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Hallmann

[11] **3,782,147**

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[54] **SECURITY LOCKS**

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[73] Assignee: **MRT Magnet-Regeltechnik GmbH,** Hamburg, Germany

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[30] **Foreign Application Priority Data**

May 11, 1971 Germany ..... P 21 23 168.5

[52] **U.S. Cl.** **70/276,** 70/413

[51] **Int. Cl.** **E05b 47/00**

[58] **Field of Search** 70/276

[56] **References Cited**

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Primary Examiner—Albert G. Craig, Jr.

Attorney—Beaman & Beaman

[57] **ABSTRACT**

A security lock adapted to be operated by magnetic induction and comprising a case, a bolting unit containing at least one group of magnets displaceably mounted in the case and at least one protective blocking member in the case arranged normally to engage with the bolting unit in detent fashion to prevent operation of the lock, the bolting unit being movable by magnets contained in a key for the lock to a position in which it is no longer engaged by the blocking member and in which operation of the lock is possible.

7 Claims, 15 Drawing Figures

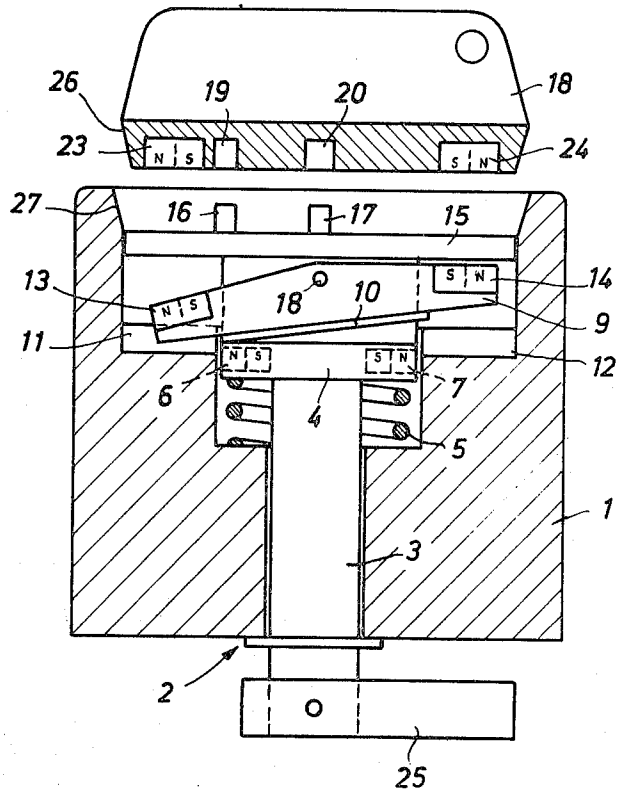

Fig. 1

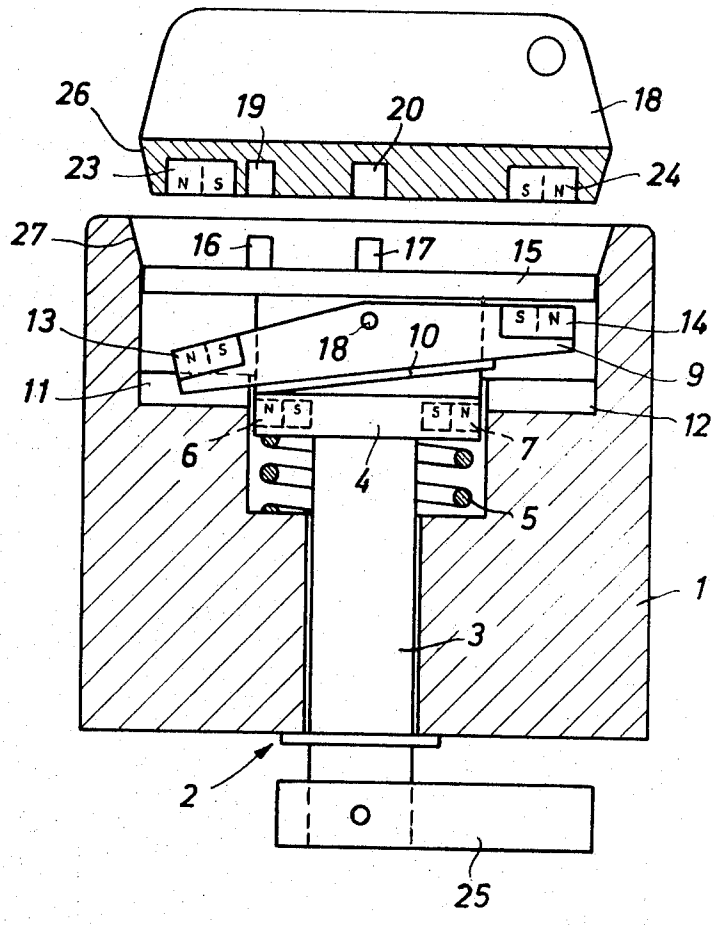
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Fig. 3

