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(54) **TUMBLER LOCK**

ZUHALTUNGSSCHLOSS

SERRURE A PENE DORMANT

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(73) Proprietor: **BJÖRKBODA LAS OY AB**
25860 Björkboda (FI)

(72) Inventor: **LINDSTRÖM, Marko**
FIN-258 60 Björkboda (FI)

(74) Representative: **Hanson, William Bennett et al**
Bromhead Johnson
19 Buckingham Street
London WC2N 6EF (GB)

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Description

[0001] The invention relates to a tumbler lock in accordance with the preamble of claim 1.

[0002] Tumbler locks according to the present invention are used for instance as security locks in doors. While the security requirements are getting more stringent, a great number of additional key alternatives of various kinds are needed. In principle this can be achieved e.g. by adding the number of tumbler discs or stepping alternatives for combination surface millings, i.e. the number of combination values. Both the size of the key and the lock must, however, be kept reasonable and the decreased stepping of millings might, for its part, cause malfunctions and erroneous openings.

[0003] The picking of locks should also be as difficult as possible. The locking channel of the tumbler discs utilized in these locks conventionally includes a straight branch interconnecting the locking branches and extending in the direction of the transfer movements of the lock bolt. Thus it is sufficient for picking the lock to arrange the tumbler discs so that the connecting branches for their respective locking channels coincide with the position of the locking pin. After this the lock bolt can be pressed to its opening position while the locking pin moves directly through the locking channel branch in question. In order to prevent picking it is known to provide the locking branches of the locking channel with various recesses, in which the locking pin can get stuck while searching for the correct position of the tumbler discs. Thereby the probing of the position of the tumbler discs is at least impeded.

[0004] One type of a tumbler lock is shown in EP 1 035 278 A2. In the disclosed solution the key blade comprises a guide member, which affects the lock bolt at the final stage of the selecting movement of the tumbler disc so that it guides the locking pin into the branch interconnecting the locking branches of the locking channel. In addition, the third branch of the locking channel comprises at least one guiding member to guide the locking pin at the same time with the transfer movement of the lock bolt and the selecting movement of the tumbler disc.

[0005] FR 2663072 A discloses a tumbler lock according to the preamble of claim 1.

[0006] US 1544389 A1 describes a lock in which a bolt includes a latch tumably journalled thereto and provided with a gravity catch cooperating with a set of tumbler discs each provided with a slot. The tumbler discs provide the opening combination for the lock and also pull the bolt into the lock casing when actuated by the key. A stop member on the inner side of lock casing prevents inward movement of the bolt.

[0007] US 1935225 A1 describes a lock having a plurality of tumbler discs provided with slots, and an abutment member carried on a lever pivoted to the lock casing for engaging one of the slots to block the tumbler disc and the bolt.

[0008] The object of the present invention is to provide a tumbler lock, the picking of which can be prevented more reliably than before.

[0009] The aims of the invention can be achieved principally as is described in more detail in claim 1 and in the other claims. A tumbler lock according to the present invention comprises a lock casing or similar including a plurality of tumbler discs provided with locking channels, a lock bolt and a locking pin or similar, arranged in force transmitting connection with the lock bolt and in interaction with the locking channels of the tumbler discs. The tumbler lock also comprises a separate force transmitting member for providing force transmitting connection between the lock bolt and the locking pin or similar. The force transmitting member is movably mounted in the lock bolt so that it has a determined freedom of movement and the locking pin is arranged in the force transmitting member. The force transmitting member is preferably arranged in operative communication with the lock bolt so that their lateral surfaces face each other and a mechanical guide system is provided for guiding their reciprocal movement. This guide system determines the limits for and/or the direction of the movement between the lock bolt and said force transmitting member. The mechanical guide system comprises at least one pin and guide groove combination or similar arranged to guide the force transmitting member in a direction deviating from the direction of movement of the lock bolt.

[0010] Blocking members are arranged in the lock casing, in the vicinity of the lock bolt, and the force transmitting member comprises a detent or similar members arranged by means of the movement between the force transmitting member and the lock bolt to interact with the blocking members so that the force exerted on the lock bolt and parallel with its direction of movement can be transmitted to the lock casing by means of said members.

