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Description

This invention relates to a lock and key, there being associated with the key a permanent magnetic field and the lock comprising at least one magnetic locking element which can be moved from a locking position to a releasing position by the magnetic field of the key, when the key is applied to the lock.

A magnetic lock and key are described in U.S. Patent No. 2,177,996. This lock comprises a hollow plug arranged for rotation within a sleeve. Axially extending grooves formed in the plug and sleeve collectively define a path along which a magnetic ball can be moved by the magnetic field of the key from a locking position to a releasing position. In the locking position, the ball is engageable with abutment surfaces at opposite sides of its path, these surfaces being formed on the plug and sleeve respectively, so that relative rotation of the plug and sleeve is restrained. In the sleeve, there is formed a circumferentially extending groove which communicates with the axially extending groove. When the ball is in its releasing position, it is aligned with the circumferentially extending groove so that relative rotation of the plug and sleeve is possible. A second magnetic ball is disposed in a similar pair of axially extending grooves which communicate with the circumferentially extending groove. The possibility of providing further magnetic locking balls is mentioned.

In the lock described in U.S. 2,177,996, the circumferentially extending groove extends completely around the axis of the lock and intersects the path of each magnetic ball. By means of a suitable magnet, all of the balls could be aligned with this single groove, thereby freeing the plug for rotation relative to the sleeve.

A further disadvantage of the lock described in the aforesaid U.S. Patent is that manufacture of the lock becomes unduly complex if the number of magnetic elements is increased. In order to provide a sufficiently large number of different locks and keys to ensure proper security, a number of locking elements exceeding two is required. The U.S. Patent proposes that the number of different locks and keys which can be produced should be increased by varying the position relative to the grooves of a driving lug of the key. However, this simple mechanical expedient does not provide adequate security.

In WO 80/1586, there is described a lock having inner and outer hollow members and a number of magnetic rollers. The inner and outer members collectively define a path for each roller, one half of the roller lying in a groove in the outer surface of the inner member and the other half of the roller lying in a groove in the internal surface of the outer member. Each path extends circumferentially of the members. In respective surfaces of the outer member which define parts of the paths for the rollers, there are

formed openings which one half of the corresponding roller can enter. This permits relative axial displacement of the inner and outer members. Whilst the magnetic rollers occupy the openings in the outer member, movement of the rollers relative to the outer member along their paths is restrained by boundaries of the openings and only after the rollers have been moved out of the corresponding openings can the rollers move circumferentially relative to the outer member along their paths away from the openings.

According to the present invention, there is provided a lock comprising an inner member, a hollow outer member in which the inner member is mounted and a plurality of magnetic elements, wherein the inner and outer members collectively define respective paths to which the magnetic elements are confined and along which the magnetic elements can move between respective releasing positions and respective locking positions, the inner and outer members have, for each path, respective abutment surfaces facing in opposite directions transverse to the length of the path and disposed at opposite sides of the path and said abutment surfaces are engageable concurrently with respective ones of the magnetic elements when the magnetic elements occupy their locking positions, whereby relative movement of the inner and outer members in said directions is restricted or prevented by engagement of the magnetic elements with the abutment surfaces except when the magnetic elements occupy their releasing positions, characterised in that there are in the abutment surfaces of the inner member openings corresponding to respective ones of the magnetic elements and each of which openings a part of the corresponding magnetic element can enter when the element is in its releasing position and in that means is provided for preventing movement of one of said magnetic elements into the opening corresponding to another of the magnetic elements whereby, whilst each opening is occupied by a part of the corresponding magnetic element, movement of that element along its path relative to the inner member is restrained by boundaries of the opening and only after the magnetic element has moved out of the corresponding opening can the element move relative to the inner member along its path away from the releasing position.

In the preferred lock according to the invention, one of said members can be locked in a selected one of a plurality of alternative positions upon withdrawal of the key from the lock and the lock includes a key-retaining member which also turns about the axis during operation of the lock and is adapted to retain the key except when the one member is in one of said alternative positions. Because the key-retaining member participates in turning about the axis, it is not necessary to modify the shape

of the key-retaining member according to the number of and relationship between the alternative positions in which the one member can be locked.

One example of a lock and key embodying each aspect of the invention will now be described, with reference to the accompanying drawings wherein:—

FIGURE 1 shows an end view of the lock, the key being absent from the lock;

FIGURE 2 shows an opposite end view of the lock;

FIGURE 3 shows a cross-section on the line III—III of Figure 1, together with a key of which the shank is present in the lock;

FIGURE 4 shows a cross-section on the line IV—IV of the lock and key, prior to rotation of the key;

FIGURE 5 shows a cross-section on the line IV—IV of Figure 3 after the key has been rotated through an angle of 30°;

FIGURE 6 shows a cross-section on the line VI—VI of Figure 3, prior to turning of the key;

FIGURE 7 shows a cross-section on the line VI—VI after the key has been rotated through an angle of 30°; and

FIGURE 8 shows a cross-section of the lock on the line VIII—VIII of Figure 3.

