

A PLURALITY OF IDENTIFICATION CARRIERS FOR A LOCKING SYSTEM

The invention is in the field of security technology and relates to a plurality of identification carriers for a locking system in accordance with the independent claims.

5 The purpose of a locking system is to prevent entry for unauthorized persons, but allow entry for authorized persons. For this purpose it must be equipped for two functions, namely an identification function for differentiating authorized from unauthorized persons, and a blocking function in order to give free entry to authorized persons, but mechanically block entry to unauthorized persons. Unlike in the case of a locking means, which performs the blocking
10 function, a locking system has a much more complex function, particularly with regards to information management and transmission. Whereas the identification function is that of information transmission and consequently requires no energy and corresponding means, the blocking function must be performed mechanically and consequently requires greater operating energy
15 levels and other means differing from the first function.

A single locking device is e.g. a lock cylinder with a key in conjunction with the lock of e.g. a door. The key can perform both functions, on the one hand supplying as the identification carrier the identification features for the identification function and on the other it serves as a force transmission means
20 making it possible to utilize the operator's force for the blocking function. On

the key can be provided "mechanical" identification features, which make it possible to cancel out the blocking function by the force of the operator. Such a key with electronic additional functions can be incorporated into a system, but further characteristics would be desirable.

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In the modern very safety conscious age, the key with its mechanical identification features is no longer considered adequate for several reasons, e.g. because it can relatively easily be copied, because its action on the locking system is time-invariant, because no action is possible by the locking system on the key, because a minor change to the system leads to significant consequences, etc. Such disadvantages of a conventional key are avoided with more modern identification carriers having non-mechanical identification features. The latter e.g. comprise magnetically or electrically stored information, which can be read out by a corresponding reader (passive), or the response of a so-called identification chip to its activation by a corresponding electronic circuit (active).

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Locking systems with such identification carriers having non-mechanical identification features are known, the identification carrier mostly only fulfilling an identification function, because it is not and cannot be mechanically loaded. However, for the blocking function it is necessary to provide a mechanically acting device, which blocks or unblocks a purely mechanical obstacle controlled by the identification function. As a function of whether this mechanical obstacle is a blocking means for a bolt or a complete door, the operator requires that it moves the bolt and opens the door, that it opens the door, or that it simply enters. The blocking function device must be designed as a function of this and supplied with an energy quantity which in all cases is significantly higher than that necessary for the identification function.

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30 The blocking function device becomes simpler and less energy-intensive if, as with the conventional pair constituted by the lock and the key, the force of

the operator is used for part of the blocking/unblocking function, e.g. in that he moves a bolt and opens the door himself. With an identification carrier which only fulfils an identification function, the difficult always arises that the operator with a first movement trips the identification function and then in a
5 closely confined period of time with a second movement must perform part of the blocking function. Thus, he must e.g. insert a card in a reader and then within a few seconds press a latch unblocked by the identification and open the door. The time allowed between the two movements is kept very short for security reasons. The brevity of the time and the coordination of the two
10 movements require relatively high concentration on the part of an accustomed user and a complicated information in the case of an unaccustomed user, which often leads to problems e.g. in the case of hotel keys.

The problem of the invention is to provide an identification carrier, which can
15 carry mechanical and/or non-mechanical identification features and which is constructed in such a way that the two aforementioned types of identification features can be used separate from one another for different security functions and can be combined in a random manner.

According to one aspect of the invention there is provided a plurality of identification carriers for a locking system, characterised in that each carrier comprises two cooperating, interchangeable functional parts, an operating part and an attachable identification part, the operating part has a shank, which can be inserted in a key opening of a lock cylinder and is used for transmitting operating forces to a locking device,

said part being able to carry mechanical identification features which constitute a first coding and that connecting elements are provided on the operating part for the fitting of the attachable identification part and that means for non-mechanical identification features are provided on the identification part, which constitute a second coding and that there are connecting elements on the identification part for fitting the identification part on to the operating part and wherein the connecting elements on both functional parts belong to a coding standard, in that there is a defined number of different possible shapes of the connecting elements of the identification carriers belonging to the locking system, wherein each shape of one functional part is matching with a corresponding coded shape of the other functional part and is not matching with a functional part of an identification carrier of the system having a different coded shape and wherein this number of different possible coded shapes is constituting a third coding with respect to connecting of the two functional parts of an identification carrier of the locking system.