[0011] A tumbler lock according to the invention comprises members on the other side of the lock bolt for transforming the turning movement of the key to a linear movement of the lock bolt, whereby the detent or similar members of the force transmitting member are preferably arranged on the opposite side of the lock bolt with respect to said members of the lock bolt.

[0012] In the following the invention is described by way of example with reference to the attached drawings, in which

Fig. 1 shows schematically a tumbler lock according to the invention in locked position;
Fig. 2 shows schematically a tumbler lock according to the invention during a picking attempt at the first stage; and
Fig. 3 shows schematically a tumbler lock according to the invention during a picking attempt at the second stage.

[0013] In the drawings the reference number 1 indicates a tumbler lock comprising a lock casing 2 or similar, where several tumbler discs 3 equipped with locking

channels 4 are provided. In addition, the lock comprises a lock bolt 5 movably mounted in the direction of its longitudinal axis in the lock casing 2. The tumbler lock comprises further a locking pin 6 or similar arranged in force transmitting connection with the lock bolt 5 so that the force exerted on the lock bolt and parallel with its direction of movement can be transmitted to the tumbler discs 3 via the locking pin 6. Further, the locking pin 6 is arranged to interact with the locking channels 4 of the tumbler discs. The tumbler discs are arranged in the lock casing 2 in a way known per se by means of elongated guide openings 3' to be moved in a transversal direction with respect to the lock bolt's direction of movement and against the pressure of spring means.

[0014] Fig. 1 depicts the initial position of the tumbler lock 1 according to the invention in locked position. The lock comprises a separate force transmitting member 7 for providing force transmitting connection between the lock bolt 5 and the locking pin 6. In this connection the force transmitting member is called a detent plate. The detent plate 7 is arranged in force transmitting connection with the lock bolt 5 allowing a specific reciprocal movement between them. The elements are located so that their lateral surfaces face each other. In addition, a mechanical guide system 8 is provided for guiding their reciprocal movement comprising pairs of pins and guide grooves or similar and determining the limits for and/or the direction of movement between the lock bolt 5 and the detent plate 7. In the embodiment according to the drawings two pins 8' are arranged in the lock bolt 5 and correspondingly, two grooves or elongated holes 8" in the detent plate 7. The direction of the grooves 8" is such that the movement between the lock bolt 5 and the detent plate 7 deviates from the direction of movement of the lock bolt.

[0015] In the lock casing 2, in the vicinity of lock bolt 5, are arranged blocking members 9, and correspondingly the detent plate 7 comprises a detent 10 or similar members, which can be arranged by means of the movement between the detent plate 7 and the lock bolt 5 to interact in a picking situation. The lower edge of the lock bolt 5 is provided with a guide surface 11 for a key for transforming the turning movement of the key to a linear movement of the lock bolt, and the detent 10 of the detent plate 7 is arranged on the opposite side of the lock bolt with respect to the guide surface 11 for the key. The locking pin 6 is arranged on the detent plate 7, whereby the pressing force exerted on the lock bolt 5 from outside makes the detent plate 7 actuated by the guide system 8 to move in such a way that the detent 10 hits the blocking members 9 and the movement of the lock bolt is prevented (cf. Fig. 2). Thus the force exerted on the lock bolt by the interaction of the detent 10 and the blocking members 9 and being parallel with the lock bolt's direction of movement can be transmitted to the lock casing and the force exerted on the tumbler discs 3 via the dead-locking pin 6 will cease. In this case there are two blocking members 9. Thus the arrangement according to the invention is applicable in all necessary opening phases of the lock. Generally, the number of blocking members is preferably one less than the number of locking channel branches parallel with the direction of movement of the tumbler discs.

[0016] By means of the arrangement according to the invention the picking of the lock, especially by the so-called Hobbs' method and its derivates, can be impeded efficiently. In this method the lock bolt is exposed to a load that presses the lock bolt inwards, whereby the locking pin is pressed against the edge of the locking channel of the tumbler disc that prevents the movement of the lock bolt. Thus, by lifting the tumbler disc through the keyhole it is possible to probe the position of the branch being parallel with the movement of the lock bolt in the locking channel. This measure is repeated for each tumbler disc until the correct opening combination is found. Even the more advanced versions of the picking method are based on this principle.