The lock illustrated in the accompanying drawings comprises an inner member 10 of generally cylindrical form having a longitudinal axis 11 about which the inner member is turned by means of a key 12 during operation of the lock. On an end portion 13 of the inner member, called herein the rear end portion, there is formed a pair of flats 14 which engage an operating arm 15 within a non-circular opening of the arm. The arm is trapped on the inner member between a circlip 16 and a nut 17. The arm 15 is used to control a device which is to be controlled by the lock. For example, the arm itself may be a latch. Alternatively, there may be formed on the arm a cam surface which co-operates with an element (not shown) controlled by the lock.

The lock further comprises a hollow outer member 18, also of generally cylindrical form, within which the inner member 10 is mounted. The outer member is concentric with the inner member and is a sliding fit on the inner member.

The outer member 18 is disposed within a housing 19, relative to which the outer member can turn about the axis 11 when the proper key is used to operate the lock. The shape of the housing may be selected according to the intended use of the lock. As illustrated, the housing may be formed in a plurality of parts, at least some of which may be provided with screw threads to enable the parts of the housing to be releasably secured together. In the example illustrated, a front part 20 of the housing extends through an opening in a mounting plate 21 and is secured therein by a nut 22 screwed onto the front housing part. The

entire housing will normally be fixed during use of the lock.

A stop element 23 is provided for releasably preventing turning of the outer member 18 relative to the housing 19 until the inner member 10 has been turned by means of the key 12 through a predetermined angle to effect release of the outer member. The stop element is in the form of a bolt having a central opening through which the rear end portion 13 of the inner member protrudes. The bolt is held against a rear end face 24 of the outer member 18 by a bolt carrier 25. The bolt carrier is of hollow, generally cylindrical form having one end wall and an external diameter equal to that of the outer member 18. The bolt carrier has three limbs 26, 27, 28 which project from the end wall of the carrier in the forward direction through the central aperture of the bolt. Five grooves are formed in the external surface of the inner member 10, each of these grooves being rectilinear, parallel to the axis 11 and extending along the entire length of the inner member. The limbs 26, 27 and 28 of the bolt carrier engage in respective ones of these grooves indicated by the reference numerals 29, 30 and 31. The bolt carrier is thereby constrained to turn about the axis 11 with the inner member relative to the bolt and the outer member.

There is formed in the wall of the outer member 18 adjacent to the rear end thereof an opening 32. Openings having dimensions extending circumferentially of the axis 11 similar to the corresponding dimension of the opening 32 are formed in a rear part 33 of the housing 19 adjacent to a rear wall 34 of the housing. In the example illustrated, there are four of these openings in the housing identified by the reference numerals 35 to 38. The bolt 23 has a nose 39 which can protrude through the opening 32 into any selected one of the openings 35 to 38 and thereby restrain turning of the outer member 18 about the axis 11 relative to the housing. The bolt is urged into the active position illustrated in Figure 3 by a leaf spring 40 having a mid portion which bears against the bolt and end portions which bear against the internal face of the outer member 18. Engagement of the nose 39 of the bolt in the opening 32 prevents turning of the bolt relative to the outer member.

From the nose 39 there projects into the central opening of the bolt 23 an abutment 41 of the bolt. When the key is absent from the lock, the abutment 41 is aligned with the limb 27 of the bolt carrier 25 as shown in Figure 4 so that complete withdrawal of the bolt from the opening of the housing is prevented by engagement of the abutment 41 with the limb 27 which constitutes an abutment of the bolt carrier.

If the key 12 is inserted into the inner member 10 and the key and inner member are

then turned in either direction about the axis 11, the limb 27 is moved out of alignment with the abutment 41 so that the nose 39 of the bolt can move towards the axis 11. Turning of the inner member in either direction also brings one or other of the limbs 26 and 28 into engagement with a respective surface 42 or 43 on the bolt which faces generally in a direction away from the leaf spring 40 and towards the nose 39. Further turning of the inner member causes the bolt to slide between the end face 24 of the outer member and the end wall of the bolt carrier in a direction transverse to the axis 11 until the nose 39 is substantially withdrawn from the opening of the housing. As shown, the nose 39 may be provided with a rounded tip which will automatically be forced out of the opening in the housing upon rotation of the bolt and outer member relative to the housing, provided the nose is substantially withdrawn from the opening of the housing before rotation of the outer member commences. Thus, by turning of the inner member 10 the bolt can be moved to the releasing position illustrated in Figure 5 in which it no longer restrains rotation of the outer member 18.