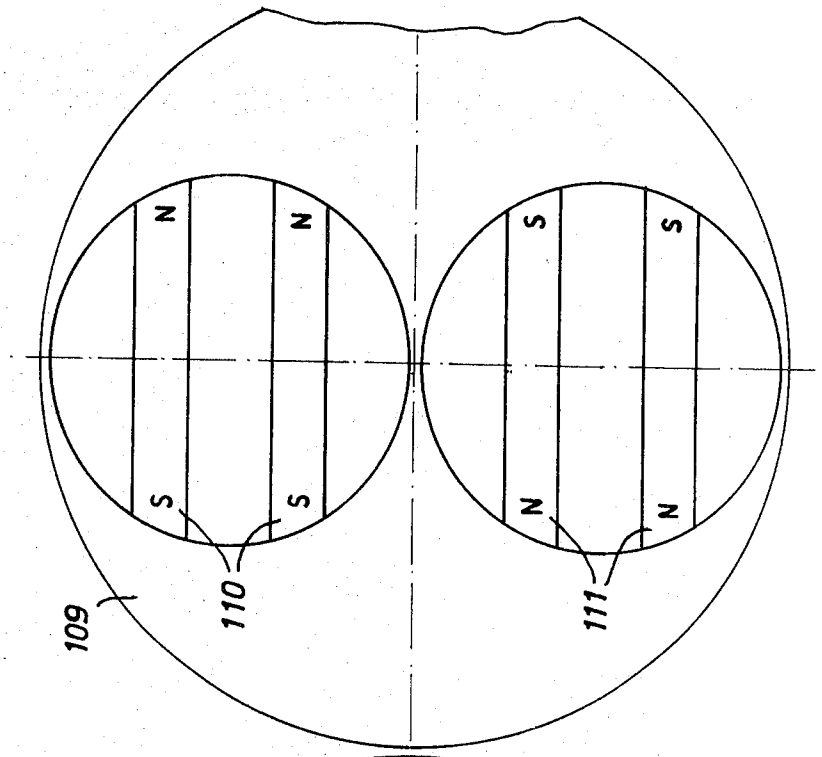
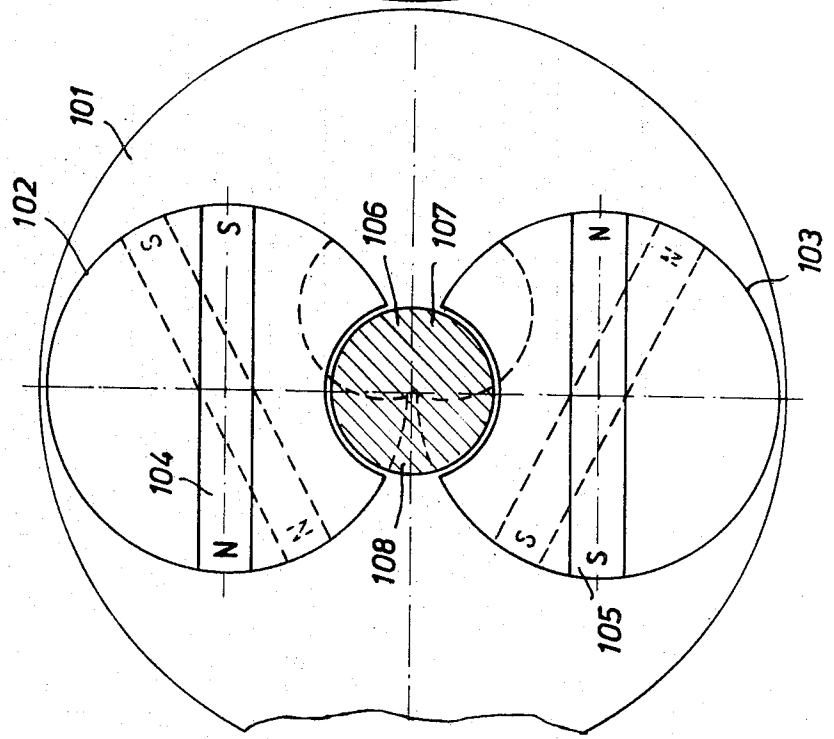


Fig. 2



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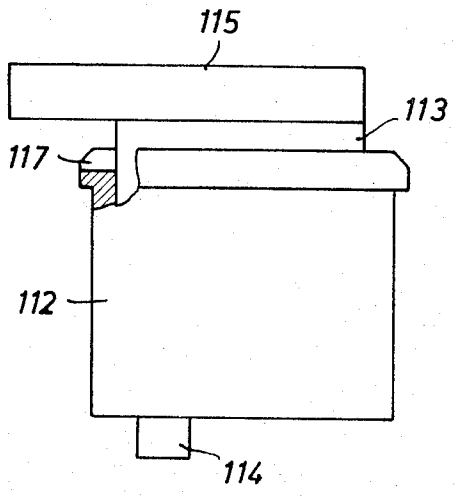
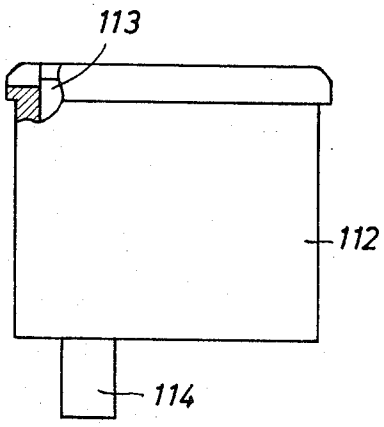