[0017] Fig. 2 depicts the situation while a picking attempt is in progress. The essential element in the present solution is the detent plate 7 attached to the lock bolt 5 or in association therewith, which plate is loaded by a spring 12 against the lock bolt in such a way that the spring urges the detent plate 7 away from the end of the lock bolt 5 protruding from the lock. Since the locking pin 6 is arranged in the detent plate 7, the external pressing force exerted on the lock bolt is transmitted at the first stage to the tumbler discs 3 via the detent plate 7. When the lock bolt is exposed to a load for instance through the keyhole pushing the lock bolt backwards, the locking pin 6 is pressed against one or more tumbler discs 3. This is also the case if a wrong key inserted through the keyhole causes the load. If the right key had been used, the tumbler discs would have risen even before the movement of the lock bolt to a position allowing free movement of the lock bolt. In addition, the detent plate 7 always remains immobile with respect to the lock bolt, when the right key is used.

[0018] In Fig. 2 the lock bolt 5 is, however, loaded in a way different from the key matching the lock, whereby it is sufficient that even one tumbler disc 3 is in a position deviating from the correct combination. This makes the locking pin 6 to be pressed against the tumbling disc 3. Thus, the detent plate 7 is exposed to an opposite force with respect to the load on the lock bolt, which force under the influence of the pins 8' and grooves 8" moves the detent plate 7 upwards in the figure, whereby the detent 10 of the detent plate is pressed against the blocking members 9. Now the force exerted on the lock bolt is transmitted through the pins 8' and grooves 8" over to the detent plate 7 and further through the blocking members 9 to the lock casing 1, and not to the tumbler discs 3. This situation is shown in Fig. 3.

[0019] Fig. 3 also depicts a picklock or similar 13, by which the probing of the tumbler discs is attempted. However, the present invention makes it impossible to determine by probing the position of the branch 4 parallel with

the movement of the lock bolt in the locking channel of the tumbler discs 3, since the tumbler disc is at this stage moving without any load by the lock pin 6. This can be made even more efficient by designing locking channels 4 in the tumbler discs and the locking pin 6 so that the contact of the locking pin 6 with the tumbler disc 3 is easily released, when the tumbler disc is probed, i.e. lifted.

[0020] It is obvious that the technical solutions described above are only exemplary. The invention is thus not limited to the above-described embodiment, but several modifications thereof are feasible within the scope of the appended claims.

Claims

1. A tumbler lock (1) comprising a lock casing (2) or similar including a plurality of tumbler discs (3) provided with locking channels (4), a lock bolt (5), a locking pin (6) or similar arranged in force transmitting connection with the lock bolt (5) and in interaction with the locking channels (4) of the tumbler discs (3), and a separate force transmitting member (7) movably arranged in the lock bolt (5) and the locking pin (6) being arranged in the force transmitting member (7), **characterised in that** blocking members (9) are arranged in the lock casing (2), in the vicinity of the lock bolt (5), and **in that** the force transmitting member (7) comprises a detent (10) or similar members arranged by the movement between the force transmitting member (7) and the lock bolt (5) to interact with the blocking members (9) so that the force exerted on the lock bolt (5) and parallel with its direction of movement can be transmitted to the lock casing (2) by means of said members.

2. A tumbler lock according to claim 1, **characterised in that** the force transmitting member (7) is arranged in the lock bolt (5) so that their lateral surfaces face each other, and **in that** a mechanical guide system 8 is provided for guiding their reciprocal movement determining the limits for and/or the direction of the movement between the lock bolt (5) and said force transmitting member (7).

3. A tumbler lock according to claim 2, **characterised in that** the mechanical guide system (8) comprises at least one pin and guide groove combination or similar (8', 8") arranged to guide the force transmitting member (7) in a direction deviating from the direction of movement of the lock bolt (5).