The outer member 18 consists of a tubular element 44 and an end cap 45 secured on the front end of the element 44. In the internal surface of the element 44, there is formed a number of grooves equal to the number of grooves provided in the external surface of the inner member 10. The circumferential extent and spacing between the grooves 46 of the outer member are the same as those of the grooves of the inner member so that each of the grooves 46 can be aligned with a corresponding groove of the inner member. The grooves 46 also extend along the entire length of the element 44 and are parallel to the axis 11. Three magnetic elements 47, 48 and 49 are each disposed partly in the groove 30 of the inner member and partly in the corresponding groove 46 of the outer member. In the particular example illustrated, each magnetic element is in the form of a hollow cylinder having flat end faces which are engageable with boundary surfaces of the grooves 30 and 46. In the example illustrated, each of these grooves has a transverse cross-section of rectangular shape with flat abutment surfaces at opposite sides of the grooves.

The groove 30 extends through a major part of the thickness of the inner member 10, almost to the central bore 50 thereof. There are also formed in the outer surface of the inner member 10 a plurality of relatively shallow circumferentially extending grooves 51 containing respective rings 52 to 55. The ring 52 lies adjacent to the rear end of the inner member. The rings 53 to 55 lie between the ends of the groove 30 and are spaced apart from each other along the axis 11. As shown in Figure 3, the magnetic elements 47 to 49 lie between respective different pairs of the rings

52 to 55 so that travel of the magnetic elements along the groove 30 is limited to prevent two or more magnetic elements occupying the same part of the groove. In the absence of the key, each magnetic element is free to move along a respective path defined collectively by the boundary surfaces of the grooves 30 and 46, these paths being co-linear and parallel to the axis 11.

In the abutment surfaces at opposite sides of the groove 30, there are formed openings 56 which are sufficiently large to receive that part of a magnetic element 47 to 49 which is normally disposed in the groove 30. In the example illustrated, there is in each abutment surface a single opening for the element 47, a single opening for the element 48 and two axially spaced openings for the element 49. The openings 56 are formed by the provision of transversely extending channels in the external surface of the inner member 10.

The boundary surface of each transverse channel 57 which faces away from the axis 11, that is the base of the channel, is such that there can be drawn on the base of the channel a rectilinear line transverse to the length of the groove 30. At the position where a transverse channel 57 intersects the groove 30, the depth of the transverse channel is equal to that of the groove. The depth of the transverse channel decreases gradually in both directions away from the groove 30 until the transverse channel runs out onto the external surface of the inner member. In the particular example illustrated, the base of each transverse channel is flat.

When any one of the magnetic elements 47, 48 and 49 is not aligned with a corresponding one of the transverse channels 57, that element is said to be in a locking position and, by engagement with opposed abutment surfaces of the inner and outer members, it prevents or restricts turning of the inner member about the axis 11 relative to the outer member. When the key is absent from the lock, at least some and usually all of the magnetic elements will occupy locking positions.

It will be noted that the depth of the groove 30 significantly exceeds one half of the corresponding dimension of the magnetic elements and that the depth of the grooves 46 is similar to that of the groove 30. However, the depth of these grooves is significantly less than the corresponding dimension of the magnetic elements. There is associated with the key 12 a permanent magnetic field such that, when a shank 58 of the key is introduced into the central bore 50 of the inner member, each of the magnetic elements is biased by the magnetic field into a releasing position where it is aligned with a respective one of the transverse channels 57. Thus, the magnetic elements are no longer engaged between oppositely facing abutment surfaces and the inner member can be turned about the axis 11 in either direction relative to the outer member

18. Since a part of each magnetic element remains in the groove 46, such turning causes each magnetic element to move along the base of the corresponding transverse channel and therefore to move further away from the axis 11. Before such movement is interrupted by engagement of the magnetic elements with a radially inwardly facing surface of the outer member, the outer member itself is freed for turning movement with the inner member by retraction of the nose 39 of the bolt from the opening in the housing 19. Continued turning of the inner member 10 is then accompanied by turning of the outer member relative to the housing. The inner member is turned sufficiently to bring about operation of an associated device by means of the arm 15.

The arm 15 can be locked in a selected angular position by turning the inner member 10 in the reverse direction relative to the outer member 18 whilst the nose 39 of the bolt is aligned with a selected one of the openings 35 to 38 in the housing 19. Such alignment is indicated to a user by noticeably increased resistance to turning of the inner member 10 which is necessary to force the rounded tip of the nose 39 out of one of the openings in the housing, against the action of the spring 40. It will be understood that reverse rotation of the inner member 10 relative to the outer member 18 causes the magnetic elements 47, 48 and 49 to move along their respective transverse channels 57 into alignment with the groove 30 once more. Withdrawal of the key then displaces the magnetic elements along their respective paths of movement into locking positions.