Fig. 5



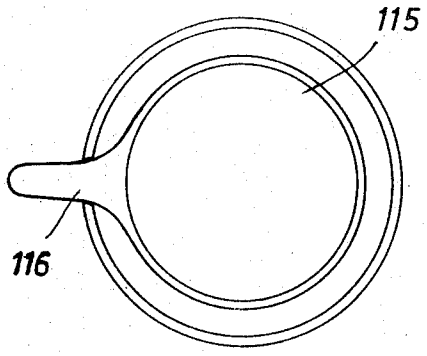


Fig. 4a

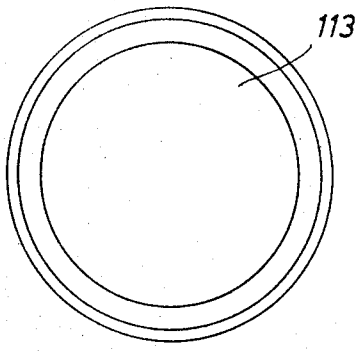


Fig. 5a

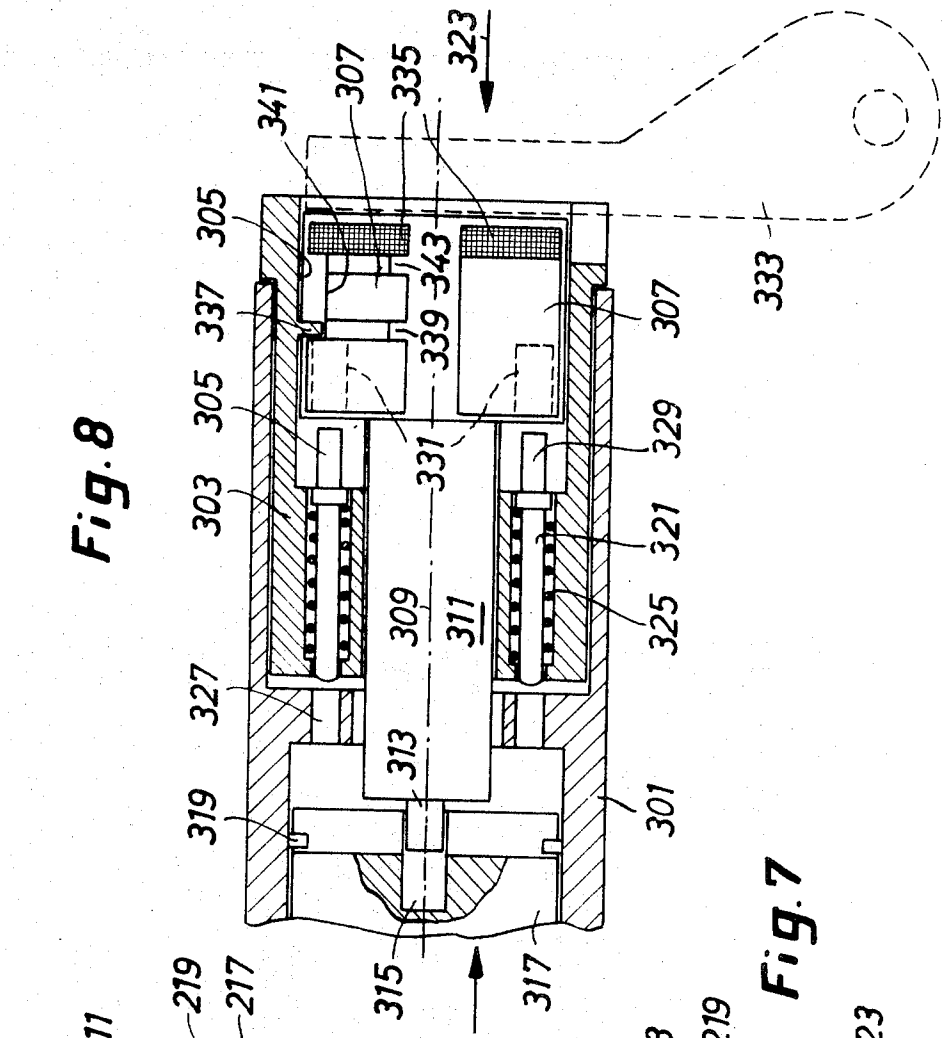


Fig. 8

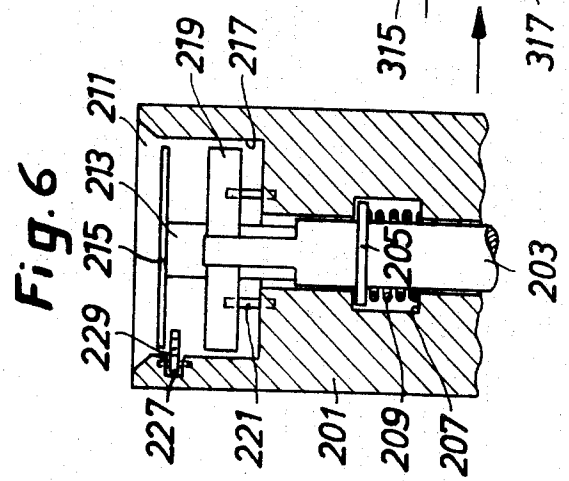


Fig. 6

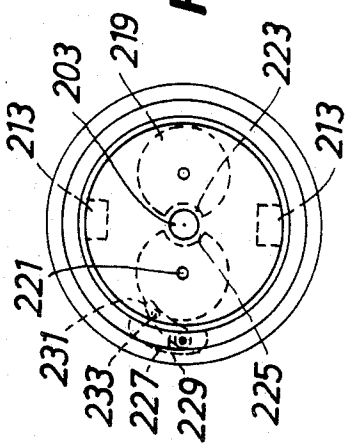


Fig. 7

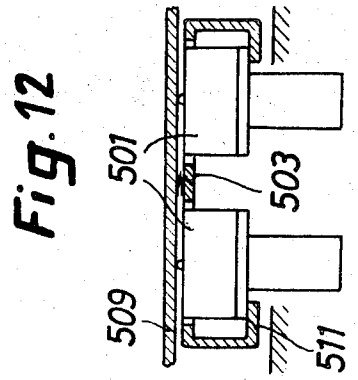


Fig. 12

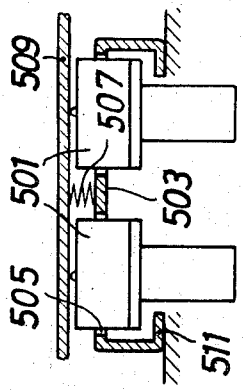


Fig. 11

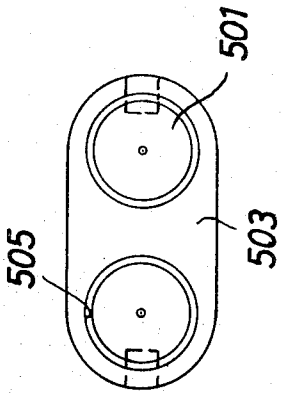


Fig. 13

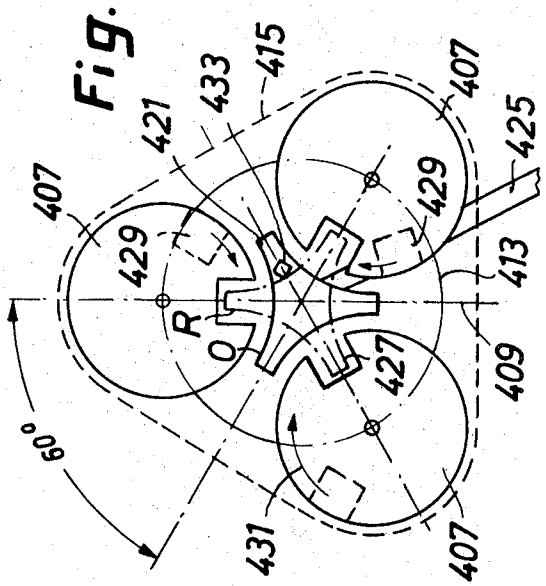


Fig. 9

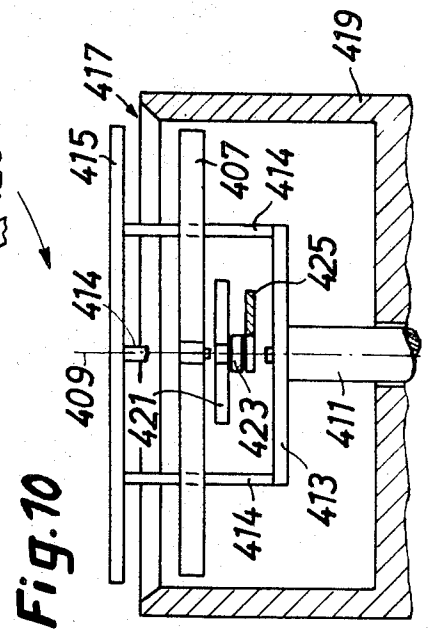


Fig. 10

SECURITY LOCKS

BACKGROUND OF THE INVENTION

The invention relates to a security lock adapted to be operated by magnetic induction, with groups of magnets in the lock and the key, at least one group of magnets of the lock being arranged in at least one bolting unit displaceable by the magnets of the key to make possible operation of the lock.

In such security locks it is necessary for them to be capable of actuation by only one key formed in a quite definite manner. They should be so arranged that by an appropriate formation of their individual parts it should be possible to manufacture as large a number as possible of variations for each of which only one key will fit. In this situation it is further necessary for the security lock not to be operable through the application of force.

To fulfil such requirements in the lock and the key, it is a known technique to utilize, in the lock and the key, magnets which are so arranged that they will only unbolt the lock when the two systems of magnets in the lock and the key are adjusted or attuned to each other in a quite definite way.

Such an arrangement is described, for example, in German Utility Model U.S. Pat. specification No. 6,928,905. Here one magnet in the lock case and one pair of magnets in a tilting arrangement are envisaged. The magnet in the lock case can be amplified to constitute a pair by means of an inserted magnet. Only through a quite specific arrangement with respect to each other of the magnetic fields that become effective through this circumstance will the tilting arrangement be converted to a floating state in which a protective blocking member can be pushed through an opening.

The known arrangement is imperfect to the extent, however, that it is not possible to bring the rocker unit to the floating state by means of any magnet. The magnet rigidly installed in the case must offer to the rocker unit a quite precise resistance which must be achieved by field-strength techniques involving repulsion on the other side of the rocker unit. This is impossible given the need for repulsion, since even with a much stronger strange magnet applied it is attraction of the rocket unit that occurs rather than repulsion, especailly as the zone of magnetization on the magnets of the rocker operates compensatingly by reason of north and south fields.

At the basis of the invention is the task of so arranging a security lock operated by magnetic induction that in each instance it can only be actuated by a single key, but with a great number of variants being possible.

SUMMARY OF THE INVENTION

According to one object of the invention, this task is solved through making the bolting unit displaceable in such a manner that, with the magnet-equipped key removed, it co-operates with protective blocking members of the case in a detent fashion, and when the magnet-equipped key is applied, as a consequence of polarity, the polar diagram and the field-strength of the mutually attuned groups of magnets appertaining to the bolting unit and the key it is maintained in a free floating state making actuation of the lock possible.