4. A tumbler lock according to claim 1 comprising members (11) on the other side of the lock bolt (5) for transforming the turning movement of the key to a linear movement of the lock bolt, **characterised in that** the detent (10) of the force transmitting member (7) or similar members are arranged on the opposite side of the lock bolt (5) with respect to said members (11) of the lock bolt.

5. A tumbler lock according to any of the preceding claims, **characterised in that** the number of blocking members (9) is one less than the number of locking channel (4) branches parallel with the movement of the tumbler discs (3).

Patentansprüche

1. Zuhaltungsschloss (1) mit einem Schlosskasten (2) oder dergleichen, der mehrere mit Verriegelungskanälen (4) versehene Zuhaltungsscheiben (3) enthält, einem Schlossriegel (5), einem Verriegelungsstift (6) oder dergleichen, der in kraftübertragender Verbindung mit dem Schlossriegel (5) und mit den Verriegelungskanälen (4) der Zuhaltungsscheiben (3) zusammenwirkend angeordnet ist, und einem getrennten Kraftübertragungsglied (7), das beweglich im Schlossriegel (5) angeordnet ist, wobei der Verriegelungsstift (6) im Kraftübertragungsglied (7) angeordnet ist, **dadurch gekennzeichnet, dass** Sperrglieder (9) im Schlosskasten (2) in der Nähe des Schlossriegels (5) angeordnet sind und dass das Kraftübertragungsglied (7) eine Sperrklinke (10) oder ähnliche Glieder umfasst, die durch Bewegung zwischen dem Kraftübertragungsglied (7) und dem Schlossriegel (5) zum derartigen Zusammenwirken mit den Sperrgliedern (9) angeordnet werden, dass die auf den Schlossriegel (5) ausgeübte und parallel zu seiner Bewegungsrichtung ausgeübte Kraft mittels der Glieder auf den Schlosskasten (2) übertragen werden kann.

2. Zuhaltungsschloss nach Anspruch 1, **dadurch gekennzeichnet, dass** das Kraftübertragungsglied (7) so im Schlossriegel (5) angeordnet ist, dass ihre Seitenflächen zueinander weisen, und dass ein mechanisches Führungssystem (8) zum Führen ihrer Hin- und Herbewegung vorgesehen ist, das die Grenzen für die und/oder die Richtung der Bewegung zwischen dem Schlossriegel (5) und dem Kraftübertragungsglied (7) bestimmt.

3. Zuhaltungsschloss nach Anspruch 2, **dadurch gekennzeichnet, dass** das mechanische Führungssystem (8) mindestens eine Kombination aus Stift und Führungsnut oder dergleichen (8', 8") umfasst, die zur Führung des Kraftübertragungsglieds (7) in einer von der Bewegungsrichtung des Schlossriegels (5) abweichenden Richtung angeordnet ist.

4. Zuhaltungsschloss nach Anspruch 1 mit Gliedern (11) auf der anderen Seite des Schlossriegels (5) zum Umwandeln der Drehbewegung des Schlüssels

in eine lineare Bewegung des Schlossriegels, **dadurch gekennzeichnet, dass** die Sperrklinke (10) des Kraftübertragungsglieds (7) oder ähnliche Glieder auf der gegenüberliegenden Seite des Schlossriegels (5) bezüglich der Glieder (11) des Schlossriegels angeordnet sind.

5. Zuhaltungsschloss nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Anzahl der Sperrglieder (9) eins weniger beträgt als die Anzahl der Abzweigungen vom Verriegelungskanal (4) parallel zur Bewegung der Zuhaltungsscheiben (3).

Revendications

1. Serrure à gorges (1) comprenant un boîtier de serrure (2) ou similaire comportant une pluralité de disques de gorges (3) pourvus de canaux de verrouillage (4), un pêne de serrure (5), une goupille de verrouillage (6) ou similaire, disposée suivant une connexion à transmission de force avec le pêne de serrure (5) et en interaction avec les canaux de verrouillage (4) des disques de gorges (3), et un organe séparé de transmission de force (7) disposé de façon mobile dans le pêne de serrure (5), et la goupille de verrouillage (6) étant disposée dans l'organe de transmission de force (7), **caractérisée en ce que** des organes de blocage (9) sont agencés dans le boîtier de serrure (2), à proximité du pêne de serrure (5), et **en ce que** l'organe de transmission de force (7) comprend un goujon (10) ou des organes similaires prévus, par le mouvement entre l'organe de transmission de force (7) et le pêne de serrure (5), pour interagir avec les organes de blocage (9) de sorte que la force exercée sur le pêne de serrure (5) et parallèlement à sa direction de mouvement puisse être transmise au boîtier de serrure (2) au moyen desdits organes.