In the end cap 45, there are formed three recesses 59 having open sides facing along the axis 11 towards the inner member 10. In each of these recesses there is disposed a freely rotatable ball 60 of hardened steel. These balls prevent the drilling away of the end cap so that the inner member 10 can be withdrawn from the outer member 18. The end cap also defines a non-circular opening 61 through which the key shank can be introduced into the bore 50 of the inner member. The opening 61 comprises a circular portion having the same diameter as, and being aligned with, the bore 50 and a rectangular extension 62 of the circular portion. The shank 58 of the key is of generally cylindrical form but has, adjacent to a handle of the key, a radially projecting lug 63 having dimensions such that it can pass through the extension 62 of the opening in the end cap. Immediately adjacent to the opening 61 and between that opening and the inner member 10, there is in the end cap 45 an arcuate recess 64 which accommodates the lug 63 of the key when the key is turned relative to the outer member 18 through an angle of 30° in either direction after the lug has passed through the opening 61. After the key has been turned through an angle of 30° relative to the outer

member, torque can be transmitted from the key to the outer member by engagement of the lug 63 with boundary surfaces of the recess 64.

The lug 63 also transmits torque to the inner member 10 by engaging in a recess 65 at the front end thereof. There is only a small clearance between the lug 63 and the boundary surfaces of the recess 65 so that no significant turning of the key relative to the inner member 10 is permitted. It will be seen that portions of the end cap 45 bordering the rectangular extension 62 of the opening therein trap the key in the bore 50 of the inner member whenever the nose 39 of the bolt is withdrawn or substantially withdrawn from the openings 35 to 38 of the housing. Only when the nose 39 is engaged in an opening of the housing can the limb 27 be moved into alignment with the abutment 41 to align the lug 63 with the extension 62 of the opening in the end cap and thereby permit extraction of the key from the lock.

The end cap 45 may include flaps 66 which substantially close the opening of the end cap when the key is absent from the lock. The end cap is preferably formed of a resilient plastics material by a moulding process.

The inner member 10 and the tubular element 44 of the outer member are preferably formed of a non-magnetic metal, for example aluminium or brass. Since the groove 30 and other grooves of the inner member and the grooves 46 of the outer member are rectilinear and extend along the entire lengths of the inner member and element 44 respectively, these grooves can conveniently be formed by an extrusion process. This has the advantage that smooth abutment surfaces on the inner and outer members can be achieved without careful machining of the inner and outer members. The other grooves and openings in the inner and outer members are formed by machining extruded tubular workpieces. It will be noted that each transverse channel 57 can be formed by a single straight cut across the inner member 10.

The inner member 10 is preferably formed by extrusion with a central opening 67 of smaller diameter than the bore 50, the bore subsequently being formed in the inner member by machining. It will be noted from Figure 3 that the bore 50 does not extend into the rear end portion 13 of the inner member.

The key shank 58 is provided with magnetic pole faces at positions corresponding to respective paths of the magnetic elements. Each pole face has a length, measured along the axis 11, which exceeds its width, measured circumferentially of the axis 11 and a maximum flux density at a position corresponding to the releasing position of the associated magnetic element. In the example illustrated, the magnetic element 49 has two releasing positions and is moved into one of these positions by a master key and into the other position by another key.

It will be understood that the number of magnetic elements in each groove of the inner member can be varied. In the particular example described, only one groove of the inner member contains magnetic elements but generally more than one groove will contain at least one magnetic element. Locks will also differ one from the other in respect of the relation between the releasing position of each magnetic element and the ends of its path of movement.

By appropriate choice of the relative positions of the paths of the magnetic elements, the magnetic pole faces of the key can be spaced well apart. This facilitates the establishment of high flux densities at the magnetic poles so that reliable operation of the lock by the key is assured even under adverse conditions.