A further object of the invention provides a case in which a securing member is rotably mounted which carries a supporting plate urged by a spring which

presses the securing member towards an opening for the key.

Another object of the invention is to provide a security lock in which the securing member carries in front of the supporting plate, and in fact in the direction of the opening for the key, a tumbler tiltable transversely to the axis of the securing member, the radial ends of the tumbler being insertable in protective detaining notches appertaining to the case. In this situation, the plate of the securing member carries two magnets, and the tumbler a part of soft iron arranged opposite these magnets. The tumbler is provided with magnets on both sides of the tilting axis.

The securing member may have, in front of the tiltable tumbler, a plate which covers over the opening for the key, two actuating studs being arranged on the plate. These actuating studs have associated with them recesses on the magnet-equipped key.

Yet another object of the invention is to provide a security lock in which the magnet-equipped key carries two magnets which in their polar diagram, the type of poles and the field-strength are so arranged that only when this key is brought to apply will the pertinent tumbler, provided with duly adjusted magnets, be led to move from the protective detaining notches to the free floating state.

If the magnet-equipped key is pushed in too vigorously, with the spring compressed the tumbler will undergo deep insertion of its two ends into the detaining notches.

The magnet-equipped key is preferably provided with an external cone which fits into a corresponding internal taper in the case.

In one embodiment of the invention, the tumbler consists of a disc bearing magnets, which disc is rotatable about an axis running in the direction of the axis of the barring bolt. Here the discs are provided with excised areas through which a barring bolt can only penetrate when the discs are so rotated by a group of magnets embedded in the magnet-equipped key that they act in complementary fashion to form a circle.

The barring bolt may be connected to a pressure plate which finds resilient support on the lock case, and to a lock-actuating bolt. In this way the barring bolt is capable of being lifted from the discs by pressing in the spring-loaded pressure plate through the agency of the magnet-equipped key, the discs as they are released rotating into the actuating position and forming their common opening into which, upon the subsequent release of the pressure plate, the bar-ring bolt can be inserted. On the other hand, the barring bolt is able to be moved into the locking position without a magnet-equipped key by pressing in the pressure plate inside the case.

This simple detent system without direct recourse to a key may well be unfavourable since in fact, for example, when in motion a steering-wheel might come to be held in detent through pressure accidentally exerted on the pressure plate. This factor can be allowed for by a protective blocking member which impedes actuation of the lock by blocking the insertional movement of the barring bolt until the magnet-equipped key has rotated the disc into the lock-actuating position.

The protective blocking member makes provision for a situation whereby the pressure plate will always be capable of actuation only when the appropriate key which rotates the discs into the lock-actuating position

is also superimposed. The accidental pressing in of the pressure plate is consequently excluded.

