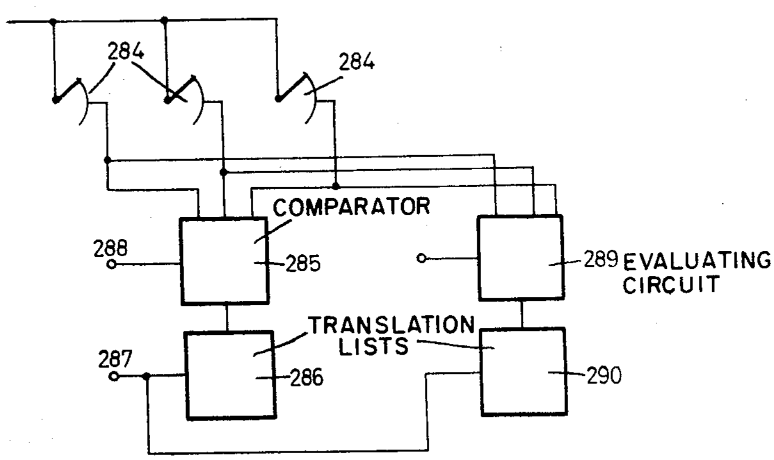

Fig. 49

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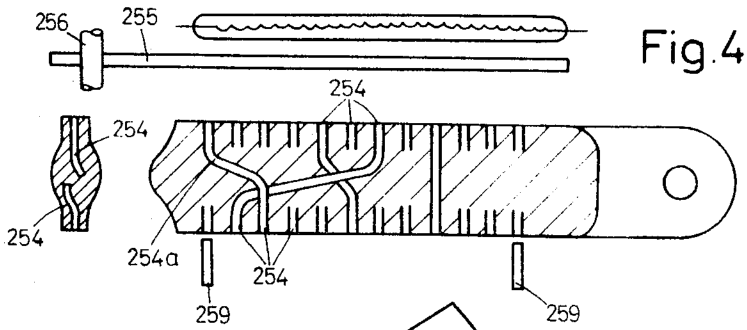

Fig.42

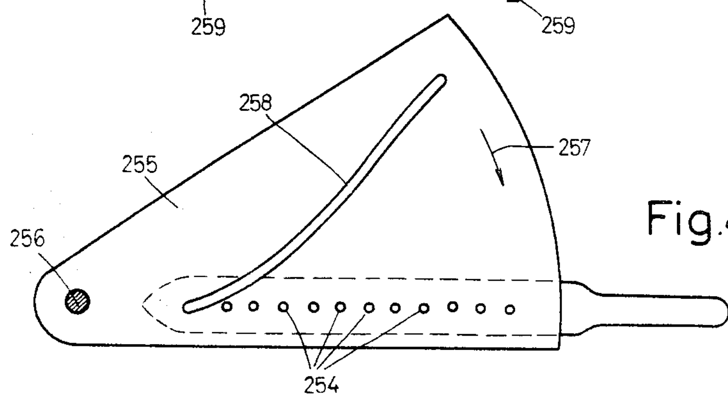

Fig.43

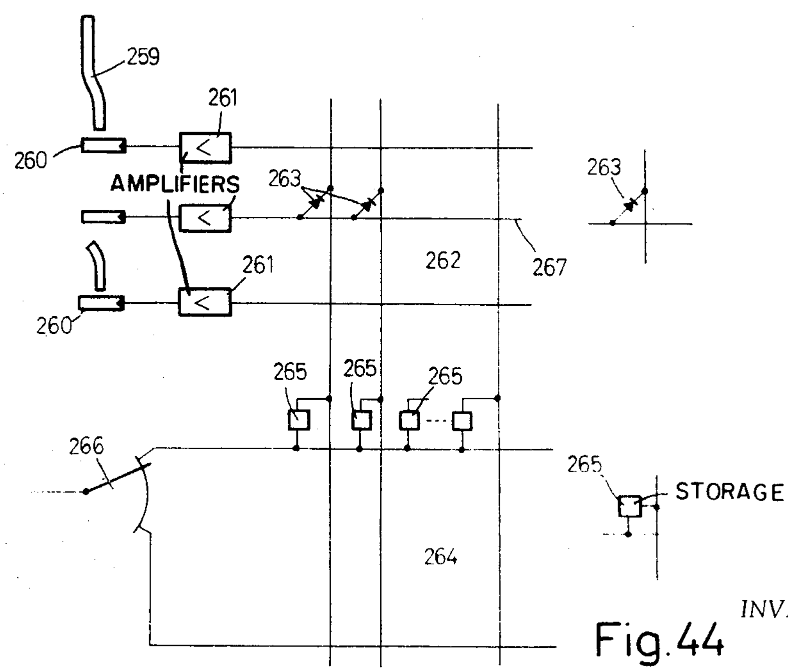

Fig.44

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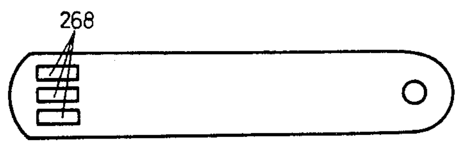

Fig.45

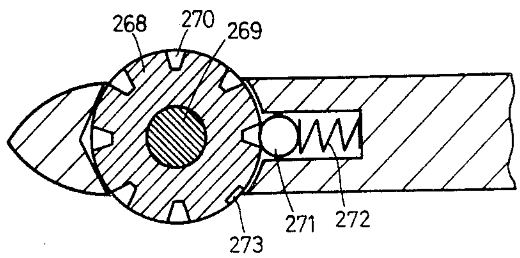

Fig.46

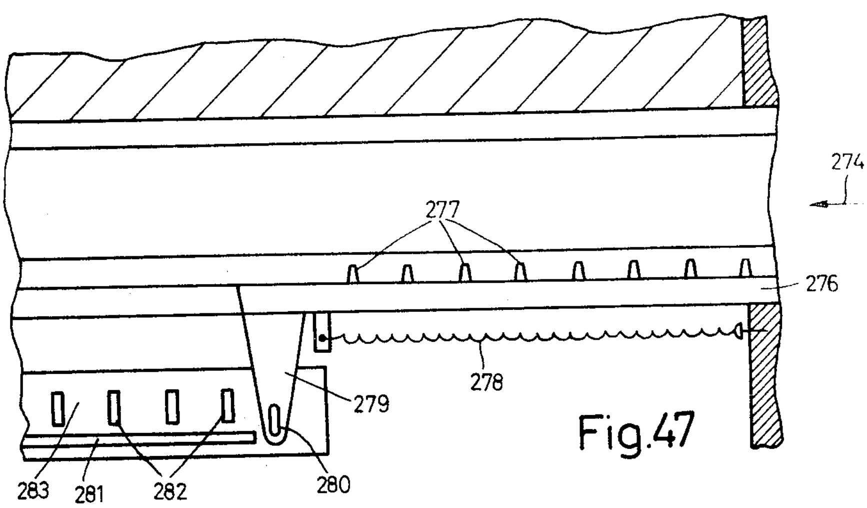

Fig.47

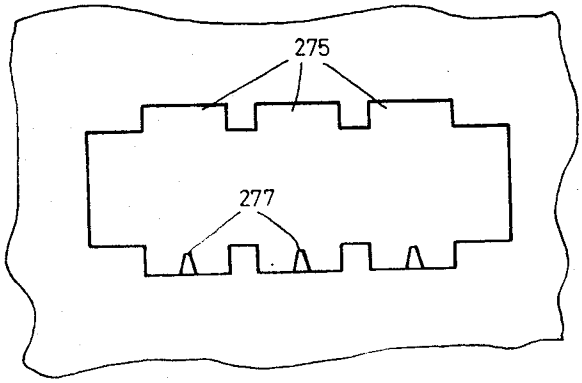

Fig.48

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IDENTIFICATION SWITCH

This invention relates to an identification system adapted to receive a certain offered information and to assign, to this information, a certain importance.

Such a function is performed, for example, in the case of identifying persons, in order that certain operations are started automatically on the basis of the identification. This can range from factory entry identity checks to purchases from automatic vending machines without cash. Identification of articles, for example, is desirable or necessary when production tickets proceed through workshops or when vehicles are located.

Thus, in principle, the identification consists of two parts, namely the information carrier, which is generally mobile, and the evaluation circuit, which is generally fixed. For ready reference hereinafter, the information carrier will be termed "identificant"and the evaluation circuit will be termed "identificator." As identificants or information carriers, there are used punched cards, cards with conductive coatings, or keys.

By way of example, a known identification circuit employs a key as the identificant, and a lock with a cylindrical core as the identificator. The information is carried on the key in the form of notches, similar to the notches on keys used with cylindrical locks. Some of these notches react in conjunction with blocking elements in the same way as in the case of normal cylindrical locks, that is, the lock cannot be operated with the wrong key. The other notches effect electrical contacts within the lock thus serving to effect the identification.