According to another aspect of the invention there is provided a mechanical key used in a system with a plurality of identification carriers, as an operating part of an identification carrier, characterised in that the key is constituting the operating part and that it has a shank and connecting elements which correspond to connecting elements of the attachable identification part and which connecting elements are forming the third coding.

According to a further aspect of the invention there is provided an attachable identification part of an identification carrier used in a system with a plurality of identification carriers characterised in that it has a hollow casing part and connecting elements shaped onto the casing part and which connecting elements are forming the third coding.

In the following embodiment the identification carriers, have a mechanical operating or key part for transmitting operating forces and are optionally provided with a mechanical locking code, and an attachable information carrier, hereinafter referred to as attachment part for short, e.g. for receiving an electronic function for transmitting information or all additional, necessary information, so as to regulate the authorization, the two parts constituted by the operating part (mechanical key part) and attachable identification part, can be detached from one another by a corresponding design, so that they can be separately or jointly used for an intended function and can also be randomly combined. When combined to form an identification carrier, they in each case

fulfil a predetermined system function.

5 The mechanical operating part, in the following embodiment in the form of a key part, is constructed in such a way that with the aid thereof a lock cylinder can be operated and can be connected to the attachment part, which can e.g. be an electronic key part, by means of a standardized connecting element. In the form of a key part it can also carry the conventional mechanical identification features, e.g. locking code depressions.

10 An electronic key part realized e.g. by means of the attachment part is constructed in such a way that as the attachment part with associated electronic means it can be associated with the or a mechanical key part, so that the identification carrier for non-motor-assisted locking devices becomes an easily handlable force transmission means with the desired integrated, mechanical
15 and/or non-mechanical identification features.

The mechanical operating parts, particularly key parts, can also be foreign to the system and can be extended by means of the matching connecting element with an attachable information part so as to form extended system integrated or system-generating identification carriers.

If the inventive identification carrier carries mechanical and non-mechanical identification features, in which the operating part represents a key part with a key stop, when inserted in the corresponding lock cylinder as a result of the
25 exact positioning of the operating part, which in turn carries the attachment part precisely positioned relative to the lock cylinder, it is possible for a corresponding reader to read the non-mechanical identification features and the mechanical identification features (lock cylinder code) mechanically free the turning of the key. Following a complete release and the subsequent turning
30 of the key, the force of the operator is used for the movement of an e.g. mechanical bolt, the mechanical key part serving as the force-transmitting means.

The inventive identification carrier can be equipped with combined mechanical and non-mechanical identification features, the equipping of the lock cylinder and the area round it determining which of the features are necessary for the identification function. The identification carrier (as a key) may only
5 be equipped with one of the identification feature types. However, the lack of the non-mechanical features (pattern of holes) in one case or the lack of the electronic features in the other must not lead to any functional deterioration, if such possibilities are provided or defined in the system with which this identification carrier is associated . The subsequently described variation
10 possibilities not only make it possible to use the inventive identification carrier for different security functions, which need not necessarily be locking functions, but they also make it more difficult as a result of the uncertainty in evaluating the valid locking and/or identification functions to copy such an identification carrier in an unauthorized manner.

15 The operating part is made from a tough material allowing the force transmission from the user to the locking device, e.g. a metal body, which is correspondingly worked as a key blank. It is e.g. provided with mechanical identification features, which are produced by a milling process. The identification
20 part in the form of an attachment part primarily serves as a fastening means for the carrier of non-mechanical identification features and other parts necessary for identification purposes (e.g. electronic parts such as chips, capacitors, etc.). It is e.g. made from plastic and by different colours and/or shapes can be used as a directly visible differentiating feature of different
25 identification carriers or carrier groups.

With an operating part it is also possible to associate more than one attachable identification part, e.g. one on each side of the operating part. With respect to the detachable connection, they can be provided with encoding
30 elements and with each attachment part is not only associated a specific operating part, but also a specific position thereon (one or other side in the case

of two attachment parts).

The invention is described in greater detail hereinafter relative to nonlimitative embodiments of the inventive identification carrier, but individual variants, such as e.g. more than one attachment part per operating part are merely described, but not shown in the drawings. In the drawings show:

- Fig. 1 A plan view of an exemplified embodiment of the inventive identification carrier.
- 10 Fig. 2 A section through the identification carrier according to fig. 1 (section line II).
- Fig. 3 A section through the identification carrier according to fig. 1 (section line III).
- Fig. 4 A section through the identification carrier according to fig. 3 (section line IV).
- 15 Fig. 5 The operating part of the identification carrier, as presented for further processing as a key blank.
- Fig. 6 Examples of the encoding of a self-closure between the attachment part and the operating part in the form of sections VI.
- 20 Fig. 7 A further embodiment seen from below showing an attachment part, which is inserted with two pin clips in the operating part, the encoding of the self-closure resulting from the size and spacing of the passages.
- Fig. 8 The embodiment of fig. 7 in section B-B, seen from the side.
- 25 Fig. 9 An operating part according to the embodiment of fig. 7 showing a diagram of the encoding of the self-closure between the attachment part and the operating part.