Claims

1. A lock comprising an inner member (10), a hollow outer member (18) in which the inner member is mounted and a plurality of magnetic elements (47, 48), wherein the inner and outer members collectively define respective paths to which the magnetic elements are confined and along which the magnetic elements can move between respective releasing positions and respective locking positions, the inner and outer members have, for each path, respective abutment surfaces facing in opposite directions transverse to the length of the path and disposed at opposite sides of the path and said abutment surfaces are engageable concurrently with respective ones of the magnetic elements when the magnetic elements occupy their locking positions, whereby relative movement of the inner and outer members in said directions is restricted or prevented by engagement of the magnetic elements with the abutment surfaces except when the magnetic elements occupy their releasing positions, characterised in that there are in the abutment surfaces of the inner member openings (56) corresponding to respective ones of the magnetic elements (47, 48) and each of which openings a part of the corresponding magnetic element can enter when the element is in its releasing position and in that means (54) is provided for preventing movement of one of said magnetic elements into the opening corresponding to another of the magnetic elements whereby, whilst each opening is occupied by a part of the corresponding magnetic element, movement of that element along its path relative to the inner member is restrained by boundaries of the opening and only after the magnetic element has moved out of the corresponding opening can the element move relative to the inner member along its path away from the releasing position.

2. A lock according to Claim 1 wherein said openings (56) are formed by the intersection of

respective transverse channels (57) and said paths, one boundary of each transverse channel being a respective surface of the inner member which faces towards the outer member and contains a rectilinear line transverse to the corresponding path.

3. A lock according to Claim 2 wherein each transverse channel (57) extends from the corresponding path in opposite directions.

4. A lock according to Claim 2 or Claim 3 wherein said surface of each transverse channel (57) is flat.

5. A lock according to any preceding claim wherein, when the magnetic elements (47, 48) are in their releasing positions, the inner and outer members (10, 18) can undergo limited relative rotation about an axis (11) parallel to the lengths of said paths.

6. A lock according to Claim 5 further comprising a housing (19) for the outer member (18) and a stop element (23) which releasably prevents turning of the outer member (18) relative to the housing until the inner member has been turned through a predetermined angle to effect release of the outer member for turning with the inner member.

7. A lock according to Claim 6 wherein the stop element (23) is a slidable bolt which is movable transversely of the axis between an active position and an inactive position, in its active position the bolt engages in respective openings in the outer member and in the housing and the inner member (10) has an abutment (27) which, when the locking elements (47) are in their locking positions, is engageable with the bolt to prevent movement of the bolt from its active position to its inactive position.

8. A lock according to Claim 7 wherein the housing (19) has a plurality of openings (35, 36, 37, 38), in any selected one of which the bolt (23) can engage to restrain turning of the outer member relative to the housing.

9. A lock according to any preceding claim wherein the inner member (10) has a bore to receive a shank (58) of the key (12), the outer member (18) defines a non-circular aperture through which the key shank can be introduced into the bore of the inner member and there is adjacent to the aperture a space (64) which can accommodate a non-circular part (63) of the key shank complementary to said aperture after such part has been passed through the aperture and then turned about the axis to trap the key shank in the outer member.

10. A lock according to any preceding claim wherein at least one of said inner and outer members is formed by an extrusion process with respective channels each extending from one end of the member to the other end and a part of at least one of the magnetic elements is received in the channel.

11. A lock according to any preceding claim wherein the inner and outer members are each formed with a respective groove, respective

It will be understood that the number of magnetic elements in each groove of the inner member can be varied. In the particular example described, only one groove of the inner member contains magnetic elements but generally more than one groove will contain at least one magnetic element. Locks will also differ one from the other in respect of the relation between the releasing position of each magnetic element and the ends of its path of movement.

By appropriate choice of the relative positions of the paths of the magnetic elements, the magnetic pole faces of the key can be spaced well apart. This facilitates the establishment of high flux densities at the magnetic poles so that reliable operation of the lock by the key is assured even under adverse conditions.

Claims

1. A lock comprising an inner member (10), a hollow outer member (18) in which the inner member is mounted and a plurality of magnetic elements (47, 48), wherein the inner and outer members collectively define respective paths to which the magnetic elements are confined and along which the magnetic elements can move between respective releasing positions and respective locking positions, the inner and outer members have, for each path, respective abutment surfaces facing in opposite directions transverse to the length of the path and disposed at opposite sides of the path and said abutment surfaces are engageable concurrently with respective ones of the magnetic elements when the magnetic elements occupy their locking positions, whereby relative movement of the inner and outer members in said directions is restricted or prevented by engagement of the magnetic elements with the abutment surfaces except when the magnetic elements occupy their releasing positions, characterised in that there are in the abutment surfaces of the inner member openings (56) corresponding to respective ones of the magnetic elements (47, 48) and each of which openings a part of the corresponding magnetic element can enter when the element is in its releasing position and in that means (54) is provided for preventing movement of one of said magnetic elements into the opening corresponding to another of the magnetic elements whereby, whilst each opening is occupied by a part of the corresponding magnetic element, movement of that element along its path relative to the inner member is restrained by boundaries of the opening and only after the magnetic element has moved out of the corresponding opening can the element move relative to the inner member along its path away from the releasing position.