There are other prior art arrangements which use cards on which the information is recorded in the form of cams or perforations by means of mechanical probing levers which, in turn, are operable with respect to electrical contacts.

A further known system, also uses cards as identificants and the information is recorded on the identificants in the form of areas of respective different transparency or different light reflectance. The identificators scan these identificants through the medium of photo cells which make the information available in the form of electrical currents.

In still another well-known system, the information is recorded on cards in the form of conductive electroplated areas. In this case, the identificator scans the identificants with appropriate scanning pins or brushes, thus obtaining the recorded information in a form which lends itself to further electrical processing.

Irrespective of the different technical designs of these known arrangements, all known identificants are binary, that is, each position of the identificant is furnished with a go/no-go indication which can be read mechanically and which is evaluated with a binary mathematical logic. The result of the identification is thus obtained, in the identificator, in the form of a binary number which has as many digits as the identificant has binary positions.

The disadvantages of these prior art devices are attributable primarily to this binary notation. Thus, in many cases it is necessary to use the information, obtained from the identificator, for the control of decimal devices, for example, for the selection of a counter in a decadic matrix or for the control of a decadic printer. Consequently, a code converter is necessary in order to convert the binary code into a decimal code, and this is uneconomical from the cost standpoint.

Still another known system has the same disadvantage, eventhough it employs the more advanced method of coordination in which the input and output contacts of the identificants are connected with each other in accordance with a certain code.

All known identification systems, however, have one disadvantage in common, namely that they are not safe from adulteration or counterfeiting because either the identificants themselves or the connections between the contacts can be imitated.

The objective of the invention is therefore to provide an identification system which permits the coordination of identificants to be unambiguous, and which is absolutely safe with respect to adulteration or counterfeiting of identificants.

Accordingly, the objective of the invention is to provide an identification system designed to produce control signals with the help of identificants which contain a number of input elements and a number of output elements, with each input element being connected with one respective output element for the characterization of the respective identificant, and with the help of an identificator which is presented with the identificants and which is provided with a number of transmitters corresponding to the number of identificant input elements, and with a number of receivers corresponding to the number of identificant output elements. The connections between the input and output elements of the presented identificant is tested by these transmitters and receivers, while the information resulting from these connections is stored in the identificator in order to determine which identificant was offered or presented. The identificants further contain additional devices which are scanned and evaluated by an appropriate testing unit of the identificator, and which protect the identificants from adulteration or counterfeiting independently of the information characterized by the connections between the input elements and the output elements.

The present invention thus distinguishes from the known arrangements in using a translation logic instead of binary logic. This makes it possible to use the recorded information, resulting from testing of an identificant, in the decimal form and without the necessity of converting binary code information into decimal code information.

The connections between the identificant input elements and the identificant output elements, and with the appropriate identificator elements, as well as with each other, can be effected by known means, for example, by electroplating, capacitors, transformers, electromagnetic, or optical arrangements.

The additional device for the protection against adulteration or counterfeiting comprises a special integrated circuit which is accommodated in the form of a monolithic semiconductor block, inside a narrow section of the identificant, and whose existence is checked automatically in the course of the identification of the identificant by the identificator. The special design of the identificant assures that this section of the identificant cannot be imitated by distinct structural components. It is well known that the provision of such special integrated circuits involves expenses which exceed, by far, the usefulness of adulteration or counterfeiting.

The integrated circuit, serving as safely device against adulteration or counterfeiting, generally is independent of the circuits provided for the identification of the identificants. However, the integrated circuit may be included in the identification by designing certain parts of the connections between the input and output elements as integrated circuits, or by making the integrated circuits part of the identification circuits. Instead of an integrated circuit, the safety device can be an electro-optical device, as described hereinafter.

The structure of the identificator depends primarily on the physical nature of the connections between the input and output elements of the identificant. The underlying principle of the new identification system consists in that defined pulse currents are transmitted from the identificator, through its transmission points, to the input elements of the identificant, and that these pulses appear, subject to the connections, at the output elements where they are received by the receiving points of the identificator and stored in the latter.

For an understanding of the principles of the invention, reference is made to the following description of typical embodiments thereof as illustrated in the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING:

In the drawing:

FIG. 1 shows the basic design of a non-wired identificant;

FIG. 2 shows the circuit diagram diagram of an identificant with a multi-valued translation;

FIG. 3 shows the circuit diagram of an identificant with a two-valued translation;

FIG. 4 shows an identificant with a galvanic translation;

FIG. 5 shows a connecting element of the identificant;

FIG. 6 shows a sectional view of an identificant with a galvanic translation;

FIG. 7 shows the scanner of the identificator for galvanic translation;

FIG. 8 shows the circuit diagram of the identificator;

FIG. 9 shows the shape of the pulse currents in the identificator as a function of time;

FIG. 10 shows an identificator with continuity checking;

FIG. 11 shows an identificator with transmission checking;

FIG. 12 shows an identificator with summation;

FIG. 13 shows an identificant with protection against imitation;

FIG. 14 shows devices in the identificator;

FIG. 15 shows an inductive scanning system;

FIG. 16 shows a control circuit with Zener Diodes;

FIG. 17 shows a test circuit of the identificator for a control circuit with Zener Diodes;

FIG. 18 shows a control circuit and a corresponding test circuit with counter;

FIG. 19 shows a control circuit and the corresponding test circuits with a decoding circuit;

FIG. 20 shows a control circuit and a corresponding test circuit with transistor amplifiers;

FIG. 21 shows a control circuit and the corresponding test circuit with diode gates;

FIG. 22 shows a top view and partial sectional view of the nose of the identificant;

FIG. 23 shows a side view of the nose of the identificant;

FIG. 24 shows a top view of the protective element;

FIG. 25 shows the protective element seen from below;

FIG. 26 shows the evaluating circuit in the identificant;

FIG. 27 shows the identificant with scanning points;

FIG. 28 shows a sectional view of the identificant;

FIG. 29 shows a pair of coils with the connecting leads;

FIG. 30 shows the scanning device of the identificant;

FIG. 31 shows the circuit of the scanning device of the identificator;

FIG. 32 shows the identificant with magnet points;

FIG. 33 shows a sectional view of the identificant;

FIG. 34 shows a pair of magnet cores with connecting leads;

FIG. 35 shows a pair of magnet cores with a common connection;

FIG. 36 shows an element of the scanning device of the identificator;

FIG. 37 shows the circuit of the scanning device of the identificator;

FIG. 38 shows the view of the identificant with capacitive translation;

FIG. 39 shows the same identificant in a longitudinal section;

FIG. 40 shows a sectional view of the identificant with the scanning electrodes;

FIG. 41 shows a capacitive scanning device;

FIG. 42 show an identificant with optical translation and evaluating parts;

FIG. 43 shows a slotted disk and the identificant;

FIG. 44 shows the evaluating circuit;

FIG. 45 shows a top view of the identificant with setting rollers for the setting of the index number;

FIG. 46 shows a sectional view of a setting roller with detent;

FIG. 47 shows a sectional view of the identificator;

FIG. 48 shows a hole of insertion of the identificator and

FIG. 49 shows the block diagram of the identificator.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows the general schematic of an identificant. The identificant contains in a mechanical structure 1 a number of input elements 20 to 29 as well as a number of output elements 30 to 37, the number of the input elements not necessarily being equivalent to the number of the output elements. In the condition shown in FIG. 1, the connecting elements and, consequently, the information required for the identification are not present in the identificant. However, the arrangement of the input elements and the output elements has already been disposed of, i.e., the places in the mechanical structure 1 at which input elements 20 to 29 are located are already distinguished by an arbitrary fixing from the places at which output elements 30 to 37 are located. Such a fixing is important in so far as identifying circuits may thus be delimitated against each other. As, for example, can be seen from FIG. 4, the input elements 20 to 29 and the output elements 30 to 37 are mechanically identical. The same applies to the scanning devices necessary for scanning the input elements and the output elements, as will be apparent from FIG. 7. Consequently, the mechanical design does not prevent identificants with a certain allotment of places for input elements and output elements are scanned by identificators which being set to a different allotment of places. On the other hand, as will be shown lateron, the identificator is in a position to determine identificants with a "false" allotment of places and thereby exclude them from further identification.

Thus it is possible to build up circuits out of a number of identificators and a number of identificants which among themselves all have the same allotment of places for input elements and output elements so that identificants of one identification circuit are not identified by the identificators of another identification circuit. Such a division into identification circuits is necessary, for example, if there is a greater number of persons using such identification systems and these persons want to protect themselves from unauthorized use of identificants of external identification circuits.