Figs. 1 to 4 show an exemplified embodiment of an inventive identification carrier. It comprises a mechanical operating part 1, here in the form of a key part with or without mechanical key coding and an attachable identification

part 2, here in the form of an attachment part with electronic identification features. The key part 1 has a shank 11 with a first stop 13 and a seat 12 as a connecting element between the two parts 1 and 2 with a second stop 14 for the attachment and positioning of the attachment part 2. The shank 11 can, but need not, have mechanical identification features in the form of a coding pattern with milled out points on its narrow and/or wide side. It is mainly used for transmitting an operating force. Between the shank 11 and the seat 12 is formed a first stop 13 used in the lock cylinder for the precise, axial positioning of the shank 11. The seat 12 constitutes an extension of the shank 11. This part is so widened by the fitted attachment part 2, that there is an easy-to-handle grip and consequently an easily handlable, key-like identification carrier, putting the manual operation of a locking device. The attachment part 2 strikes against the second stop 14, so that with respect to the first stop 13 it is located in a precisely defined position and can therefore be brought into a precisely fixed position with respect to a reader e.g. located in the lock area.

The seat 12 and the attachment part 2 are constructed in such a way that they can be interconnected in interlocking, but detachable manner (with or without the destruction of an additional security element, e.g. a seal, lead seal, etc.). In the represented embodiment the seat 12 is constructed as an extension of the shank 11 widened around the first stop 13 and whose longitudinal edges are parallel to the longitudinal edges of the shank 11 and whose narrow sides are constructed in step-like manner, so that one wide side of the seat 12 has a width corresponding to the shank 11, whereas the opposite wide side of the seat is wider by the total width of the stop 13. In this form the operating part constitutes a key blank, which can be used with three different functions (see diagram hereinafter). Thus, key blanks can be kept in stock and through the shank can belong to another locking system, but as a result of the standardized connecting element 12 it is still possible to use the same attachment parts, which also cooperate with another locking system. Besides its function

as an operating element the key part also has the function of a mechanical interface (intermediate or adapting piece).

5 The attachment part 2 is e.g. shaped from a slightly elastic plastic and in the represented embodiment is constituted by an attachment body 21, which forms a closed space and holding elements 22.1 and 22.2 shaped onto both sides thereof and which are shaped in such a way that they closely embrace the end of the seat 12 of the reception part 1 and are elastically tensioned so that this tension ensures an adequate fixing of the attachment part 2 to its seat 12. In 10 the second embodiment additional security elements are used with which it is possible to detect an e.g. unauthorized replacement of the attachable identification carrier.

15 The closed space of the attachment body 21 contains the parts necessary for the non-mechanical identification features. In the represented embodiment they are in the form of an identification chip 23, an energy storage element, e.g. a capacitor 24 and an "antenna", e.g. in the form of an electric coil 25 directly wound onto a ferrite core. The three electronic components are advantageously prefitted and electrically interconnected together with a print or 20 carrier and are mounted in the form of a partly finished article in the attachment part 2. Thus, the attachable identification carrier has become an electronic key part, which can be produced, stored, programmed and evaluated in a separate operation. If the electronic key part is only used for checking the person and the mechanical key part (besides its function as an operating 25 element and intermediate part) only fulfils a locking function, in the case of a periodic interchange there can be an uninterrupted check with uninterrupted operability. The locking function remains permanently in the possession of the person allocated the identification carrier and a check can still take place in the form of an evaluation and programming.

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Obviously the locking function can be distributed over both parts, e.g. the

mechanical locking function in a permanent manner and on which is superimposed a time or data window locking function by means of the attachment part.

- 5 The operating part 1 which performs several functions, namely the transmission of the operating forces to the locking device, that of an "intermediary" transfer part between a specific locking device and its standard, an attachable identification part and its standard and as a carrier for the attachable identification part. The operating part 1 can also carry a code for different attachment parts, which can be correlated with the operating part shank 11. For
10 example the operating part shank 11 is designed for the standard of a specific locking device and the identification carrier of the latter is constituted by a specific, attachable identification part (by programming, coding, etc.), so that no identification part of an other group can be connected to said operating
15 part and for this purpose an encoding of the detachable connection is provided .

