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I-20122 Milano (IT)(54) **Holographic security locking device.**

(57) It is disclosed a security device (4,6) for lockin, in a manner that can be opened, generic leaves. The device comprises a hologram (45) wherein informations are recorded and which is formed on a portable support (41,61), an opto-electronic reader of said hologram for comparing said informations with identification informations stored in the reader, and means for locking/unlocking the leaf (1) controlled by the reader. The leaf (1) locking means are operated after the reader has read the hologram (45) and compared the informations recorded thereon with the identification informations stored in the reader itself. Since the parameters used for recording the hologram (45) can be many and widely varying ones, the informations contained therein are the result of a large number of combinations which make them virtually impossible to duplicate and decode.

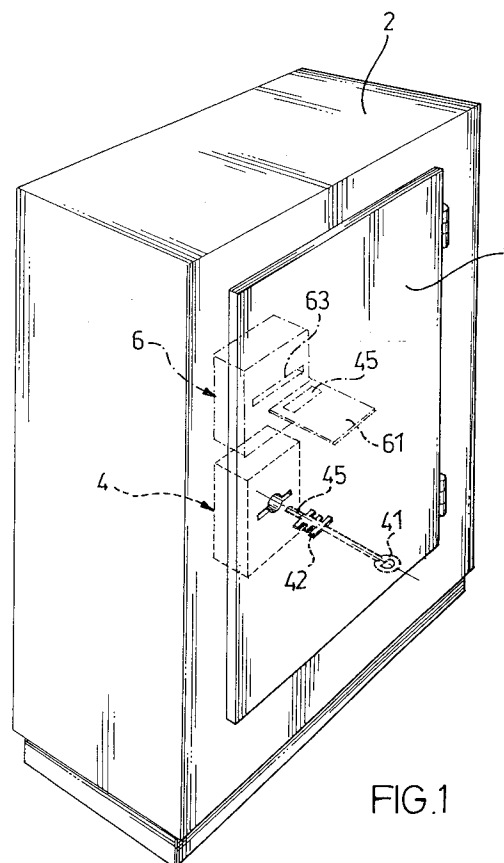


FIG.1

EP 0 623 722 A1

This invention relates to a security device for locking, in a manner that can be opened, generic leaves.

Before further proceeding in this description, it is convenient to specify that the word optronics as used herein refers to a technical field jointly involving optics and electronics; in particular, with the attribute deriving from this word, which is used especially by persons skilled in the art, there will be defined those devices, apparatuses, instruments, etc. whose operation is based on applications of optics and electronics principles.

A known example of such applications is holography; this application may be considered basically as a technique of recording on a plate or another support, and of later reproducing as well, generally luminous waves of the coherent monochromatic type (laser beam). This technique enables, for instance, the characteristic reproduction of objects with three-dimensional effects.

Coming now back to the field of application of the preferred invention, namely to security devices for doors and generic leaves, it should be pointed out that, although many technological innovations have been made, the solutions currently available on the market are not fully satisfactory.

For instance, among the latest innovations in this field are locks operated by anti-duplication keys, intended especially for safes and armoured cabinets; such keys usually have conventional shapes and have a set of permanent magnets are embedded in their bit, whose induction fields have unknown orientation.

Unfortunately, even such keys have been duplicated by counterbeaters. In fact, by disposing around the bit a set of orientable magnets, the latter assume a complementary pattern to that of the embedded magnets, from which it is possible to infer the original shape of the key.

However, this is only one example out of the many excerptible ones. On a more general level, from the security systems for doors and leaves based on the use of combination locks, to the most sophisticated key designs with various forms and sizes, no technical solutions have been provided heretofore which either can eliminate the risk of confidential informations or elements diffusion, which are useful for overcoming the protection afforded by said security systems, or successfully avoid duplication of the keys.

It is the object of this invention to overcome the limitations and deficiencies of security systems for locking, in a manner that can be opened, generic doors and leaves, as provided by the state of the art.

This object is achieved, according to the invention, by a device as outlined above and characterized in the appended claims.

Further features and the advantages of the invention will be more clearly apparent from the description of two embodiments thereof, given herein below by way of example and not of limitation with reference to the enclosed drawings, in which:

Figure 1 shows a perspective view of a safe with a leaf according to the invention;

Figure 2 shows a sectional view of a first embodiment of the device according to the invention; and

Figure 3 shows a sectional view of a second embodiment of the device according to the invention.