For example if the identificant contains 10 input elements and 10 output elements, the number of the possible allotment of places and, consequently, the number of the possible identification circuits will be according to known formulas:

$$\binom{20}{10} = 185\ 000$$

This great number of identification circuits constitutes an essential advantage of the device according to the invention over the known devices.

FIG. 2 shows the same identificant as FIG. 1 but now with the connections established by the connecting elements between the input elements and the output elements. Provided that each input element can be connected with each output element, a number of different groupings is obtained. For example, in FIG. 2, the input elements 20, 21 and 22 are all connected with the output element 30. The input elements 23, 27, 28 and 29 as well as the output elements 35 and 36 are used for no connection whatever. The input element 24 is only connected with the output element 31, and the input element 25 is connected only with the output element 37. The input element 26 is connected with the three output elements 32, 33 and 34. The number of identificants that can be set up in this manner may also be easily calculated according to known relations, proceeding from the fact that each output element may be connected with any input element or none at all. For example, a number for an identificant having ten input elements and 10 output elements will be:

$$10^{11} = 100\ 000\ 000\ 000$$

This great number of possible and distinguishable identificants is obtained in each of the above given different identification circuits.

FIG. 3 schematically illustrates an identificant, in accordance with the invention, which has input elements 40–49 and output elements 50–59 which are connected in a certain pattern with each other by means of electrical connections, so as to characterize this identificant by the nature of the connections. The devices for the protection against adulteration or counterfeiting are omitted in FIG. 3 for the sake of clarity, and because of the desirability of first explaining the identification system per se.

The location of the input and output elements in FIG. 3 can be varied so that groups of identificants with identical geometrical arrangements of these elements, and consequently different identification circuits, can be formed. Thus the identificants of a certain identification circuit of one identificator, which is assigned to another identification circuit, can be recognized as being not permissable and consequently a first degree of protection against adulteration or counterfeiting is obtained.

A practical embodiment of the identificants shown in FIG. 3 is illustrated in FIGS. 4, 5, and 6. A plastic envelope tube, having a handle 6, contains a number of openings 3 which can be either input elements or output elements. However, within one identification circuit, the geometrical arrangement of input and output elements is fixed, as mentioned above.

The openings 3 may be provided on both sides of the plastic envelope 2 or only on one side as illustrated in FIG. 4. Within the plastic envelope 2, there is a number of isolated sandwiched plates 7 of conducting material which are protected against shifting by the isolating bolts 4. These plates 7 serve as connecting elements and, for this purpose, each of the plates has two noses 8 which on different plates, are provided at different places, one nose 8 in each case being within the area of an input element and one nose 8 within the area of an output element. A guide hole 5 provided in the envelope 2 serves for the mechanical fixing of the identificant in the identificator.

The described exemplified embodiment of an identificant has major economical advantages. As a calculation shows, altogether one hundred different connecting elements are necessary with every ten input and output elements. In the case of the embodiment of an identificant illustrated in FIGS. 4 to 6 the number of the necessary different plates 7 is, for symmetrical reasons, reduced to twenty-five within an identification circuit. The plastic envelope 2 is appropriately designed in the form of a case with a cover which are welded together.

The scanning (pick-up) unit of the identificator is schematically illustrated in FIG. 7. It contains scanning (pick-up) pins 15 which are, in a well known manner, resiliently mounted and whose number and positioned corresponds to the identificant. A limit switch 9, which is actuated by the identificant when the latter is completely inserted into the identificator, causes, as in the case of similar devices, at first the insertion of the guide pin 10 into the guide hole 5 of the identificant and thus the fixing of the identificant, and subsequently the lifting of the scanning (pick-up) pins which make contact with the noses 8 of the plates 7 through the openings 3 of the identificant. Thus, two scanning (pick-up) pins 15 are in each case connected by one plate 7.

Twenty scanning (pick-up) pins 15 of the identificator are divided up into two groups of 10. One group of the scanning (pick-up) pins 15 which, in the circuit diagram of the identificator according to FIG. 8, has the numbers 60 to 69 leads to the same number of pulse generators 70 to 79. The other group of the scanning (pick-up) pins 15 which, in FIG. 8, has the numbers 80 to 89 leads to the same number of counters 90 to 99. The counters 90 to 99 may be designed as electromechanical counting decades for only one digit in each case and may be used either for the indication or for the printing of the result of the counting.

The pulse generators 70 to 79 of the identificator are supervised by a common control device not shown in FIG. 8. After the scanning (pick-up) pins 15 have been placed on the identificator, this control device effects the transmission of the pulse scheme illustrated in FIG. 9. At first the pulse generator 71 transmits one pulse, then the pulse generator 72 transmits two pulses, etc. until finally the pulse generator 70 transmits 10 pulses. These pulse currents are led via the scanning (pick-up) pins 60 to 69 and the identificant and applied to the counters 90 to 99, in an order prescribed by the identificant, via the scanning (pick-up) pins 80 to 89.

After the end of this operation, a 10-digit number is represented by the counters 90 to 99 in which number each digit is present only once. This number represents the identification number of the respective identificant and may be used for further processing.

A number of control devices is provided in the identificator which devices are designed to supervise the functioning of the identificator and the validity of the identificant. FIG. 10 shows the pulse continuity control of the identificator. The transistors 100 to 109 represent the output transistors of the pulse generators 70 to 79 of which, according to the foregoing, only one carries a current at the same time during the identifying operation. An OR gate, consisting of the diodes 110 to 119 and the resistor 11, is connected to the emitter leads of the output transistors 100 to 109. During each pulse transmitted by the pulse generators 70 to 79, a positive base potential is applied to the transistor 12 via this gate so that it is rendered conductive.

In a similar manner, the counter leads from the scanning (pick-up) pins 80 to 89 are connected to the transistor 13 by an OR gate formed of the diodes 120 to 129 and the resistor 14. Thus, the transistor 13 obtains a positive potential with each pulse coming in via the scanning (pick-up) pins 80 to 89, thereby being rendered non-conductive.

Consequently, if a pulse duly passes through the identificant, the transistor 12 is simultaneously rendered conductive and the transistor 13 is blocked so that the output potential at the terminal 16 remains unchanged. However, if, due to a disturbance, a pulse transmitted by a pulse generator is not received on any of the leads to the counter, a positive signal is produced at the terminal 16 which may be used for the purpose of giving alarm.

The same signal is also produced if an identificant of an external identification circuit is used because in this identificant, if the identification circuits are suitably fixed, at least one of the pulse currents produced in the identificant does not reach one of the scanning (pick-up) pins 80 to 89 but is led back to another of the scanning (pick-up) pins 60 to 69. Thus, in this case, too, the alarm is triggered and the "not admitted" identificant is recognized as such.

A simple control of the pulse generators as provided for in the identificator is illustrated in FIG. 11. The output lines of all pulse generators are led to a common counter 17 via decoupling diodes 130 to 139. This counter, which may be designed as an electromechanical or an electronic counter, is a counter module 55 which, after the end of an identifying operation in which a total of 55 pulses is transmitted by the pulse generators 70 to 79, is again in its original position. After the identifying operation, the counter 17 is interrogated by a control device, not shown in FIG. 11, and, when in its zero position, releases the identification as correct.

The great number of different identificants which are possible within one identification circuit will only rarely have to be utilized completely. Therefore, FIG. 12 shows a possibility of forming sub-groups of identificants within an identification circuit, which sub-groups have a common feature which can be recognized by the identificator. In order to be able to furnish a clear description of the method, it is assumed that a 10-digit number is assigned to each identificant, as already described. If a number of optional positions, e.g., four, is picked out of these 10 positions, e.g., the units place, the tens place, the hundreds place, and the thousands place, and if it prescribed that the sum of the digits at these four positions shall be divisible by a certain number, a group has been selected from the total number of the possible identificants of an identifaction circuit. Depending on the number of the used positions of the 10-digit identification number and the chosen devisor, the size of this group is very different. For example, with four selected positions and a devisor 3, a group of about 240.000 identificants is obtained. The checking in the identificator is carried out using a device according to FIG. 12. The input lines of the counters corresponding to the selected positions of the identification number are led via decoupling diodes 140 to 143 to a common counter 18 which, in the example, is a counter module 3. After the end of the identification operation, it is interrogated together with the counter 17 of FIG. 11 and releases the identification only if it is again in its original position.

This type of grouping of identifcants and thus of the formation of identification circuits has the advantage of being highly flexible. According to this method, as can easily be seen, a great many identification circuits may be formed which are very different in size and thus adapted to each application. Furthermore, this method has the advantage of being highly economical. The devices required in the identificators are few and, in addition to that, can be largely standardized.