- Figs. 5 and 6 show a mechanical key part as a so-called key blank with the essential features 11, 12, 13 and 14, the stops 13, 14 for the adequate positioning of the key part in the lock cylinder on the one hand and an attachment
20 part on the other, and the "adapting elements" 11, the shank for the locking device and the seat for the attachment part. Fig. 6 shows a number of possible profiles in cross-section as to the way in which the attachment part 2 can be encoded ensuring that only this type and not some other can be fixed to the
25 seat 12. As will be shown hereinafter the way in which the combination is mechanically dissolved and reestablished on the one hand for the coding and on the other for the mechanical fixing is subject to such numerous variations that all of these cannot be described here. However, it is sufficient to have given the principle for the design of the connecting elements/coding elements
30 between the parts 1 and 2.

The variability is that the attachment parts, which e.g. carry the system information are separately prepared, engaged at another time on a mechanical key part or can be generally interchanged. Thus, there is e.g. a group with mechanical key parts, which have a common mechanical code for opening a door with the corresponding lock cylinder. On one of the mechanical key parts can be engaged a preprogrammed attachment part, which e.g. carries additional information for checking presence, so that authorization can be checked in a time-based manner. Together with the presence check the number of locking manipulations, etc. can be established. This makes it possible to produce shift change, overtime, zonal and similar keys. With a system based person identification, it is possible to e.g. periodically interchange the attachment part. The attachment part carrying the information is removed and a new-programmed attachment part fitted. This can be carried out by the identification carrier operator, or by an inspection station. As the attachment part interchanges and receives information concerning the transmission/reception mode, no sensitive parts like contacts are involved in such an interchange and it can therefore be very simple.

The mechanical key part and the electronic attachment part together form a two-part unit. The mechanical key part is designed for receiving an attachment part and has the function of mechanical force transfer and non-electrical, mechanical unblocking, whilst the electronic attachment part is constructed for fixing to the mechanical key part and fulfils the non-mechanical functions (mainly information transmission and identification). The standard key shape is retained, because it best permits the "mechanical opening", unlike in the case of plastic cards, where additional aids are required for opening a lock. However, the identification carrier has little in common with a key or even an electronic/mechanical key, because with such keys the variability required by a complex system cannot be provided.

The presently proposed solution still has advantages in the direction of con-

ventional use. For example the attachment part can, but need not contain electronics. The mechanical key part can, but need not have a mechanical coding. Thus, identification carriers (e.g. for a certain time) can be "down-graded" to keys, but without being removed from the system, or identification carriers can be used as purely electronic keys or neutralized as such. This leads to four possibilities, three of which can be used for direct employment and one (temporarily) free from system information, e.g. if a specific quantity is system-caused, can be used as a reserve and subsequent identification. These four possibilities are given below in the form of a table:

Electronic attachment part	Mechanical operating part	Function of combination
X	X	el/mech. ID carrier
X	O	el. ID carrier
O	X	mech. ID carrier
O	O	zero info. ID carrier

Figs. 7, 8 and 9 show a further embodiment of the identification carrier according to the invention. The operating part 1 once again in the form of a mechanical key part is, unlike the previously discussed embodiment, in the form of a conventional key with a grip, a shank 11 and a first stop 13. In place of the second stop 14 for positioning the attachment part 2, it has two coded insertion openings 14', through which can be passed two fixing pins 15 of the attachment part 2. Thus, the attachment part 2 is in a defined position with respect to the first stop 13, as with the stop 14 in the first embodiment. The elements 14' and 15 of this embodiment fulfil the same function as elements 12 and 22 in the first embodiment. This example clearly illustrates what has been state hereinbefore regarding the numerous possibilities for designing the connecting elements, whilst incorporating encoding elements.

The attachment part 2 is e.g. shaped or moulded from plastic and comprises an attachment body 21, which forms a closed space and two holding or fastening elements 15 shaped thereon and which are moulded in such a way that they can be passed through insertion openings 14' in the mechanical key part 1. This most advantageously takes place by a resilient snap connection or clamping connection, which ensures the necessary reciprocal hold of the two parts 1 and 2.