2. Serrure à gorges selon la revendication 1, **caractérisée en ce que** l'organe de transmission de force (7) est agencé dans le pêne de serrure (5) de telle sorte que leurs surfaces latérales soient en regard l'une de l'autre et **en ce qu'**un système de guidage mécanique (8) soit prévu pour guider leur mouvement réciproque déterminant les limites du mouvement et/ou la direction du mouvement entre le pêne de serrure (5) et ledit organe de transmission de force (7).

3. Serrure à gorges selon la revendication 2, **caractérisée en ce que** le système de guidage mécanique (8) comprend au moins une combinaison de goupille et de rainure de guidage ou similaire (8', 8") agencée pour guider l'organe de transmission de force (7) dans une direction s'écartant de la direction de mouvement du pêne de serrure (5).

4. Serrure à gorges selon la revendication 1, comprenant des organes (11) de l'autre côté du pêne de serrure (5) pour transformer le mouvement de rotation de la clé en un mouvement linéaire du pêne de serrure, **caractérisée en ce que** le goujon (10) de l'organe de transmission de force (7) ou des organes similaires sont agencés de l'autre côté du pêne de serrure (5) par rapport auxdits organes (11) du pêne de serrure.

5. Serrure à gorges selon l'une quelconque des revendications précédentes, **caractérisée en ce que** le nombre d'organes de blocage (9) est un de moins que le nombre de branches des canaux de verrouillage (4) parallèles au mouvement des disques de gorges (3).