2. A lock according to Claim 1 wherein said openings (56) are formed by the intersection of

respective transverse channels (57) and said paths, one boundary of each transverse channel being a respective surface of the inner member which faces towards the outer member and contains a rectilinear line transverse to the corresponding path.

3. A lock according to Claim 2 wherein each transverse channel (57) extends from the corresponding path in opposite directions.

4. A lock according to Claim 2 or Claim 3 wherein said surface of each transverse channel (57) is flat.

5. A lock according to any preceding claim wherein, when the magnetic elements (47, 48) are in their releasing positions, the inner and outer members (10, 18) can undergo limited relative rotation about an axis (11) parallel to the lengths of said paths.

6. A lock according to Claim 5 further comprising a housing (19) for the outer member (18) and a stop element (23) which releasably prevents turning of the outer member (18) relative to the housing until the inner member has been turned through a predetermined angle to effect release of the outer member for turning with the inner member.

7. A lock according to Claim 6 wherein the stop element (23) is a slidable bolt which is movable transversely of the axis between an active position and an inactive position, in its active position the bolt engages in respective openings in the outer member and in the housing and the inner member (10) has an abutment (27) which, when the locking elements (47) are in their locking positions, is engageable with the bolt to prevent movement of the bolt from its active position to its inactive position.

8. A lock according to Claim 7 wherein the housing (19) has a plurality of openings (35, 36, 37, 38), in any selected one of which the bolt (23) can engage to restrain turning of the outer member relative to the housing.

9. A lock according to any preceding claim wherein the inner member (10) has a bore to receive a shank (58) of the key (12), the outer member (18) defines a non-circular aperture through which the key shank can be introduced into the bore of the inner member and there is adjacent to the aperture a space (64) which can accommodate a non-circular part (63) of the key shank complementary to said aperture after such part has been passed through the aperture and then turned about the axis to trap the key shank in the outer member.

10. A lock according to any preceding claim wherein at least one of said inner and outer members is formed by an extrusion process with respective channels each extending from one end of the member to the other end and a part of at least one of the magnetic elements is received in the channel.

11. A lock according to any preceding claim wherein the inner and outer members are each formed with a respective groove, respective



parts of said grooves collectively form said path for at least one of said magnetic elements and wherein one of the inner and outer members has an element extending across its groove between the ends thereof to limit travel of the magnetic element along the grooves.

Patentansprüche

1. Schloß mit einem Innenteil (10), einem hohlen Außenteil (18), in dem das Innenteil angebracht ist und mehreren magnetischen Elementen (47, 48), wobei Innen- und Außenteile gemeinsam Wege festlegen, auf welche die magnetischen Elemente beschränkt sind, und längs derer sich die magnetischen Elemente zwischen Öffnungs- und Verriegelungspositionen bewegen können, wobei Innen- und Außenteile für jeden Weg entsprechende Anschlagoberflächen, die gegenüberliegend, quer zur Weglänge an gegenüberliegenden Seiten des Weges angeordnet sind, besitzen, wobei die Anschlagflächen gleichzeitig mit entsprechenden magnetischen Elementen dann, wenn die magnetischen Elemente in Schließposition sind, in Eingriff bringbar sind, wodurch eine Relativ-Bewegung des Außen- und Innenteils in den Richtungen durch Ineingriffkommen der magnetischen Elemente mit den Anschlagflächen begrenzt oder verhindert wird, außer wenn die magnetischen Elemente sich in ihren Öffnungsstellungen befinden, dadurch gekennzeichnet, daß in den Anschlagflächen der Innenteile Öffnungen (56), den magnetischen Elementen (47, 48) entsprechend, vorliegen, wobei in jede Öffnung ein Teil des entsprechenden magnetischen Elementes eintreten kann, wenn sich das Element in seiner Öffnungsstellung befindet und daß eine Einrichtung (54) zum Verhindern der Bewegung eines der magnetischen Elemente in die einem anderen magnetischen Element entsprechenden Öffnung vorgesehen ist, und daß während jede Öffnung durch ein Teil des entsprechenden magnetischen Elementes besetzt ist, die Bewegung des Elementes entlang seines Weges relativ zum Innenteil durch die Begrenzung der Öffnung eingeschränkt ist und lediglich nachdem sich das magnetische Element aus der entsprechenden Öffnung bewegt hat, das Element sich relativ zum Innenteil längs seines Weges aus der Öffnungsposition bewegen kann.

2. Schloß gemäß Anspruch 1, wobei die Öffnungen (56) durch die Schnittstellen entsprechender Querkanäle (57) mit den Wegen gebildet sind, wobei die Begrenzung jedes Querkanales eine Oberfläche des Innenteils ist, welche gegen das Außenteil gerichtet ist, und eine rechtwinklige Nut, quer zum entsprechenden Weg, enthält.