The foregoing describes the principle of the new identificant and identificator, and that part of the identification system which is designed to protect against forgery, imitation and counterfeiting will now be described with the aid of two examples. FIGS. 13 through 19 illustrate the first example, and FIGS. 20 through 24 illustrate the second example. Although the description is restricted to the application of the invention in identifying systems, the invention may also be transferred to other equipment to be protected against imitation. Thus it is quite possible to protect identity cards or products of high value against imitation according to the principles of this invention.

FIG. 13 shows an identificant. The identificant contains a part 19 in which there is recorded information which may be read automatically by some physical method and serves for the identification. For easy handling, the identificant has a grip 6. Via a relatively thin neck 144, a head 145 is firmly connected with the identificant, which head contains a monolithic semiconductor circuit which is connected to the, e.g., four, connections 146. In its spatial structure, the head 145 is so designed as to offer just enough volume for the monolithic semiconductor block but by no means so much space that, for example, an equivalent circuit of the monolithic semiconductor block made of discrete separate components would fit in.

FIG. 14 shows schematically the devices of the identificator which are essential to the invention. The identificator contains an insertion opening 147 into which the identificant can be inserted, and, in the hollow space behind this insertion opening 147, a number of scanning elements 148, e.g., scanning pins, which serve to automatically read the information recorded in the identificant in the middle part 19. In a narrow extension 149 which serves for the reception of the head 145 of the identificant, there are a number of scanning elements, e.g., scanning pins 150, which connect the monolithic semiconductor block of the identificant with the circuit of the identificator via the connections 146.

Moreover, at the place at which the neck 144 of the identificant is located when the latter is inserted, there is an inductive switch 151 whose design is shown in detail in FIG. 15.

FIG. 15 shows a sectional view of the inductive switch 151. It consists of the two core halves 152 each of which carries a winding 153. The neck 144 of the identificant is between the middle legs of the core halves 152. The whole device is so small and, if necessary, arranged slideably with respect to its plane in such a matter that the two core halves 152, after the identificant has been inserted into the identificator, closely wrap around a neck 144. The two windings 153 effect, in a well known manner, the coupling of an oscillator whose oscillation is interrupted whenever there are metallic items in the neck 153 located between the core halves. Such inductive switches for detection of metallic items are known in many designs. The description of the corresponding circuit may therefore be dispensed with. With the aid of the inductive switch 151, it is thus possible to determine whether the neck 144 of the identificant is spotted with metallic conductors or not. This determination is important because, in the case of forgery, an equivalent circuit for the monolithic semiconductor block could be formed at a place other than in the head 145 of the identificant or even outside of the identificant and this equivalent circuit could be connected with the connections 146 by means of leads. The check with the aid of the inductive switch 151 makes such imitations impossible.

According to the application, there are a number of possibilities for the design of the control circuit of the monolithic semiconductor block. Some of these possibilities are shown in the following which, due to their simple and economical design or their incorporation into the identifying operation, are especially suitable for use in identifying systems.

A particularly simple control circuit is illustrated in FIG. 16. It consists of four zener diodes 154, 155, 156 and 157 connected in opposition in pairs. These zener diodes appropriately have different zener voltages. The semiconductor blocks formed of the zener diodes are similar for all identificants of one identification circuit and, consequently, also the corresponding checking devices in the identificators belonging to the same identification circuit. By means of different designs of the monolithic semiconductor blocks, e.g., by choosing different zener voltages, identification circuits may be formed whose identificants cannot be interchanged.

FIG. 17 illustrates schematically the test circuit of the identificator in cooperation with the control circuit of the identificant. In order to simplify the representation, mechanical switches and electromagnetic relays have been used in FIG. 17. The circuit principles may be transferred to the semiconductor technique without difficulty.

According to FIG. 17, the test circuit of the identificator is connected with the control circuit of the identificant via the scanning pins 158 and the connections 146. The test circuit has a change-over switch with three decks A, B, and C and four switch positions I to IV. In each of these four switch positions I to IV, certain potentials are applied to the control circuit by the decks A and B. In position I, the diode pair 154 and 155 obtains a negative voltage which is lower than the zener voltage of the diode 155. Consequently, the circuit through the relay 159 does not conduct current. At the same time, a negative potential is applied to the diode pair 156, 157 via the deck B, which negative potential is also lower than the zener voltage of the diode 157, i.e., does not cause a current in the circuit through the relay 160 either. Correspondingly, in the switch position II, positive voltages which are lower than the zener voltages of the diodes 154 and 156 are applied to the diode pairs and, consequently, do not cause any current to flow through the relays 159 and 160 either.

In the switch positions I and II, the potential zero V is applied to the operating contacts 161 and 171 of the relays 159 and 160. Since the circuits through the relays are not closed in either position, the contacts 161 and 171 remain open and the output terminal 163 of the test circuit is connected to the positive potential via the resistor 164.

In the positions III and IV, however, the diode pairs are supplied with voltages each of which exceeds the zener voltages of one diode and thus causes currents to flow through the relays 159 and 160. In the positions III and IV, the deck C of the change-over switch applies the potential zero V to the break-contacts 162 and 172 of the relays 159 and 160. Since, in the case of proper operation, the relays have picked-up, the positive potential at the output terminal 163 remains. If, however, the Zener voltage of only one of the four Zener diodes 154 to 157 does not correspond to the limiting values as employed by the identificator, the output terminal 163, at least in one switch position I to IV of at least one of the contacts 161 to 172, will receive the potential zero V, which may be processed for releasing an alarm.

Another type of embodiment of an identifying system which is protected against imitation, and which is particularly suitable for being used in cases where the identifying system already employs counting processes for the identifying purpose, is shown in FIG. 18. The monolithic semiconductor block which, by the terminals 165, 166, 167, and 168, via scanning pins 158, is connected to the identificator, contains an electronic counter 169. Such types of electronic counters, as regards their construction, are also known, perhaps in the form of monolithic semiconductor blocks, so that it may be desisted from representing this circuit.

Via the terminals **165** and **166** the counter **169** is supplied with the necessary supply voltage from the identificator. Via the terminal **167** the counter **169** receives from the pulse generator **170** of the identificator the pulses to be counted. These pulses are simultaneously fed to a control counter **173**. Both counters **169** and **173** are of identical construction and, therefore, count up to the same number before emitting a transmission pulse. The transmission pulses of the two counters **169** and **173** are fed to the exclusive OR-circuit **174** producing a signal at its output **175** when, and only when, only one of the two counters **169** or **173** transmits its transmission pulse.

As regards the numbers of pulses to be processed in the course of one counting period, the counters **173** in the identificator are in agreement within one identification circuit, hence all of them are counters of the module n . Within the same identification circuit, however, also the counters **169** has built into the identificants, must be of the module n type. When using a counter having a different counting volume, the alarm circuit will be caused to respond.

In this way it is possible, by differently selecting the number *n*, to form different identification circuits.

It is also possible to design the monolithic semiconductor block in such a way that it can perform at least part of the decoding with respect to identifying systems in which the message is detected in binary notation and requires that it be converted into decimal notation or into the decadic code. Solely by way of example; one such type of circuit, with a part of the associated evaluating circuit is shown in FIG. **19**. The identificant comprises five input terminals **176** to **180** of which each time only two, e.g., **176** and **178** are opened after the access by the scanning pins **181** of the identificator, whereas the remaining terminals **177** , **173**, and **180** are covered by layers of insulating material. By selecting the non-covered terminals the information leading to the identification is recorded within the identificant, here in the two-out-of-five code. The monolithic semiconductor block contains 10 diode gates **182** to **191** which are connected to the identificator by means of scanning pins and terminals. Each of the associated scanning pins of the identificator extends to a transistor switch. For the sake of simplicity only one of these switches is shown in FIG. **19**. The transistor switch **192** operates a relay **193** corresponding to the decadic representation of the recorded information. Upon inserting the identificant into the identificator, two of the scanning pins **181** serve to apply the potential zero V to the terminals **176** and **178**. In this way the output of the diode gate **183** which, up to now just like all other outputs of the diode gate, was lying at a positive potential, is brought to a potential zero V, and the transistor **192**, which was hitherto blocked, is rendered conductive. As a result of this the relay **193** is operated, and the identification is performed.

With respect to identifying systems with translation (assignment) there will result according to FIG. **20** a rather expensive, but very effective protection or safety device, by installing a monolithic semiconductor block. As is well known, in the case of an identificant operating with a translation (assignment), a number of input elements **194** is connected to the same number of output elements **195**, with the translation (assignment) being varied from identificant to identificant. Pursuant to the basic idea of this invention, the input terminals **194** are connected to the base electrodes of transistors arranged within a monolithic semiconductor block, with the emitters thereof, via a special input terminal **196**, being supplied with supply voltage from the identificator, whereas the collectors extend to the output elements **195**.