According to a further embodiment of the invention, the disc is provided with an excised portion into which a barring bolt connected to a pressure plate from the direction of the inner side of the lock is insertable when the magnet-equipped key has rotated the disc into the lock-actuating position, and the blocking member is a swivelling latch which, upon the key being duly applied or upon due actuation manually, is turned outward from the path of travel of the pressure plate and, upon the key being removed, is rotated into the path of travel of the pressure plate. The swivelling latch therefore by these means provides for the effect that the pressure plate cannot be pressed in when the key has not been duly applied. The pivotal movement of the swivelling latch into the path of travel of the pressure plate is effected with the aid of magnetic forces between the swivelling latch and the disc. The pivotal movement of the swivelling latch into the wall of the case is effected by the magnet-equipped key.

The freely movable arm of the swivelling latch may have a magnet adjustably mounted thereon. This magnet is attracted by the magnets of the disc so long as the magnetic field between the disc and the magnet of the swivelling latch has been neutralized by the key.

In another embodiment of security lock according to the invention the disc is in addition arranged to be axially displaceable, and the protective blocking member to be stationary within the case; the blocking member in this situation engages radially in the disc, it being freely movable in annular grooves at the axial terminal positions of the disc and being capable of transfer fromm one annular groove at one terminal position to the other such groove, by way of an axial groove connecting the two annular grooves, only when the key has rotated the disc into the lock-actuating position. In this form of embodiment of the invention, the disc therefore undergoes displacement with respect to the blocking member, whereas in the form of embodiment previously described the blocking member undergoes displacement with respect to the axially displaceable pressure plate.

In a further embodiment of the invention, in which the disc is maintained to present an extremely flat shape, the terminal positions of the disc are provided on either side of the blocking member, and the blocking member travels through an excised area at the margin of the disc when the disc has been brought to the locking position upon being pressed in.

For reasons connected with providing security, discussion will now be transferred from the single-disc embodiment to a multi-disc embodiment. As regards the mode of operation of the locking system, however, no alterations will emerge through this step.

Cases occur in which, independently of the operation of the lock by a special key, the lock has also to be opened in another manner. This is necessary, for example, in the case of a lock in a car door in which the bolted lock must be able to be unlocked from the inside with the aid of a mechanical lever. Such an unlocking system is rendered possible, according to a further embodiment of the invention, by a technique in which, with the employment of n discs arranged around a central axis, the protective blocking member is formed as an n-toothed stellate unit which is rotatable between the discs into such an open position that the discs are able to be pushed past it independently of the position of their marginal excisions.

This rotation of the toothed stellate unit into the open position must not only be possible manually with the assistance of a mechanical lever. If, for example, a master-key is required for a certain group of locks, then the rotation of the stellate unit into its open position can be effected, against the urging of a spring, by means of a special magnet-equipped key operating on a magnet arranged on the stellate unit.

The advantages achieved by the invention more especially consist in the point that the lock according to the invention can in each instance be operated by only one key, which can be produced with a very great number of variants through the circumstance that every arrangement of the angle of the magnets to the actuating studs, every alteration of the magnets in respect of polarity and field-strength result in a combination which cannot be operated by any key of another combination. These possibilities of variations are increased to some hundred thousands by an arrangement involving two tumblers.

A further advantage consists in the point that the lock cannot in practice be opened by forceable mechanical intervention without the appropriate key. In the first place, any axial displacement of the securing member increases the locking strength of the lock because it brings the tumbler or tumblers into more powerful engaging action with the protective detaining notches in the case but even an attempt to cancel out the locking system of the lock by magnetic force effective in another way is in practice always condemned to failure because too many conditions. regarding the mechanical arrangement and the formation of the magnet fields would have to be fulfilled for such a goal to be attained.

On the other hand, the advantage exists that the lock, upon the use of the correct key, can be undone and actuated with childish simplicity. Given the employment of well-known magnetic materials with a pronounced coactive force, permanent magnets are produced which in practice do not alter their characteristics even during persistent use, so that a further advantage emerges — that the safety factor of the lock according to the invention is in practice free of the effects of wear.

A further embodiment of the lock according to the invention possesses the advantage of a still more sturdy design. The key no longer has any projecting parts, with the consequence that, for example, it cannot get snagged in the pocket in the way other keys do. Actuation of the lock without the key is impossible without the lock being destroyed. By combining the many possible angular positions of the magnets and given the numerous ways of magnetizing them, an extremely large number of possible embodiments of locks, each matching a single key, are made available.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be further described, byy way of example, with reference to the accompanying drawings in which:

FIG. 1 shows one embodiment of a security lock according to the invention in section;

FIG. 2 shows a second embodiment of a security lock according to the invention, this time in a fractional section viewed from above;

FIG. 3 shows the magnet-equipped key belonging to lock shown in FIG. 2;

FIG. 4 shows in side elevation the security lock shown in FIGS. 2 and 3 in the open position;

FIG. 4*a* is a top plan view of FIG. 4;

FIG. 5 corresponds to FIG. 4 but shows the lock in the locked position;

FIG. 5*a* is a top plan view of FIG. 4;

FIG. 6 is a section taken through a security lock operated by magnetic induction, with a protective blocking member according to a further embodiment of the invention;

FIG. 7 is a fractional top view of the security lock shown in FIG. 6;

FIG. 8 shows a further embodiment of a security lock according to the invention fitted with a protective blocking member;

FIG. 9 shows a further embodiment of a security lock according to the invention in plan view;

FIG. 10 is a side sectional view of the embodiment shown in FIG. 9; and

FIGS. 11 to 13 show a retarding device for the rotating tumbler discs to provide security against illicit operation.

DESCRIPTION OF PREFERRED EMBODIMENTS

Reference will first be made to FIG. 1 of the drawings which shows a security lock according to the invention having a case 1. A securing member 2 is rotatively mounted, the member comprising a shaft 3 and a rotative plate 4. A coil spring 5 bears at one end against the plate 4 and at the end against the end wall of a recess in the case 1, in which the plate 4 is located. Magnets 6 and 7 are inserted into the plate 4. A tumbler 9 is pivotally mounted on the securing member 2 and is movable within a further recess in the case 1. To the lower side of the tumbler 9 is attached a steel plate 10, positioned opposite the magnets 6 and 7. The steel tongue 10 along with the magnets 6 and 7 constitutes a bistable tilting system which is in both instances at rest when the steel tongue 10 is in contact with one of the two magnets 6 or 7, the tumbler 9 then having undergone tilting into the corresponding position. In each of the two positions of tilting, the tumbler 9 engages in one of two protective detaining notches 11 and 12 provided in the case 1. By this means they secure the securing member 2 against rotation.