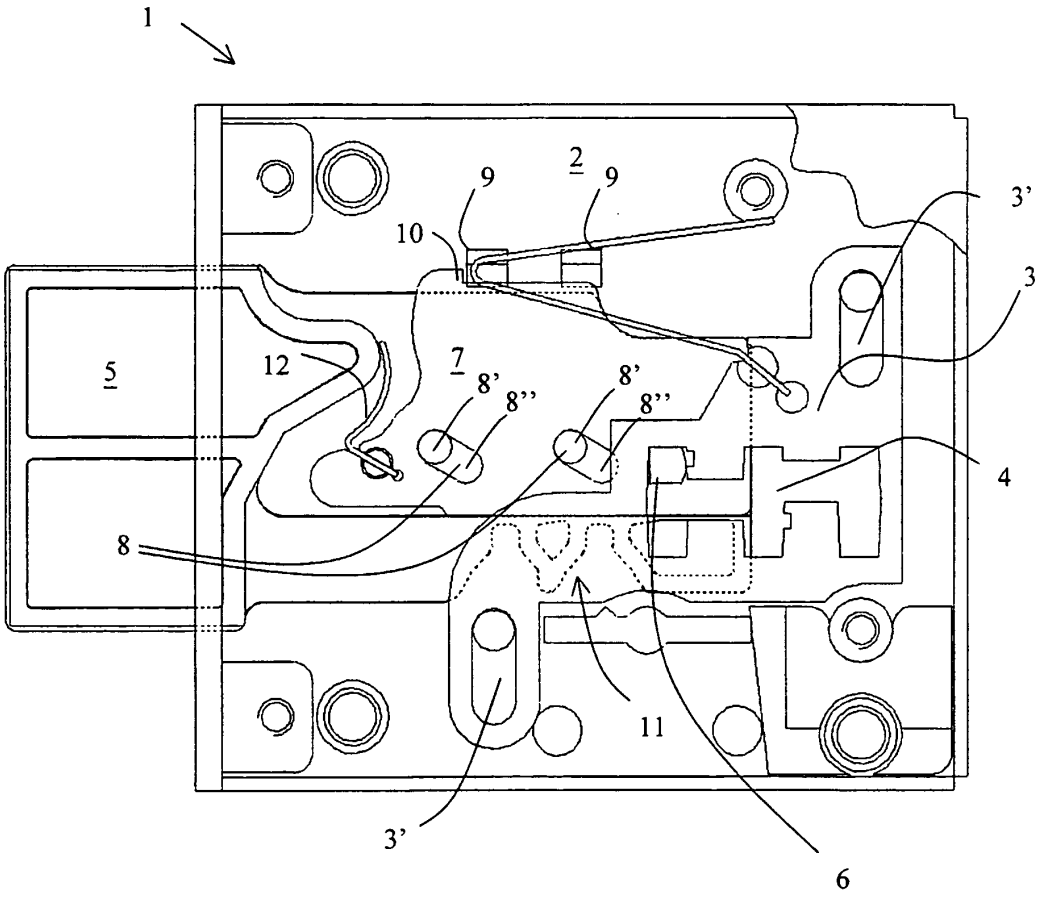

Fig. 1

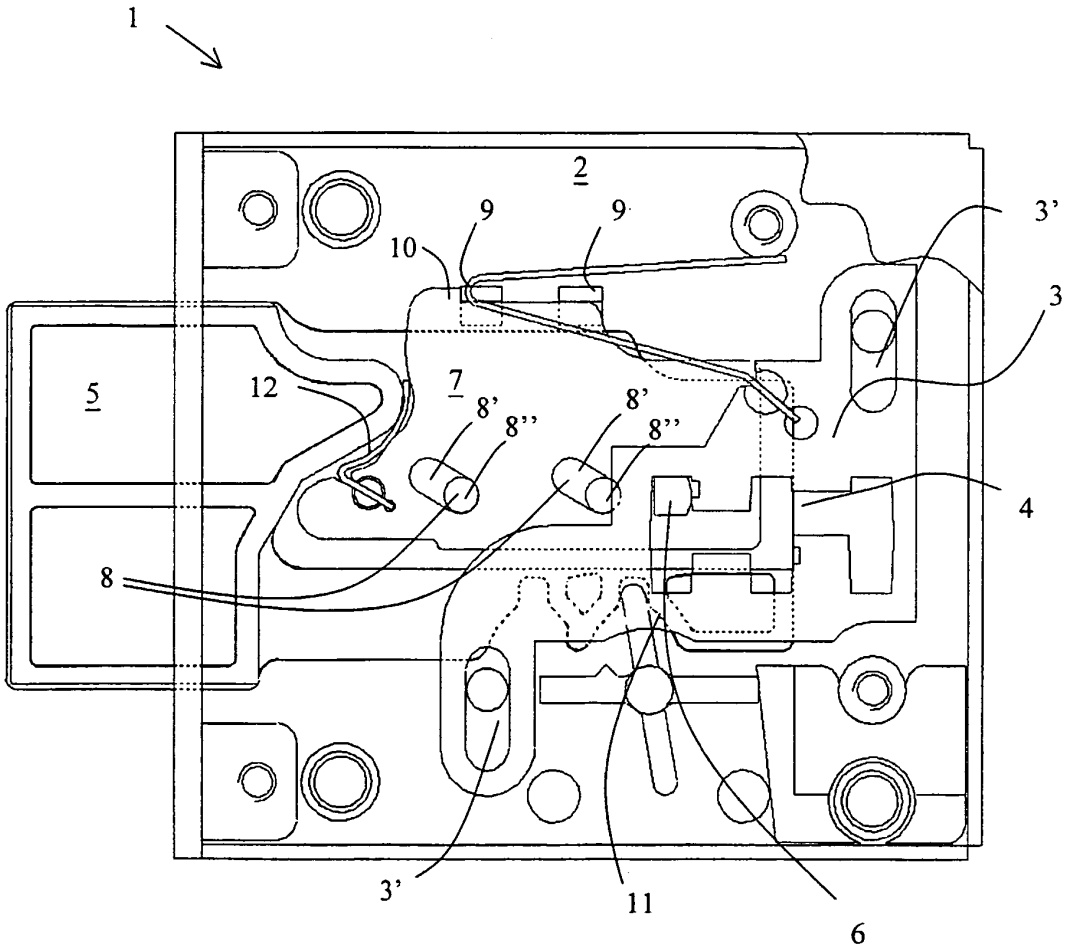