Known devices of this type employ in the identificator a number of pulse generators **197** and a corresponding number of counters **198**, in order to evaluate the information as provided by the translation (assignment). Since, in the known devices of this kind, the identificants establish a galvanic connection extending from their input terminals **194** to their output terminals **195**, this connection is established in the identificants according to FIG. **20** via the switching transistors **199**.

FIG. **21** shows a control circuit for identificants operating with translation (assignment), which is featured by a particularly low investment. The input terminals **194** of the identificant are led, via diode gates **200** in a monolithic semiconductor block, to the control output terminals **201**, extending in the identificator, via scanning pins, to the counters **202**. In this circuit the generators **197**, as already described hereinbefore, transmit pulse currents with different pulse numbers successively, so that in the circuit according to FIG. **21**, at the control terminals **201**, there will result pulse currents in which the number of pulses are the sums of the number of pulses of the connected generators. The correctness of these sums in the identificator is supervised by the counters **202**. Since to the input terminals **194** within one identification circuit, and from the identificator, there are always applied or arranged the same generators **197**, in the case of a constant construction of the monolithic semiconductor block including the diode gates **200**, the counting result as appearing at the counters **202** is the same with respect to all identificants belonging to or forming part of one identifications circuit. If, as is not expressly shown in FIG. **21**, the diode gates **200** or a part thereof, are connected to the output terminals of the identificant, there will result restricting descriptions with respect to the possible translations (assignments) within the identificant, which may be used in connection with the forming of the identification circuits.

The already described circuit, in which pulse generators **197** transmit pulse currents having different numbers of pulses, is varied in this case in such a way that these circuits exist in the form of a monolithic semiconductor-block in the respective identificants.

Independently of the specific mode of operation of the control circuit which is composed or built up on the monolithic semiconductor block as accommodated in the identificant, the protection against imitation of the identificants according to the present invention is still increased in that monolithic semiconductor blocks require extremely expensive manufacturing facilities and, therefore, will only be manufactured, if at all, by a relatively small number of manufacturers. The further type of embodiments to be described hereinafter, avoids the galvanic connections as used in the examples described herein before as a protection against imitation.

In FIGS. **22** and **23** there is shown the nose portion of the identificant. The base body **203** of the identificant is followed by a rotation—symmetrical relatively thin neck portion **204** which is completely free from metallic or other conducting insertions. The neck portion **204** carries the head portion **205** in which the protective element **206** is built. This protective element is a monolithic chip on which, in the manner known per se, there is deposited a number of semiconductor configurations. The protective element **206** is pressed between two plan-parallel glass plates **207** and is accomodated, in common therewith, in a bore hole **208** provided in the head portion **205**. The head portion **205** has a square cross-section and carries on the two surfaces which are not traversed by the bore hole, two metal coatings **209** which, via the wire terminals **210**, are connected to the protective element **206**.

During the checking operation, i.e., when the identificant is positioned in the identificator, the two test rods **211** are inserted into the bore hole **208** in the direction as indicated by the arrows. The test rods **211** are traversed by light conductors whose cut ends rest at the plan-parallel glass plates **207** and are in this way aligned exactly in relation to the protective element **206** and the semiconductor configurations as arranged thereon. For the sake of clarity the light conductors as well as the subsequently following light transmitters or light receivers respectively have not been shown.

The protective element contains on its top side a number, for example, five photo-electric diodes **212**, as is shown in FIG. **24** and, on its bottom side a number, for example, of two Gallium-arsenid diodes **213**, as is shown in FIG. **25**.

Moreover, as may be seen from FIG. **26**, it contains two transistors **214**, as well as two resistors **215**. In FIG. **26** there will be still recognized the two metalic coatings **209**.

In practical embodiments, and in accordance with the present state of miniaturization, substantially greater numbers of photo-electric diodes **212**, gallium-arsenide diodes **213**, and other semiconductors devices can be accommodated on the protective element, and in the same way a correspondingly larger number of light conductors can be accommodated in the two test rods **211**.

Upon inserting the identificant into the identificator, corresponding metallic abutting surfaces which are coated with a layer of isolating material, of the identificator, will meet against the metallic surfaces **209** of the identificant. The representation of these abutting surfaces has been omitted. Via the capacitances which are formed in this way, there is derived from the identificator a strong high-frequency alternating current, which, as may be seen from FIG. **26**, flows between the metallic surfaces **209** across the resistor **215**.

The five photo-electric diodes **212**, as may be seen from FIG. **26**, are subdivided into two groups **212a** and **212b**. All of the photo-electric diodes are un-illuminated, hence both transistors **214** are blocked. In this condition the high-frequency alternating current flows between the plates **209** also via the gallium-arsenide diode **213** forming part of group **212*b***, and the associated resistor **215**, because the transistor **214** belonging thereto is blocked. The gallium-arsenide diode **215** is lit up, and the light current is transmitted via a light conductor into the evaluating device of the identificant, where the current is controlled (checked).

If now the group **212*a*** of the photo-electric diodes is illuminated via the associated light conductors, the associated transistor **214** becomes unblocked, and the associated gallium-arsenide diode **213** is likewise lit up; also this illumination or lighting-up is transmitted via light conductors to the evaluating device.

If, however, there is illuminated the group **212*b*** of the photo-electric diodes, the associated transistor **214** is unblocked and the associated gallium-arsenide diode **213** is extinguished. This extinction is also transmitted via light conductors, for being evaluated in the identificator.

From the foregoing it will be easily understood, that, especially in the case of greater numbers of electro-optical semiconductor elements or devices, a plurality of checking operations and numerous combinations can be used. In FIG. **26**, for the sake of simplicity, the circuit has been greatly simplified. A more reliable operation of this circuit can be reached by generating, from the applied high-frequency voltage, a DC voltage inside the identificant, which can bee easily accomplished with known means. In this particular case, the greatly simplified gate functions, as shown in FIG. **26**, can be realized with the aid of the well known means of integrated circuit engineering.

Also the form of the protective element, and the way in which it is arranged in the head portion **205**, can be greatly varied without deviating from the basic idea of the invention. In particular, it is possible to arrange the photo-electric diodes **212** and the gallium-arsenide diodes **213** on the same side of the protective element **206**, so that only one of the test rods **211** needs to be provided with light conductors (fiber optics).

In the following there will now be described, by way of example, various ways of translation, i.e., FIGS. **27** to **31** show an identificant employing a translation with the aid of transformers, FIGS. **33** to **37** show an identificant employing conductive translation, FIGS. **38** to **41** show an identificant employing capacitive translation, and FIGS. **42** to **45** shown an identificant employing the optical translation.

The identificant illustrated in FIG. **27** is a profiled plastic structure resembling the shape of a key, consisting of the handle portion **6**, the key-neck portion **216**, and the scanning portion **217**. The scanning portion **217** comprises the scanning points **218**. From the handle portion **6** via the key-neck portion **216** two guiding portions **219** extend up to the point end of the scanning portion **217**, serving to stiffen the plastics body and, at the same time, to assure that it is inserted in the proper position into the identificator.

One cross-sectional view taken through the identificant is shown in FIG. **28**, in which there are clearly recognizable two cut-through coils **220** which are embodied into the plastics body. Moreover, it will be recognized that the scanning points **218** are lying inside the coils **220**, and are featured by a particularly small thickness of the plastics body. The coils **220**, as is shown in FIG. **29**, are self-supporting coils, which are bound without a coil support or body, and which are connected to one another by a connecting lead **221**, which, preferably, is of twisted type.

In the embodiment according to FIG. **27** the identificant is provided altogether with twenty scanning points **218**. If, in accordance with the representation of FIG. **29**, each time two coils **220** are connected to one another by a connecting lead **221**, a total of 10 such coil pairs can be accommodated in the identificant according to FIG. **27**. The two coils **220** belonging to one pair do not necessarily need to have the same number of turns. During the identification operation, these two coils have different tasks, because one serves as a receiver coil, and the other one as a transmitter coil. The distribution of the coil pairs according to FIG. **29** to the scanning points **218** of the identificant may be effected in a very great variety of ways. As always in translation systems, however, the position of both the transmitting poonts and of the receiving points in the identificator is fixed, so that within one identification circuit serving all identificants, there are fixed the positions for the transmitting coils on one hand and for the receiving coils on the other hand. Therefore, only within one identification circuit it is possible to identify all identificants by all identificators. If, instead, there is used an identificant of an alien identificator circuit, hence in which the assignment of the scanning points **218** to the transmitting coils on one hand, and to the receiving coils on the other hand, is different than the described one, this particular identificant can not be identified by the identificators of the identification circuit. It may, however, be recognized as being non-associative and may be illuminated or rejected.