Two magnets 13 and 14 are provided on the upper side of the tumbler 9. The end of the securing member 2 on which the tumbler 9 is provided bears against an actuating plate 15 in which two actuating studs 16 and 17 are located.

A magnet-equipped key 18 has two recesses 19 and 20 which are able to be placed over the catching studs 16 and 17. The key 18 carries on its lower side two magnets 23 and 24. The polarity of the magnets 23 and 24 is arranged to correspond with the polarity of the magnets 13 and 14 as shown in FIG. 1 so that if the magnet-equipped key 18 is placed upon the plate 15, the tumbler 9 will be converted by the relevant magnet 6 or 7 from its tilted position into a horizontal floating state, the attraction of the steel tongue 10 being then relieved, with the consequence that the securing member 2 will be freed. Now, by means of the magnet-equipped key 18, through the agency of the actuating studs 16 oand 17, the securing member 2 can undergo rotation, it then actuating a tang 25 fo the lock which is connected with it.

The axial engagement of the magnet-equipped key 18 in the case 1 may be limited by a cone 26, for instance, which is in contact with a corresponding internal taper 27 of the case 1, so that no axial forces are exerted during actuation. If an attempt should be made to open the lock by force through the agency of the actuating studs 16 and 17 without the appropriate key, then this is countered by the tumbler 9 detained in a protective detaining notch 11 or 12. If, in this situation, an attempt should be made to loosen the securing effect by exerting axial pressure, then the coil spring 5 will be compressed and the tumbler 9 will engage in both protective notches 11 and 12, so that the securing effect is doubled.

The magnets 13, 14, 23 and 24 are coded by multipole and lateral magnetization. By the displacement of the polar diagram and of the angular settings the consequence is a great number of variants. Even the smallest alteration in a magnetic field on one side has the effect that the tumbler 9 will drop into one of the protective detaining notches 11 or 12 and will secure the lock. The number of variants rises into some hundreds of thousands if two tumblers are employed, possibly through a technique whereby the second one is tiltably borne at a right angle to the first. The copying of a magnet-equipped key with four polar diagrams is extremely difficult, since the polar diagram and the type of the poles have to be determined, along with absolutely identical field-strengths.

Reference will now be made to FIGS. 2 to 5 of the accompanying drawings which show another embodiment of the invention in which the axis of rotation of the tilting arrangement is in a vertical direction. In the lock case 101 there are a plurality of tumbler discs, in the present instance two tumbler discs 102 and 103 rotatively borne between stops. The discs 102, 103 carry magnets 104, 105 respectively. The tumbler discs 102 and 103, tumblers 106 and 107 are situated to form semi-circular excised areas removed from the margin of the disc-shaped bodies. Only in one set position during rotation of the tumbler discs 102 and 103 with respect to each other do the tumblers 106 and 107 act complementarily to constitute a circle through which a barring bolt 108 is able to penetrate. If the tumbler discs 102 and 103 do not occupy this position but lie in the position indicated by chain-dotted lines which is achieved by the fact that the tumbler discs tilt towards each other through mutual attraction of the magnets, then the barring bolt 108 makes contact with the discs 102, 103 and consequently finds support similarly against the case 101, just as in the previously described arrangement the tumbler 9 engaged in the protective detaining notches 11 and 12 in the case 1.

Inside a magnet-equipped key 109, pairs of reciprocal magnets 110 and 111 are firmly attached. If this magnet-equipped key 109, after rotation counterclockwise about its axis, is laid upon the lock illustrated in FIG. 2, then the north poles of the magnets 110 will exert repulsion forces on the north pole of the magnet 104, which forces, if the magnets of the magnets 110 are equally strongly magnetized, will be different fromm each other to the extent that the north pole of the magnet 104 is not positioned precisely between them. These forces of repulsion therefore have the ef-

fect that the tumbler disc **102** keeps rotating until this condition is fulfilled.

Correspondingly, upon the application of the key, the tumbler disc **103** will rotate until the south pole of its magnet **105** is positioned precisely between the south poles of the key magnets **111.** Then, the tumblers **106** and **107** will release the barring bolt **108,** and the lock will open.

FIGS. **4** and **5** show an overall arrangement of this embodiment of the security lock according to the invention. In a cup-shaped outer case **112** there are a resilient pressure plate **113** and a lock-actuating bolt **114,** both connected to the barring bolt **108** (not shown). The pressure plate **113** is pressed into the case and thus is locked because of the contact made by the barring bolt **108** on the tumblers **106** and **107.** Through this circumstance the lock-actuating bolt **114** will protrude downwards as shown in FIG. **5.** If the magnet-equipped key **115** is applied to the pressure plate **113,** it then being fixed in place by a projection **116** (FIG. **4**) in a recess **117** on the margin of the outer case **112,** then the tumbler discs **106** and **107** will rotate into the releasing position. If the key **115** is pressed downwards, then the barring bolt **108** will be released. The pressure plate **113** springs upward and the lock-actuating bolt **114** is drawn back against the case and releases the lock mechanism.

The magnet-equipped key **115** may be removed and, for example, put into a pocket. Through this circumstance the tumbler discs **102** and **103** will attempt by a rotating movement to tilt back into their position of repose. This they are still prevented from doing, however, by the barring bolt **108.** If the lock is to be locked again, however, then the pressure plate **113** need only be pressed downward for example by a finger. The barring bolt **108** will release the tumblers **106** and **107.** The tumbler discs **102** and **103** will tilt back into their position of repose, and the lock-actuating bolt **114** will close the lock mechanism. It is now no longer possible to open the lock without the magnet-equipped key **115.**

In a case **201,** shown in FIG. **6,** of a security lock operated by magnetic induction there is a barring bolt **203** arranged to be axially displaceable. On the barring bolt **203** there is affixed a movement-limiting disc **205** between which and the lower edge of a recess **207** in the case **201** there is provided a coil spring **209.** The coil spring urges the barring bolt **203** in the direction of an opening **211** provided in the case **201.** A pressure plate **215** is attached to the barring bolt **203** by means of lateral supports **213.** The pressure plate **215** closes off the opening **211** of the lock.