3. Schloß gemäß Anspruch 2, wobei jeder Querkanal (37) sich vom entsprechenden Weg in entgegengesetzte Richtungen erstreckt.

4. Schloß gemäß Anspruch 2 oder 3, wobei die Oberfläche jedes Querkanales (57) eben ist.

5. Schloß gemäß einem der vorangehenden Ansprüche, wobei dann, wenn die magnetischen Elemente (47, 48) sich in ihrer Öffnungsposition befinden, die Innen- und Außenteile (10, 18) eine begrenzte Relativrotation um eine Achse (11), die parallel zur Weglänge verläuft, durchführen können.

6. Schloß gemäß Anspruch 5, welches ferner ein Gehäuse (19) für das Außenteil (18) und einen Anschlag (23), der lösbar das Drehen des Außenteils (18) relativ zum Gehäuse verhindert, bis das Innenteil sich um einen vorherbestimmten Winkel gedreht hat, um das Entriegeln des Außenteils zum gemeinsamen Drehen mit dem Innenteil zu bewirken aufweist.

7. Schloß gemäß Anspruch 6, wobei das Anschlagelement (23) ein verschiebbarer Bolzen ist, der quer zur Achse zwischen einer Wirkstellung und einer in-aktiven Stellung bewegbar ist, wobei der Bolzen in seiner Wirkstellung in Öffnungen im Außenteil und im Gehäuse in Eingriff kommt und das Innenteil (10) einen Anschlag (27) besitzt, der dann, wenn die Verriegelungselemente (47) sich in ihren Verriegelungspositionen befinden, mit dem Bolzen in Eingriff bringbar ist, um Bewegung des Bolzens aus seiner Wirkstellung in seine inaktive Stellung zu verhindern.

8. Schloß gemäß Anspruch 7, wobei das Gehäuse (19) mehrere Öffnungen (35, 36, 37, 38) besitzt, wobei der Bolzen (23) mit einer ausgewählten, in Eingriff kommen kann, um das Drehen des Außenteils relativ zum Gehäuse zu verhindern.

9. Schloß gemäß einem der vorangehenden Ansprüche, wobei das Innenteil (10) eine Bohrung zur Aufnahme eines Schaftes (58) des Schlüssels (12) besitzt, wobei das Außenteil (18) eine nicht kreisförmige Öffnung begrenzt, durch welche der Schlüsselschaft in die Bohrung des Innenteils eingeführt werden kann und neben der Öffnung ein Raum (64) vorgesehen ist, welcher einen nicht kreisförmigen Abschnitt (63) des Schlüssel-Schaftes aufnehmen kann, der zu dieser Öffnung komplementär ist, nachdem ein derartiges Teil durch die Öffnung gesteckt worden ist, und sodann um die Achse gedreht worden ist, um den Schlüsselschaft im Außenteil festzuhalten.

10. Schloß nach irgendeinem der vorangehenden Ansprüche, wobei Innen- und/oder Außenteil durch ein Extrusionsverfahren ausgeformt ist, wobei sich entsprechende Kanäle jeweils von einem Ende des Teiles zum anderen Ende erstrecken und ein Teil von mindestens einem der magnetischen Elemente im Kanal aufgenommen ist.

11. Schloß gemäß einem vorangehenden Anspruch, wobei Innen- und Außenteile jeweils mit einer entsprechenden Vertiefung ausgebildet sind, wobei entsprechende Teile der Vertiefungen gemeinsam einen Weg für zumindestens ein magnetisches Element bilden und wobei in Innen- oder Außenteil ein sich über die



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Vertiefung erstreckendes Element zwischen der Ender befindet, um die Fortbewegung des magnetischen Elementes längs der Vertiefungen zu begrenzen.