The electrical connection of the coils **220** does not need to be carried out absolutely in accordance with FIG. **29** in a pairwise fashion; in fact identificants are conceivable in which several receiver coils are connected to one transmitter coil, or vice versa.

The identifcants are manufactured in a manner such that, into a plastics mold for manufacturing the plastics body according to the FIG. **27**, there are inserted the coil pairs, with the connecting wires **221** being irregularly placed in the remaining free space, in particular in the space provided for the guiding strap portions **219**. After the insertion of the coil pairs, the remaining hollow space is filled with a plastics compound, and the plastics body according to FIG. **27** is manufactured in the usual way by the application of pressure and heat.

The identificator contains a scanner according to FIG. **30**. This scanner consists of a movable yoke portion **221**, a fixed yoke portion **222**, and a yoke wall **223** establishing the magnetic circuit between these two yoke portions. Both of the yoke portions **221** and **222** are provided with cores **224** which are shown partly in a sectional and partly in a flat view because they are disposed in a spacially staggered fashion.

The cores **224** of the fixed yoke portion **222** are designed to carry windings **225**, which are used partly as transmitting windings and partly as receiver windings and, if necessary, they have correspondingly different number of turns. In FIG. **30** there are shown two winding **225** in both a sectional and a flat view, depending on their spacial positions.

The identificant is inserted by hand into the scanning device according to FIG. **30**, and is guided with the aid of not shown guiding devices. By likewise not shown automatic arrangements, the movable yoke portions **221**, subsequently to the insertion of the identificant, is lowered in the direction as indicated by the arrow, towards the fixed yoke portion **222**, until the cores 224 almost touch each other, and are only separated by the plastics layer of the identificant which is particularly thin at the scanning points 218. In this way there is provided for each winding 225 a magnetic circuit which is completed via the cores 224, the yoke portions 221 and 222, as well as via the yoke wall 223.

In FIG. 31 there is shown, by way of example, the circuit of an identificator. One portion of the windings 225 serves as the transmitter winding 225*a*, and another portion of the windings 225 serves as the receiver winding 225*b*. The transmitter windings 225*a*, as is shown with respect to such a winding in FIG. 31, are connected to a generator 226 preferably transmitting modulated pulses. The receiver windings 225*b*, as is shown in FIG. 31 with respect to a receiver winding, are connected to detectors 227 permitting to receive preferable modulated pulses, to amplify them and, if necessary, to identify the same. The aforementioned closed magnetic circuits are shown in FIG. 31 in the form of cores 222*a* and 224*a*. These cores 222*a* and 224*a* not only traverse the transmitter windings 225*a* and the receiver windings 225*b*, but also the windings 220 of the identificant of which, in this case, there is shown one pair serving as receiving winding 220*a* and the transmitting winding 220*b*.

The generator 226, with the aid of the transmitting windings 225*a*, produces in the core 222*a* an alternating magnetic field, and, on account of this, in the receiving winding 220*a* a corresponding alternating current. This alternating current is supplied via a galvanic connection 221, to the transmitting winding 220*b* likewise lying in the identificant, with this transmitting winding 220*b*, in turn, inducing an alternating magnetic field in the core 224*a*. This alternating magnetic field produces in the receiver winding 225*b* an AC voltage which is finally applied to the detectors 227, where it is further processed.

The information as transmitted by the generators 226 via the different transmitter coils 225*a*, for example, may consist in that in the transmitter coils 225*a* there will flow successively pulse currents consisting of modulated pulses with different pulse rates. If, for example, ten such transmitter windings 225*a* are contained in the identificator, the first one may receive one, the second two, etc., and the tenth 10 modulated pulses.

Via the coil pairs 220*a* 220*b* these pulse currents are transmitted to the receiver coils 225*b*. Since now the identificants according to FIG. 27 differ from one another by the different translation (assignment) of the scanning points 218 for transmitting and receiving coils, hence by the different positions of the coil pairs according to FIG. 29, the various pulse currents of the generator 226, depending on the respective identificants, meet upon different detectors 227. In this way it is possible to evaluate the information as recorded in the identificants.

The evaluating and safety or protection circuits as used in the already described arrangements and forming the identification in accordance with the translation principle, can be easily adapted to the arrangement as described.

One variation of the inductive translation (assignment) will result when using an identificant comprising a number of holes 228 (FIG. 32) in its main portion. In FIG. 32 there are shown 20 holes 228 which are arranged in a pairwise fashion.

FIG. 33 shows a cross-sectional view taken through the identificant, in which the cross-sectional areas (surfaces of interception) are hatchlined in different directions for the sake of enabling a better understanding. The plastics body of the identificant, as shown in FIG. 33, consists of a top portion 229 and a bottom portion 230 acting as the cover, with these two portions being joined to one another by way of cementing (glueing) or welding. In the top portion 229 there is embossed a nose for a protecting portion, and the holes 228 are designed as passages 231. The bottom portion 230 is a flat form-locking cover, completely covering the top portion 229 and likewise provided with openings only at the locations of the holes 228. Around the passages 231 there are placed the cores 232 of magnetic material which are fixed in their respective positions by the passages 231. The cores are provided with windings not shown in FIG. 33; these windings are connected to one another by means of the leads 233. These leads 233 are accommodated irregularly, without any kind of order, in the hollow space formed below the nose or protecting portion.

Connecting the windings of the cores 232 may be effected in very different ways. Different numbers of windings of different cores may be connected either in series or in parallel. Preferably, however, there will be used the arrangement as shown in FIG. 34. In this arrangement two cores 232 are connected to respective windings 234, and these two windings are connected together by means of a two-wire connecting lead 235 to form one common circuit. The cores 232 preferably consist of a magnetically soft material which is suitable for transmitting higher frequencies. Arrangements as shown in FIG. 34, for manufacturing the identificants according to FIG. 32, may already be prefabricated without having to consider the specific construction of a particular type of identificant.

One specific identificant differs from other identificants in that it comprises other connections among the 20 holes 228 than those provided for the other identificants. The specified information, as described for the respective identificant, is established in that core pairs according to FIG. 34 are inserted or embodied in the top portion 229 in such a way that each time one pair of cores with its two cores 232, is associated with the two holes 228 for which there exists a prescribed connection. In so doing it is not necessary that, for example, of each core pair, one core 232 is brought into one row, and the other core 232 into the other row, of holes 228 in FIG. 32, but the two cores 232 of one core pair may actually be positioned in the same row of holes 228, since also the arrangement of the holes 228 in the identificant is not at all bound to the arrangement as shown in FIG. 32. The insertion of the cores 232 is effected in such a way that they are positioned over the passages 231, and the connecting leads 235 without any visible order, are accommodated in the collective space as formed below the nose or protective portion. Accordingly, for an identificant according to FIG. 32 there is required a total of ten core pairs in order to fill all holes 228 with cores. Subsequently to the insertion of the cores 232 in the top portion 223 the latter, for the purpose of increasing the safety factor, and for the purpose of rendering more difficult an examination by unauthorized persons, is completely sealed with a sealing compound and is thereafter closed by the bottom portion 232.

FIG. 35 shows another possibility for connecting the windings 234. In this case the connecting lead 235, extending between the cores 232, only consists of one wire, whereas one end of each winding 234 is connected to one main connecting lead 236 which is common to all core pairs. This main connecting lead 236 may be firmly arranged, for example, in the space formed in the top portion 229 by the nose or protecting portion.

The identificator comprises a number of scanning (sensing) pins 237 corresponding to the number of holes in the identificant, with these pins being mounted in a movable support 238, and of which one is shown in FIG. 36. Here, in the identification process, the scanning pins 237 are displaced by the movable support 238 and project through the holes 228 of the identificant, until coming into contact with the contact bushings 240 arranged in the fixed support 239.

The identificator circuit is shown in FIG. 37. Half the number of all scanning pins 237, and likewise half the number of all contact bushings 240 are connected to one pulse generator which is switched off by a not shown control means, as soon as the scanning pins 237 have established contact with the contact bushings 240. Via the various circuits completed by both the scanning pins 237 and the contact bushings 240, the pulse generator 241 produces different currents. Since these circuits, as is shown in FIG. 36, extend through the cores 232 of the identificant, magnetic fluxes are induced in the cores 232 of the identificant.

Now the scanning pins **237** with the associated contact bushings **240** of the identificator are selected in such a way as to be associated respectively with one of the two cores **232** of the pair of cores shown in FIG. **34**, whereas the scanning pins **237***a* with the associated contact bushings **240***a* are selected in such a way as to belong to the respective other core **232** of the pair of cores shown in FIG. **34**. Together with the contact bushings **240***a*, the scanning pins **237***a* serve to complete circuits extending via amplifiers, for example, to counters **242**. In FIG. **37** the amplifiers are symbolically indicated by the transistors **243**. As a rule, one transistor stage will not be sufficient for amplifying the signals. In addition thereto, and with respect to the case where the counters **242** are of the electromagnetic type, it will be necessary to extend the pulses, which may be effected with the aid of known arrangements.