With reference to such figures, and in particular to figure 1, generally shown at 1 is a leaf in accordance with this invention. More particularly, in this description, the leaf door is the armored door of a safe 2, depicted in figure 1 together with a pair of devices 4 and 6, respectively shown in dash and dot lines. These devices 4 and 6 represent respective embodiments of the invention, and their simultaneous presence in figure 1 is for convenience of illustration: indeed, they may be used alternatively, as explained hereinafter, depending on different situations.

With reference to Figure 2, the first of these embodiments will now be described.

The security device 4 includes a key 41 having a bit 42 of conventional design, which key is associated with a respective lock 43 mounted on the leaf 1 and provided with a keyhole 43a for the key 41; at said bit 42, the key 41 has an end 44 jutting out therefrom and carrying a hologram 45 of a conventional type which occupies substantially the whole surface of one side of said end 44. In this embodiment, said hologram is applied to the end 44 and carries identification informations recorded thereon, as explained hereinafter.

The lock 43 is provided with an aperture 46 to let the end 44 with its hologram 45 project outwards when the key 41 is inserted into the lock 43. The device 4 of this invention includes a reader of the opto-electronic type, generally shown at 48. The reader 48 is of conventional type and will not be further described in detail as regards to its component parts, but only its distinctive functional aspects will be considered here.

Furthermore, the device 4 of the invention includes a magnetomotive locking assembly 50 for releasably driving a conventional bolt 51 of the lock 43 and thus lock in a manner that can be opened, the leaf 1. The device 4 also includes an electric power supply 52 for powering the reader 48 and the magnetomotive assembly 50. The magnetomotive locking assembly 50 operation is controlled by the reader 48; the latter is provided with conventional opto-electronic means to enable the holog-

ram 45 on the key 41 to be read and the information recorded thereon compared with identification information stored in the reader 48 and thereby, to enable the magnetomotive assembly 50 to release the bolt.

In operation of the inventive device 4, to lock or unlock the leaf 1 it is foreseen that the holder of the key 41 insert it into the lock 43 so as to make the end 44 and its hologram 45 to come out. The reader 48 reads and recognizes said hologram, and once it is verified that the informations recorded thereon match the informations stored in the reader, it enables the magnetomotive assembly to release the bolt 51. Under this condition, the user is allowed to operate the key 41 and the open or shut the leaf 1 as desired.

A device according to the invention, constructed as in the above embodiment affords a number of advantages.

Notice, first of all, that the hologram 45 provides the key 41 with a means of identification which is almost impossible to duplicate or decode. It is indeed well known, that holograms, i.e. the recordings of light waves by surface etching with coherent monochromatic light beams, cannot be decoded if the way they have been formed is unknown. In the same way it is known that the parameters used for obtaining the holograms, namely the wavelengths used for the light beams, their respective phase displacement and their chronological sequence of incidence on the surface where the hologram is formed, provide a virtually unlimited range of combinations which, unless known in advance, preclude all chances of the hologram being read and recognized.

It can be appreciated, therefore, that the technical solution provided by the invention achieves the object previously mentioned. It should be also noted that in this embodiment, the key 41, additionally to carrying the hologram 45, still retains its mechanical function to operate the bolt 51 after the reader 48 has enabled the magnetomotive assembly 50 to release the bolt.

This feature allows the invention to be also employed with common keys as used in normal applications.

With reference to Figure 3, shown in detail therein is a second embodiment of the invention. In the figure, parts which are structurally and functionally equivalent to those of the first embodiment are denoted by the same reference numerals.

In this second embodiment, the device of the invention is generally shown at 6 and includes a key 61 having form of a card, adapted for insertion into a lock 63 basically in the form of a slot. The key 61 is provided with a hologram 45 at an end 44.

A conventional opto-electronic reader 48 is mounted on the leaf 1 at the location of the lock 63; this reader 48 is similar to the one of the first embodiment and is arranged to read the hologram 45, compare it with identification informations stored in the reader itself, and enable the operation of a bolt 51 as explained hereinafter.

In addition, the device 6 of this invention comprises an electromechanical actuator assembly 70 for operating a bolt 51 which locks the leaf 1; such an assembly 70 is also conventional (for example, similar assemblies can be found on delayed opening safes which include electromechanical motors driven by timers), and its construction will not be described in detail.