Revendications

1. Serrure comprenant une pièce intérieure (10), un pièce extérieure creuse (18) dans laquelle la pièce intérieure est montée et plusieurs éléments magnétiques (47, 48), dans laquelle les pièces intérieure et extérieure définissent ensemble des passages respectifs dans lesquels les éléments magnétiques sont enfermés et le long desquels les éléments magnétiques peuvent se déplacer entre des positions respectives de déblocage et des positions respectives de verrouillage, les pièces intérieure et extérieure possèdent, pour chaque passage, des surfaces respectives de butée se faisant face dans des directions opposées, transversales à la longueur du passage et disposées aux extrémités opposées du passage et ces surfaces de butée peuvent s'engager concurremment avec des butées respectives des éléments magnétiques quand les éléments magnétiques occupent leurs positions de verrouillage, grâce à quoi un déplacement relatif des pièces intérieure et extérieure dans les dites directions est limité ou empêché par l'engagement des éléments magnétiques avec les surfaces de butée excepté quand les éléments magnétiques occupent leurs positions de déblocage, caractérisé en ce qu'il existe dans les surfaces de butée de la pièce intérieure des ouvertures (56) correspondant à des éléments magnétiques respectifs (47, 48) et dans chacune de ces ouvertures une partie de l'élément magnétique correspondant peut entrer quand l'élément est dans sa position de déblocage et en ce qu'un moyen (54) est prévu pour empêcher un déplacement d'un des éléments magnétiques dans l'ouverture correspondant à un autre des éléments magnétiques grâce à quoi, tant que chaque ouverture est occupée par une partie de l'élément magnétique correspondant, un déplacement de cet élément le long de son passage par rapport à la pièce intérieure est limité par les extrémités de l'ouverture et c'est seulement après que l'élément magnétique soit sorti de l'ouverture correspondante que l'élément peut se déplacer par rapport à la pièce intérieure le long de son passage en s'éloignant de la position de déblocage.

2. Serrure selon la revendication 1 dans laquelle les ouvertures (56) sont formées par l'intersection de canaux transversaux respectifs (57) et des passages une limite de chaque canal transversal étant une surface respective de la pièce intérieure qui est tournée vers la pièce extérieure et contient une ligne rectiligne transversale au passage correspondant.

3. Serrure selon la revendication 2 dans laquelle chaque canal transversal (57) s'étend à

partir du passage correspondant dans des directions opposées.

4. Serrure selon la revendication 2 ou la revendication 3 dans laquelle la surface de chaque canal transversal (57) est plate.

5. Serrure selon l'une des revendications précédentes dans laquelle, quand les éléments magnétiques (47, 48) sont dans leurs positions de déblocage, les pièces intérieure et extérieure (10, 18) peuvent être soumises à une rotation relative limitée autour d'un axe (11) parallèle aux longueurs des passages.

6. Serrure selon la revendication 5 comprenant de plus un boîtier (19) pour la pièce extérieure (18) et un élément d'arrêt (23) qui empêche d'une façon amovible une rotation de la pièce extérieure (18) par rapport au boîtier jusqu'à ce que la pièce intérieure ait été tournée d'un angle prédéterminé pour réaliser une libération de la pièce extérieure pour une rotation avec la pièce intérieure.

7. Serrure selon la revendication 6 dans laquelle l'élément d'arrêt (23) est une cheville pouvant glisser qui peut être déplacée transversalement à l'axe entre une position active et une position inactive, dans sa position active la cheville s'engage dans des ouvertures respectives dans la pièce extérieure et dans le boîtier et la pièce intérieure (10) possède une butée (27) qui, quand les éléments de verrouillage (47) sont dans leur position de verrouillage, peut s'engager avec la cheville pour empêcher un déplacement de la cheville de sa position active à sa position inactive.

8. Serrure selon la revendication 7 dans laquelle le boîtier (19) possède plusieurs ouvertures (35, 36, 37, 38), la cheville (23) pouvant s'engager dans n'importe laquelle de ces ouvertures pour limiter une rotation de la pièce extérieure par rapport au boîtier.

9. Serrure selon l'une des revendications précédentes dans laquelle la pièce intérieure (10) possède un alésage pour recevoir une tige (58) de la clef (12), la pièce extérieure (18) définit une ouverture non circulaire à travers laquelle la tige de la clef peut être introduite dans l'alésage de la pièce intérieure et il existe, adjacent à l'ouverture, un espace (64) qui peut recevoir à une partie non circulaire (63) de la tige de la clef complémentaire de cette ouverture après qu'une telle partie ait été passée à travers l'ouverture et ait ensuite été tournée autour de l'axe pour bloquer la tige de la clef dans la pièce extérieure.

10. Serrure selon l'une des revendications précédentes dans laquelle au moins une des pièces intérieure et extérieure est formée par un procédé d'extrusion avec des canaux respectifs s'étendant chacun d'une extrémité de la pièce à l'autre extrémité et une partie d'au moins un des éléments magnétiques est reçue dans le canal.

11. Serrure selon l'une des revendications précédentes dans laquelle les pièces intérieure et extérieure sont chacune formées avec une



rainure respective, des parties respectives des rainures formant ensemble le passage pour au moins un des éléments magnétiques et dans laquelle une des pièces intérieure et extérieure

possède un élément s'étendant en travers de sa rainure entre les extrémités de celle-ci pour limiter un déplacement de l'élément magnétique le long des rainures.

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