Fig. 2

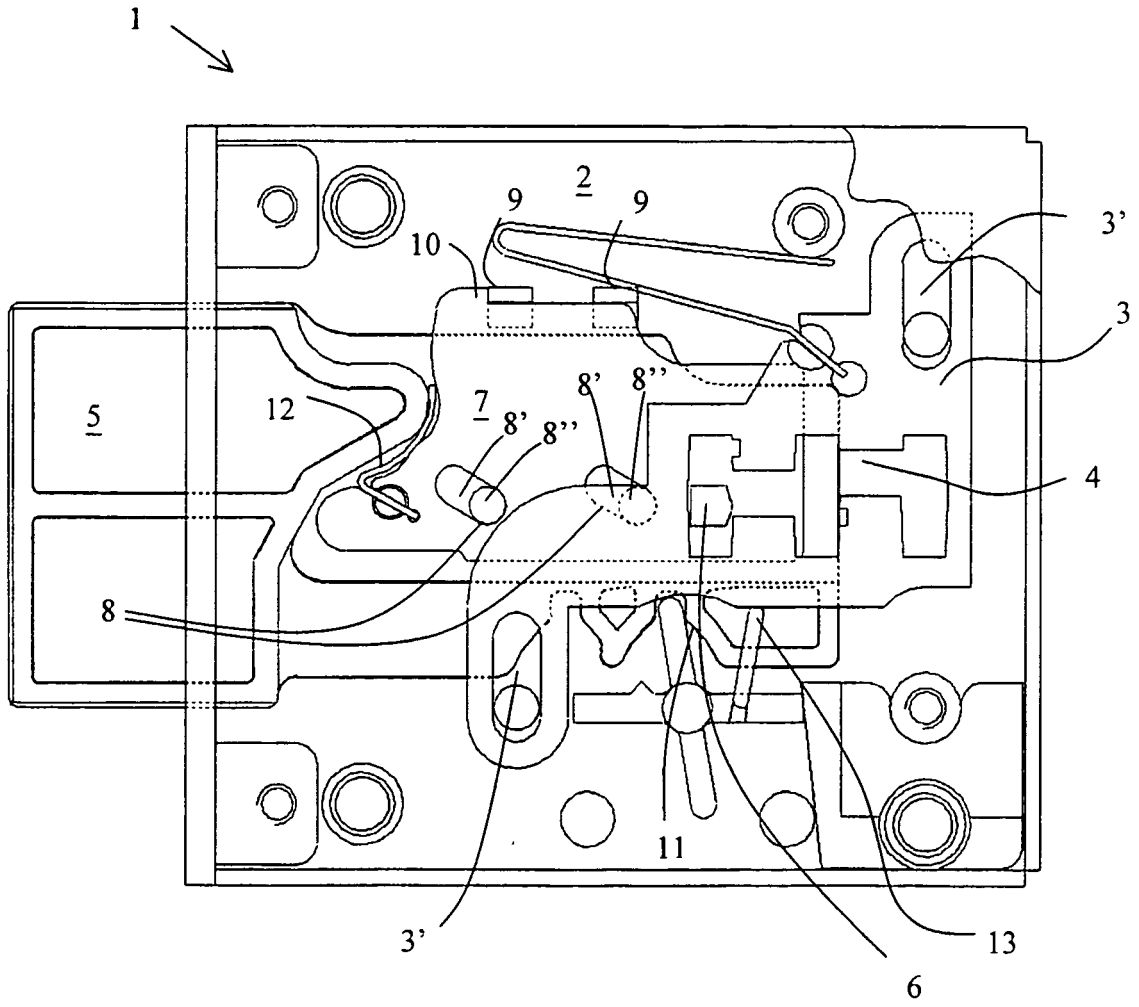

Fig. 3