In an enlargement **217** of the case two magnet-equipped discs **219** are rotatively mounted. The said magnet-equipped discs may be turned about axes **221.** The magnets arranged in the magnet-equipped discs **219** co-operate with their fields in such a way that the discs **219** tend to undergo displacement from the position shown in FIG. **7.** If no barring bolt **203** were to be inserted in a common opening **223** formed by the discs **219,** then the excised areas **225** in the discs **219** would not function complementarily. In the position of release shown, however, the excised areas **215** operate complementarily to the opening **223** through which the barring bolt **203** is inserted.

In the upper portion of the side wall of the case **201** there is a recess **227** in which a swivelling latch **229** is pivotally mounted. The axis of rotation of the swivelling latch runs in a direction parallel to the axis of the barring bolt **203.** The latch **229** is equipped at its freely moving end **231** with a magnet **233.** The said magnet **233** co-operates with the magnetic fields of the discs **219** in such a manner that the swivelling latch is turned to be under the plate **215,** in the path of travel of the latter. The swivelling latch only pivots into the recess **227** when a magnet-equipped key is applied to the case **201** when the magnetic fields of the key operate on the magnet **233** and pivot the swivelling latch **229** into the recess **227.**

In this way the pressure plate **215** is prevented from being able to be pressed inward without the key having been applied, a situation which might be connected with the operation of the lock, and consequently possibly too the operation of a steering-wheel lock.

In the embodiment shown in FIG. **8,** a special form of steering-wheel lock is dealt with. The design is naturally not tied merely to application in a motor vehicle.

As shown in FIG. **8,** the lock comprises a case **301** housing a cylinder **303** to effect locking. In the cylinder **303** an enlargement **305** is provided in which tumbler discs **307** are pivotally mounted. The axes of rotation of the tumbler discs **307** run parallel to the axis **309** of a barring bolt **311.**

On the side towards the lock, a tang **313** is arranged on the barring bolt **311** which is capable of insertion into a recess **315** in a connecting plate **317.** Stops **319** indicate the position of the connecting plate within the case **301.**

Inside the cylinder **303** to effect locking are arranged spring-equipped barring bolts **321** which are capable of being pressed home in the direction of an arrow **323** against the action of springs **325.** The bolts **321** can engage in protective bores **327** and are provided with pins **329** which are arranged to engage in bores **331** in the tumbler discs **307** when a key **333** is applied to the lock. Magnets inside this key rotate the tumbler discs **307** into such a position that the rotor bores **331** are located in front of the pins **329.** In this reciprocal position of the tumbler discs the latter can be pressed in by means of the key **333,** the barring bolt **311** then being pushed into a locking position. If no key **333** is applied, then insertion of the barring bolt **311** is not possible since a protective blocking member **337** operates against this insertion. This blocking member **337** is arranged on the cylinder **303** and engages in the tumbler disc **307** indicated above. In the position of release shown in the drawing, the blocking member is located in an annular groove **339,** so that the disc **307** is freely movable. The annular groove **339** provided in one terminal position of the disc is connected by means of an axial groove **341** to a further annular groove **343** which is located at the site of the other terminal position of the axially displaceable disc. The connecting groove is arranged in such a manner that the blocking member is freely displaceable within it if the discs, when the key is applied, have been rotated to their lock-actuating position.

If the discs have been rotated by means of the key into the lock-actuating position, then the barring bolt can be transferred to the detent position by an axial displacement of the discs. If, however, no key has been applied to the discs **307,** then they will have rotated into a reciprocal position prescribed by the magnets **335.** In this case the blocking member **337** will not be in the zone of the connecting groove **341.** The disc co-

operating with the blocking member therefore cannot be pressed in. Consequently a specific locking system proof against accidental pressure or catching has been brought about.

It is naturally also possible in a further form of embodiment (not shown here) to prescribe for the discs a so modest axial length that they will be pushed between the two terminal positions of displacement, in each instance right past the blocking member. In this case the disc has a marginal excision through which the blocking member can travel if the disc, with the key duly applied, has turned into the lock-actuating position.

In the embodiment shown in FIGS. 9 and 10, three tumbler discs 407 are arranged centrically about an axis 409. All three discs 407 are carried by a barring bolt 411 by way of a supporting disc 413 and axles 414. Reinforcement is provided for the supporting system, comprising the plate 413 and the axles 414, by means of a pressure plate 415 which closes off the lock 417 from above.

The barring bolt 411 can be pressed into the case 419 in the direction of the axis 409, upon the pressure plate 415 being pressed downward. The prerequisite for this is, however, that a stellate unit 421 should permit the travel of the discs 407 past itself. This stellate unit 421 is pivotally arranged on the case 419 by means of a support 423. The axis of rotation of the stellate unit coincides with the axis 409 of the barring bolt 411. Furthermore, the stellate unit 421 engages an actuating lever 425 by which the stellate unit is manually rotatable through a pivotal angle of 60°. The stellate unit and the lever arm 425 are fixed firmly to each other for this purpose. The stellate unit 421 is, given a lack of external force operating on the lever arm 425, swung over into the position shown in chain-dotted lines in FIG. 9, this being indicated by the letter R. If the stellate arm 421 is turned with the aid of the lever arm 425, then it will attain the position shown in solid lines denoted by 0.