The operation of this second embodiment of the invention is substantially similar to that of the first one, and may be summarized as follows; as the key 61 shaped as a card is inserted into the corresponding lock 63, the end 44 carrying the hologram 45 comes out of the lock 63 and enter the reader 48 through its opening 46.

The reader 48 reads the hologram 45 and checks its match with the identification informations stored in the reader. In the case of a positive match, the reader 48 enables the electromechanical assembly 70 to operate the bolt 51, thereby unlocking the leaf 1.

Of course, the device 6 of this invention would also lock the leaf, when the same procedure as has been used for unlocking it is followed in the reverse order.

It should be emphasized that in this second embodiment of the invention, the door bolt is not operated mechanically through a key, but rather through means incorporated to the device itself. A part from this difference, the second embodiment also ensures a total security for the device 6 by virtue of the provision of hologram 45, on account of the same considerations as have been offered in connection with the first embodiment.

In addition, it matters to remark that by virtue of its simplicity, the device can be readily used in a variety of applications, other than the armor doors of safes as described above, such as ordinary civil interior doors, leaves of gates and main entrance doors.

It is important to observe that the device of this invention may indeed be easily adapted for different uses in alternative versions of the embodiments previously discussed; in fact, in the first embodiment described, the hologram locates on the protruding end of the key but obviously it could be provided at any other location on the key and the key could, of course be of a type different from that illustrated. It is as much evident that several holograms might be provided on one key, without this constituting a departure from the invention

teaching.

Other possible embodiments of the invention may provide for a particular location of the reader 48; the latter could be placed inside the door rather than on it as in the examples given, and especially in connection with the second embodiment of the invention, it could be located away from the leaf 1 and be linked operatively to the door locking means 70 and 51. Such would be the case with a security device according to the invention which is to be operated remotely from its installation leaf.

Other alternative embodiments of the invention may be readily foreseen for those applications where the simple bolt described in the foregoing is replaced with more complicated locking arrangements; in some cases, for instance, the electromechanical assembly 70 or the locking assembly 50 could be easily replaced with electromagnetic locking means. Furthermore, also the various functions of the reader 48 which have been previously described as grouped in a single structural element for simplicity, could instead be performed in a distinct manner; such would be the case, for example, where a set of doors are controlled by a central computer which provides the functions of storing the identification information and comparing them with the informations read from the peripheral readers. Such a solution might advantageously be applied to the control of a set of security doors in banks and the like.

Neither these nor any other possible modifications of the embodiments described hereinabove would depart from the essence of the teaching provided by the invention.

Claims

1. A security device for locking, in a manner that can be opened, a leaf (1), characterized in that it comprises a hologram (45) containing a plurality of informations, a portable support (41,61) for said hologram (45), an opto-electronic reader (48) associated to said leaf (1) and fitted to read and compare said hologram with identification informations stored in the reader (48), a means (43,50,51,70) of locking, in a manner that can be opened, the leaf (1) under control by said reader (48), said means (43,50,51,70) of locking being enabled to operation by the reader (48) subsequently to reading the hologram (45) and comparing the informations contained therein with the identification informations stored in the reader (48).
2. A security device according to Claim 1, characterized in that said support for the hologram (45) comprises a key (41), and said leaf (1) locking means comprises a lock (43) asso-

ciated with the key (41) provided with a bolt (51) and a bolt locking assembly (50) controlled by said reader (48), which reader (48) is located at said lock (43).

3. A device according to Claim 2, characterized in that said key (41) has an end (44), extending along its longitudinal continuation, wherein said hologram (45) is supported, said end (44) projecting outwards through a lock (43) opening (46) when the key (41) is inserted therein to allow reading of the hologram (45) by the reader (48).
4. A security device according to Claim 3, characterized in that said locking assembly (50) is of a magnetomotive type.
5. A device according to Claim 1, characterized in that said leaf (1) locking means comprises an electromechanical assembly (70) for operating a bolt (51), controlled by the reader (48).
6. A device according to Claim 5, characterized in that said support (61) is substantially a card.
7. A device according to Claim 1, characterized in that said door (1) locking means (43,50,51,70) is of an electromagnetic type.