The information as transmitted by the generator **241** via the various lines, for example, may consist in that pulse currents of different pulse rates or pulse numbers are produced on the lines. The circuit portions as constituted by the scanning pins **237** act like primary windings in the cores **232**, and generate in the windings **234** secundary currents, which, via the connecting leads **235**, also flow in the winding **234** of the second core **232** of the core pair according to FIG. **34**, thus causing magnetic fluxes in this second core **232**. These magnetic fluxes, in turn, generate in the circuit portions, as constituted by the scanning pins **237***a*, secondary currents which, via the amplifiers **243**, are fed to the counters **242**. Accordingly, after the performed identification, the counters **242** will indicate the number of pulses as applied thereto. The number of pulses as supplied by the generator **241** to the scanning pins **237** is constant per scanning pin **237**, within one circuit of identificators. The translation (assignment) of these pulse currents to the scanning pins **237***a*, however, is effected differently with respect to each identificant in accordance with the translation information as recorded therein. For example, if the pulse currents as transmitted by the pulse generator **241** to its 10 output lines and, consequently, to the ten scanning pins **237**, consist of zero, one, two, three, four, five, six, seven, eight, nine pulses then, after they have performed identification, the counters **242** will contain the digits zero to nine in an order of succession corresponding to the information as stored in the identificant.

Besides differing by the number of pulses, the pulse currents, as transmitted by the pulse generator **241**, may also differ from one another by other features, for example, by the different lengths of the pulses or by different type intervals between the pulses, respectively. Accordingly, the counters **242** may be replaced at the receiving end by corresponding electronic or relay combinations which are suitable for identifying such different pulse currents. Thus, for example, it is possible, instead of the pulse generator **241**, to use an AC generator with ten different frequencies, and to use, instead of the counters **242**, either electronic or electro-mechanical frequency relays with subsequently arranged indicators.

It hss already been pointed out that the translation (assignment) of the holes **228** and, consequently, of the scanning pins **237**, to the transmitting or receiving end of the identificator does not need to be rigid. In this way it is possible to form identification circuits within which all identificants and identificators have the same translations (assignment) to the transmitting or the receiving end respectively, in which case, with the aid of relatively simple testing possibilities, it can be detected if an identificant is being used in an identification circuit to which it is not permitted.

In addition to the plastics skin **247** of the identificant, also the scanning electrodes **248** may be covered by a plastics skin or film, which has not been shown in particular. If so required, the plastics skin or film **247** on the identificant may also be omitted.

Each two electrodes **246** of the identificator are connected with one another by a metal lead **249** extending in the inside of the plastics body **1**. This connection does not need to extend between oppositely arranged electrodes **246**, as shown in FIG. **40** for the sake of simplicity or for enabling a better understanding, but may connect any arbitrary electrodes **246** with one another within certain limits in accordance with the translation principle as described herein before. These leads are arranged in such a way within the plastics body **244** as to have no galvanic (metallic) connection among each other, and also only have very small leakage capacitances.

In FIG. **41** there is shown a block diagram relating to the circuit of the identificator which, together with the earlier explanations, serves to explain the function of the identificator. The transmission pulses as mentioned already hereinbefore are fed, via the modulation input **250**, to a high-frequency transmitter **251**, which is modulated by these pulses. The modulated pulses are fed to a scanning (sensing) electrode **248**. Half the number of the scanning electrodes **248** is equipped with such high-frequency transmitting arrangements. The other half of the scanning electrodes **248** is fed to a resonance amplifier **252** for the frequency as generated by the transmitters **251**. Following a rectification, as symbolically indicated in FIG. **41**, the pulse will again be available at the output terminal **253**.

The evaluation of the pulses is effected in exactly the same way as in the other processes or operations als already described hereinbefore.

In the type of embodiment to be described hereinafter, there is used an identifying system employing a capacitive translation (assignment). In the identificant according to FIG. **38**, comprising the plastics body **244**, the handle portion **6**, and the point end **245**, a number of electrodes **246** are laid in on the surface. The shape of the electrodes **246**, as chosen in FIG. **38**, as well as the arrangement thereof is only given by way of example; it is equally well possible to choose shapes and arrangements other than those shown herein.

It may be seen from FIG. **39** that the electrodes **246** are arranged closely below the surface of the plastics body **244**. This is done in order to achieve as large as possible capacitances between the scanning arrangement and the electrodes **246**.

FIG. **40** shows a cross-section taken through the identificant. The two electrodes **246**, which are recognizable in this representation, lie closely below the surface of the plastics body **244**, which, on the surface equipped with electrodes **246**, is appropriately covered by a thin resistive film of plastics **247**.

The identificator comprises a number of scanning electrodes **248** corresponding to the number of electrodes **246**, and of which two are shown in FIG. **40**. These scanning electrodes **248**, in a manner not shown in greater detail, and subsequently to the insertion of the identificant into the identificator, are brought into an intimate connection with the electrodes **246** associated therewith, thus establishing a capacitive connection therewith.

The identifying switch may also be equipped with an optical translation (assignment) as will be described hereinafter; relative thereto there is also shown an evaluating circuit other than the one already explained hereinbefore.

The identificant according to FIG. **42** again consists of a plastics body which is evenly designed at the narrow sides, and which is bulgingly designed at the top and bottom sides. At the narrow boundary surfaces fiber optics **254** are designed to terminate, of which in FIG. **42** four are shown in full length, whereas of the remaining ones there are only shown the beginnings and the end pieces. It is not necessary for the fiber optics, as shown in FIG. **42**, to extend from one narrow boundary surface to the other boundary surfaces, in fact both ends of the fiber optics may end in the same boundary surface of the identificant.

The arrangement as chosen in FIG. **42**, however, offers constructional advantages with respect to the identificator. The use of this type of embodiment of the identificant can be easily derived from the examples as already described hereinbefore; each time one side of the fiber optics is acted upon by pulsating light, the respective other side of the fiber optics direct the pulsating light current to photo-sensitive elements to which, via corresponding amplifiers, the evaluating circuit is connected. The use of the optical translation (assignment), however, permits to employ at the transmitting end a somewhat simpler, substantially mecanical evaluating arrangement. This arrangement as shown in FIG. **43** and **44**, consists of a slotted disk **255** which is arranged capable of being rotated about a pivot **256**. Above the slotted disk **255**, as symbolically represented in FIG. **42**, there is arranged an illuminating arrangement, such as a glow lamp or an illuminated gap, or corresponding optical system.

The slotted disk comprises a slot **258**, and is otherwise not transparent. The shape of slot **258** is so chosen thus that, in the case of uniform movement of the slotted disk **255** in the direction as indicated by the arrow **257**, all inputs of the fiber optics **254** of the identificant are illuminated successively, e.g., at equal time intervals.

The light pulses, as emerging from the respective other ends of the fiber optics **254**, are conducted by the fiber optics **259** of the identificator, of which only two are shown in FIG. **43**, to respective single photo-electric cells **260**.

The slotted disk **255** may also be provided with a slot arrangement other than the slot **258** as shown in FIG. **43**. Thus, it is possible to supply the individual ends of the fiber optics **254**, for example, successively with a number of different light pulses, by providing the slotted disk **255** with concentric rows of variable numbers of slots.

A particularly suitable evaluating circuit for the described arrangement is shown in FIG. **44**. In this circuit there is provided a number of photo-electric cells **260** corresponding to the number of fiber optics **254** of the identificant. Each of these photo-electric cells **260** is energized by one fiber optics **259** of the identificator. The energization of the photo-electric cells **260** is determined in its timely order of succession by the translation (assignment) chosen in the respective identificant, i.e., by the identification number.

The pulses as transmitted by the photo-electric cells **260**, after having been amplified in the amplifiers **261**, are fed to a matrix **262**, which, in the manner known per se, forwards the pulses arriving on the rows, via diode arrangements consisting of diodes **263** corresponding to the chosen code, and arranged at the crosspoints of the matrix, to selected columns of the matrix **262**.

The columns of the matrix **262** are simultaneously the columns of the matrix **264** and correspond in their number to the desired coding. All crosspoints of the matrix **264** are provided with storage elements **265**, such as ring cores, and the storage elements **265** themselves are designed in the known way in such a manner that, for the storing of one bit, both input leads of the storage element **265** must be energized.

The row leads of the matrix **264** extend to a change-over switch **266** which, via not shown mecanical connections, is moved synchroniously with the slotted disk **255**, i.e., in such a manner that, each time when one of the fiber optics **254** of the identificant is being illuminated by the slot **258**, it will assume one switching position.