Fig. 9 shows an example as to how an encoding pattern can be provided on the relatively large surface available, so that a large number of groups of attachable identification parts can be associated with the operating part. A reference opening R is associated with the insertion openings 14' with the stops. In this form the operating part corresponds to a basic encoding arrangement. On two vertically aligned axes are provided a main group H and a subgroup U of utilizable positions for a mouldable or subsequently fittable coding pin or pins on the attachable identification part. This e.g. corresponds to a portable system. The reference opening can either be moved on the axes or it can be moved together with the axes. A once made group of attachable identification carriers on the axes can be retained, even if there is a variation in the reference opening position for any reason. This example shows the encoding depth to which such a simple measure on the operating part and attachable identification part can extend, as a result of the relatively large amount of space available on the key-shaped operating part, compared with the embodiment according to figs. 1 to 6. The encoding arrangements can be such that by removing e.g. a snap connection, the connection between the operating part and the identification part is no longer reliably ensured.

As a rule the two functional parts do not have to be secured against unauthorized separation, because normally the identification carrier does not function with one or other part. It is optionally possible to provide security of the connection of these two elements against unauthorized disassembly. It may occur

that it is wished to prevent unnoticed interchange of attachment parts 2 on other mechanical key parts 1. In this case the second embodiment is particularly appropriate, because the fastening part designed as a resilient clip can be additionally "lead sealed " into the passage opening 14'. Although this does
5 not ensure that no unauthorized interchange can take place, such an interchange or replacement would be noticed, because it would be necessary to damage the seal or lead seal 15.

The closed space of the attachment body 21 contains the parts necessary for
10 non-mechanical identification features. In the represented embodiment this is constituted by an identification chip 23, an energy storage means e.g. in the form of a capacitor 24 and an "antenna", e.g. in the form of an electric coil 25. These three electronic components are advantageously prefitted together on a print or carrier and electrically interconnected and are mounted in the attach-
15 ment part as a partly finished article.

CLAIMS

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provided on the operating part (1) for the fitting of the
able identification part (2)
at means (23, 24, 25) for non-mechanical identification
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(22.1, 22.2) on the identification part (2) for fitting the
fication part on to the operating part (1)
erein the connecting elements (12, 14, 14', R and 15, 22.1,
on both functional parts (1, 2) belong to a coding standard
, in that there is a defined number of different possible
of the connecting elements of the identification carriers
ging to the locking system, wherein each shape of one
lonal part (1) is matching with a corresponding coded shape of
ther functional part (2) and is not matching with a functional
(2) of an identification carrier of the system having a
rent coded shape and wherein this number of different possible
shapes is constituting a third coding with respect to
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er of the locking system.



identification part (2) and which connecting elements are forming third coding.

Key according to claim 10, characterized in that the shank (11), which is shaped in such a way that it can be inserted in the key ring of a lock cylinder, has means shaped onto said shank (11) for fixing an attachment part, a widened portion being constructed as a first stop (13) with which the identification carrier can be positioned in the lock cylinder.

Key according to claim 11, characterized in that the shank has parallel longitudinal edges (12) as connecting elements which are constructed in step-like manner for encoding and for fixing.

Key according to claim 12, characterized in that a wide side of a connecting element (12) has the width of the shank (11) and the other wide side is wider by the size of the first stop (13).

Key according to claim 10, characterized in that in an area of a connecting elements in which the attachable identification carrier (2) is to be arranged, there are openings (14') for receiving and positioning the attachable identification part (2) with resilient clip pins (15) as connecting elements and the association is made clear by elements (R, H, U) of a self-closure and encoding arrangement.



6. A plurality of identification carriers according to claim 1 or 2, characterized in that the operating part (1) has insertion openings (14') and a reference opening (R) as connecting elements, which correspond to fixing pins (15) and to a reference pin of the attachable identification part (2) and wherein these connecting elements are forming the third coding.

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7. A plurality of identification carriers according to claims 1 or 2, characterized in that the attachable identification part (2) has a space for receiving the non-mechanical identification means.

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8. A plurality of identification carriers according to claim 7, characterized in that in the space of the attachable identification part (2) are provided an identification chip (23), energy storage means (24) and a reception means (25).

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9. A plurality of identification carriers according to claim 8, characterized in that in the space of the attachable identification part (2) are provided an identification chip (23), a capacitor (24) and a coil (25).

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key

10. Mechanical key used in a system with a plurality of identification carriers according to one of the claims 1 to 8 as an operating part (1) of an identification carrier, characterized in that the key is constituting the operating part (1) and that it has a shank (11) and connecting elements (12, 14, 14', R) which correspond to connecting elements (15, 22.1, 22.2) of the attachable

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