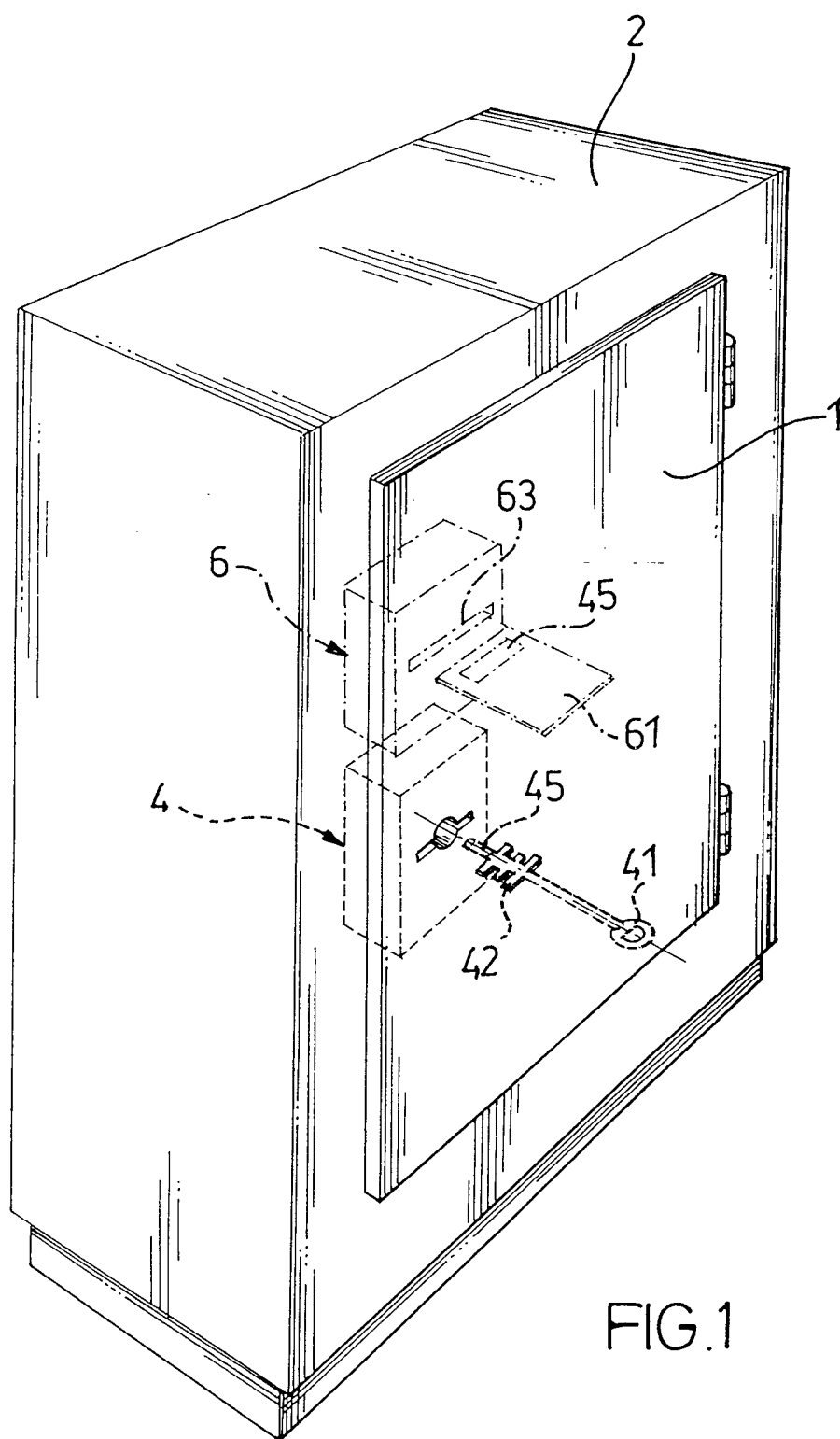


FIG.1



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EUROPEAN SEARCH REPORT

Application Number
EP 94 20 1215

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
Y	EP-A-0 257 808 (THE GENERAL ELECTRIC COMPANY) * column 3, line 29 - column 4, line 46; figures 1-3 *	1	E05B49/00
A	---	2,5-7	
Y	IBM TECHNICAL DISCLOSURE BULLETIN, vol.14, no.12, 1 May 1972, NEW YORK US pages 3832 - 3834 KREWSO,TAIT 'holographic security key'	1	
A	---	2,3	
A	WO-A-92 08863 (KUDRYAVTSEV) ---		
A	US-A-5 138 468 (BARBANELL) -----		
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 27 July 1994	Examiner Herbelet, J.C.
CATEGORY OF CITED DOCUMENTS			
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