The mode of operation of the arrangement will now be explained with reference to an example. At the beginning of the movement of the slotted disk **255**, the fiber optics **254*a*** is illuminated through the gap or slot **258**. The light pulse emerges at the end of the fiber optics **254*a***, and is forwarded to the row **267** via the corresponding photo-electric cell and the amplifier. The row **267** of the matrix **262** is connected via the diodes **263**, to two columns of the two matrices **262** and **264**. Upon commencement of the movement of the slotted disk **255**, the switch **266** activates the first row of the matrix **264**, so that now the storage elements **265** are activated, and the signals as arriving via the diodes **263**, are stored into the two storage cells **265** as lying on the left hand side of the matrix **264**.

In the course of this operation the signal, as fixed by a diode configuration of the third row of the matrix **262**, has been stored into the first row of the matrix **264**.

The special advantage of this identificant results from the simple construction, the omission of galvanic (metallic) connections and the use of inexpensive mechanical means in the identificator.

Furthermore, there is described an identifying system which, as a means of protection against imitation, operates with an index number. This index number is set in the identificant prior to the use of the identificator, so that no delays will be caused during the actual identification. Subsequently to its use, the index number is erased (cancelled) again in the identificant.

FIG. **45** shows the top view of an identificant comprising three adjusting or setting rollers. For the sake of clarity, those parts of the identificant enabling the actual identification, and also any possible devices which are intended to safeguard a protection against forgery of the identificant, have been omitted.

The base body of the identificant carries a number, for example three setting rollers **268** which are seated on one common shaft, with the diameter of the rolers being somewhat greater than the thickness of the base body, so that they can be conveniently adjusted or set by the thumb or forefinger of one hand.

FIG. **46** shows the embodiment of a setting roler **268** with reference to a schematical enlarged cross-sectional view taken through the point end of the identificant, in greater detail. The setting roller **268** rotates about the shaft **269** which is common to all of the setting rollers **268**, with this shaft, in a not shown manner, being anchored in the base body. The setting rollers **268** are provided with a number of engaging holes **270** which are intended to be engaged by an engaging ball **271** which is acted upon by a swing **272**. Both the engaging ball **271** and the spring **272** are accommodated in a hollow space (borehole) provided in the base body. On their top sides, the setting rollers **268** are provided with digits, letters or other symbols, serving as references during the setting operations. The engaging holes **270** are designed to be of uniform depth, with the exception of one engaging recess **273** which is of a flatter design without afecting the actual engaging process in cooperation with the engaging ball **271**.

FIG. **47** schematically shows a cross-section taken through the introduction opening of the identificator. The identificant is inserted or introduced into the identificator in the direction as indicated by the arrow **274**, this opening introduction again being separately shown in FIG. **48**. The hole of introduction, as regards its contour, corresponds to that of the identificant, in particular, there will be clearly recognized the three inlet openings **275** for the three setting rollers **268**.

Beneath the three inlet openings **275** there are positioned the setting slides **276** which are provided the pointed teeth **277**, and are retained at normal by a tension spring **278** which is shown in FIG. **47**. These setting slides **276** each carry one contact bridge **279** to which there is fixed a bridge contact **280**. These bridge contacts **280** slide over contact arrangements consisting of a contact rail **281** and of individual contacts **282**. The contact rail **281** and the individual contacts **282** are mounted in the well known manner, for example, by way of etching a contactor board, to the contact base **283** of insulating material. The contact base **283** itself is mounted to the housing. Upon moving the setting slide **276**, the bridge contact **280** will successively connect the individual contacts **282** to the contact rail **281**.

Upon inserting the identificant into the identificator in the direction as indicated by the arrow **274**, there are first of all turned the setting rollers **268** which is due to the teeth **277** engaging with the engaging holes **270**. The setting slides **276** remain at normal, because the tension of spring **278** is sufficient for overcoming the engaging torque of the engaging ball **271**.

In the course of the rotation of the setting rollers **268**, the engaging hole or recess **273**, which is of a flatter design than the remaining engaging holes **271**, will finally enter the range of the teeth **277**, thus preventing the further rotation of the setting rollers **268**. From this moment on, the associated setting slide **276** will be taken along in the direction of insertion, in opposition to the force of spring **278**.

As will easily result from the foregoing, the length of path, by which the setting slide **276** is being taken along, is dependent upon the position of the engaging hole for the recess **273**, hence of the setting rollers **268**, as assumed at the beginning of the process of insertion or introduction. Upon termination of this process the identificant is retained and fixed inside the identificator with the aid of not shown means. The switches consisting of the individual contacts **282**, of the contact rail **281**, and of the bridge contacts **280** assume a defined position which is dependent upon the position of the setting rollers prior to the process of insertion or introduction, thus reporting in this way the set index number. Upon termination of the process as linked to the identification, the identificant is released by the aforementioned means and, at the same time, with the aid of likewise not shown means, the setting slides **276** are lowered, so that the setting rollers **268**, when removing the identificant from the identificator, will not be turned, but will in fact remain in the normal position which is common to all the setting rollers **268**.

FIG. **49** shows the evaluating circuit of the identificator in a symbolic representation. The multiple switches which are constituted by the bridge contact **280**, the contact rail **281**, and the individual contacts **281**, and the individual contacts **282**, are symbolized by three rotary switches **284**. The output leads of these switches extend to a comparator **285** for comparing the offered information with an electronically stored translation (assignment) list **286**. At the same time, via the input **287**, the identification number of the identificant, as obtained in the manner described hereinbefore, is fed to the translation (assignment) list **286**, thus simultaneously releasing the search process, by which there is performed the selection of the proper index number via the translation (assignment) list. If the index number as offered by the switches **284** is in agreement with the index number as offered by the translation (assignment) list **286**, the comparator **285**, at its output **288**, will release the process which is associated with the identification. In case these index numbers are not in agreement, the comparator **285** will cause the releasing of an alarm, which, for example, may also include steps and measures for protecting the identificant from being removed.

From FIG. **49**, moreover, it may be seen that, to the output leads of the switches **284**, there is connected an evaluating circuit **289** with an associated translation (assignment) list **290**. This arrangement becomes necessary in cases where two index numbers are allotted to one identification number. This can be used, for example, in the case of unauthorized use of a stolen identificant, when the unauthorized holder of the identificant was able to find out the second index number and deems it to be the correct index number, and in which case, in spite of the non-coincidence or non-agreement of the first index number, there is not released an alarm in the sense as described hereinbefore, but a so-called "silent alarm," during which the process is performed in the normal way, but a prosecution of the illegal holder of the identificant is instituted.

What is claimed is:

1. An identifying system, operating upon a translation logic, comprising, in combination, a plurality of identificants serving as the information-bearing recording media, and each including input elements and output elements; and an identificator cooperable with said identificants to evaluate the respective information thereon; said identificants being substantially identical in appearance, construction and form; the input elements being positioned at the same respective locations on each identificant, and the output elements being positioned at the same respective locations on each identificant, and which differ from the input element locations; connecting elements on at least certain of said identificants each connecting at least one input element to at least one output element in accordance with the respective information to be translated by each identificant; said identificator including a number of transmitters equal to the number of input elements on each identificant and connected to the respective input elements responsive to connection of an identificant to said identificator; said identificator further including a number of receivers equal to the number of output elements on each identificant and connected to the respective output elements responsive to connection of an identificant to said identificator; whereby, upon connection of an identificant to said identificator, signals are transmitted from said transmitters to said receivers in accordance with the connections between input and output elements of the connected identificant; and control circuit means included in said identificator and connected to said receivers, said control circuit means, responsive to said signals, detecting the authorized use of a connected identificant; said transmitters being pulse generators operable, in a predetermined sequence, to transmit pulse currents; each pulse generator transmitting a respective fixed number of pulses differing from the respective fixed number of pulses of each other pulse generator; said receivers being counters providing a counting result.

2. An identifying system, as claimed in claim **1**, in which said transmitters are pulse generators operable, in a predetermined sequence, to transmit pulse currents; each pulse generator transmitting a respective fixed number of pulses differing from the respective fixed number of pulses of each other pulse generator.

3. An identifying system, as claimed in claim **1**, in which said input elements and said output elements are identical in construction and design so that said elements are capable of interchangeable use as input elements and output elements.

4. An identifying system, as claimed in claim **1**, in which said identificants are flat envelopes of plastic composition material formed with openings constituting said input elements and said output elements; said connecting elements comprising electrically isolated electrically conductive plates sandwiched in said envelopes; each connecting element having a planar contour such as to connect only one respective input element to one respective output element; said identificator including a plurality of electrically conductive scanning pins corresponding to the number of input and output elements of each identificant.

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