As emerges particularly clearly from FIG. 9, the teeth 427 of the stellate unit 421 are in position R pivoted into the effective zone of the discs 407. Let us assume that no key has been applied to the lock. The excised areas 429 in the discs 407 will then be positioned in various contrarily placed situations following rotation, and the teeth 427 will be covered by the material of the discs 407. In this position, therefore, the pressure plate 415 cannot be pressed inwards, since the discs will not come past the teeth 427. If, however, a key is applied to the lock 417, then the tumbler discs 407 will rotate in the direction of the arrow 431 into the position indicated in solid lines in FIG. 9. The excised areas 429 will therefore be located in the area of the teeth 427, and the pressure plate 415 can now be pressed in thus making possible the bolting of the lock. After the key has been removed, the discs 407 forthwith pivot again, and the discs are unable to return to their initial positions because of a spring operating on the stellate unit. This return will only become possible again if a key is applied and if, with light downward pressure on the pressure plate 415, the discs are released and pivot into the position shown in solid lines in FIG. 9.

In the case of a car lock, it is necessary for this lock also to be opened manually from inside, even without a key. To facilitate such opening, the lever arm 425, for example, is swung over when the pressure plate is pressed in. Upon this occurring, the stellate unit 421 will rotate from position R (in chain-dotted lines) to the position 0 (in solid lines). The teeth 427 of the stellate unit 421 will then be situated between the discs 407. Independently of the position of the excised areas, the discs 407 will therefore be released and are able to travel in FIG. 10 upwards past the stellate unit, the barring bolt 411 then travelling from the locked position to the open position, and the lock is now open.

There are cases in which manual opening, such as is necessary on the inside of car doors, does not have to be considered. A distinctly similar case which requires opening independently of the special lock may well exist if, for example, apart from the special key for the special lock, many locks are to be opened with the aid of a single masterkey. In this case permanent magnets 433 will, for example, be arranged on the stellate unti 421, the magnets co-operating with a master-key. When the master-key is placed on the pressure plate 409, then the stellate unit will rotate to the position 0 and the lock will be released.

It is always possible that the attempt will be made with a strange magnet (an electromagnet or a permanent magnet) to bring the rotating tumbler discs into the position for opening. These attempts may well be condemned completely to failure if, as shown in FIGS. 11 to 13, a retarder is provided for the rotating tumbler discs 501. The said retarder consists of a soft-iron part 503 possessing excised areas 505 for discs 501 and capable of undergoing displacement axially with respect to the discs. The soft-iron core 503 finds support by means of a spring 507 located between a pressure plate 509. When no strange magnet has been placed on the pressure plate 509, then the spring 507 will urge the soft-iron part away from the pressure plate, and the flanges 511 of the soft-iron part 503 that are interposed beneath the discs 501 will be lifted away from the discs 501 (FIG. 11). If, however, a strange magnet is applied, then the soft-iron part 503 will rise, and the flanges 511 interposed beneath will press from below against the discs 501 (FIG. 12). By these means the latter will be rendered immobile and are no longer able to rotate. Opening of the lock by means of the strange magnet is consequently impossible.

What is claimed is

1. A magnetic security lock comprising, in combination; a housing having an axis and an accessible end, blocking means rotatably mounted within said housing for limited rotation about an axis substantially parallel to said housing axis and selectively orientable between locking and unlocking positions, control means mounted within said housing for selective relative cooperable movement with respect to said blocking means in the direction of said housing axis, said blocking means cooperating with said control means wherein orientation of said blocking means to said locking position relates said blocking and control means to prevent unlocking of said lock and orientation of said blocking means to said unlocking position relates said blocking and control means to permit unlocking of said lock, said blocking means having a first permanent magnet diametrically mounted thereon disposed adjacent said housing end having poles rotatable in a plane substantially perpendicular to said housing axis, a key adapted to be placed adjacent said housing end for orientation in a predetermined manner with respect to said housing axis, a pair of spaced, substantially parallel second permanent magnets mounted upon said key having poles

substantially perpendicularly oriented to said housing axis when said key is placed adjacent said housing end, the spacing between said second magnets being greater than the width of said first magnet and said second magnets being so located on said key as to be disposed on opposite sides of said first magnet when said key is oriented to said housing end in said predetermined manner, like poles of said first and second magnets being oriented such that said second magnets impose repulsion magnetic forces on said first magnet to rotatably orient said blocking means to its unlocking position and permitting relative movement thereof with respect to said control means to permit unlocking of said lock.

2. In a magnetic security lock as in claim **1** wherein said blocking means comprises at least a pair of rotatable members mounted within said housing each having a first permanent magnet mounted thereon, said first magnets being rotatable in a common plane substantially perpendicular to said housing axis, and at least two pairs of second magnets mounted in said key within a common plane, each pair of second key magnets adapted to impose a repulsion magnetic force upon a first magnet and member.

3. In a magnetic security lock as in claim **2,** key positioning means defined on said housing accessible end, and complementary key positioning cooperating means defined on said key controlling orientation of said key adjacent said housing end.

4. In a magnetic security lock as in claim **2** wherein said blocking means members include coplanar discs disposed substantially perpendicular to said housing axis each having a periphery, a notch defined in each of said disc peripheries complementary to a portion of the aligned transverse cross section of said control means, said notches defining an opening receiving said control means upon positioning of said blocking means discs to said unlocking position permitting relative axial movement of said control means and said blocking means members.

5. A magnetic security lock comprising, in combination, a housing having an axis and an accessible end, control means movably mounted within said housing for movement in the direction of said housing axis between operative and inoperative positions, blocking means movably mounted within said housing selectively orientable between locking and unlocking positions, said blocking means cooperating with said control means wherein orientation of said blocking means to said locking position prevents movement of said control means from said inoperative position to said operative position and orientation of said blocking means to said unlocking position permits movement of said control means from said inoperative position to said operative position, said blocking means comprising at least one member rotatable about an axis parallel to said housing axis and having a first permanent magnet mounted thereon disposed adjacent said housing end having poles rotatable in a plane substantially perpendicular to said housing axis, a key adapted to be placed adjacent said housing end for orientation in a predetermined manner with respect to said housing axis, a second permanent magnet mounted within said key having poles substantially perpendicularly oriented to said housing axis, the poles of said first and second magnets being oriented such that said second magnet imposes repulsion magnetic forces on said first magnet to rotatably orient said blocking means member to its unlocking position and permitting axial movement of said control means to its operative position, a ferromagnetic anti-tampering member surrounding said blocking means and axially displaceable within said housing between holding and release positions selectively preventing and permitting rotation of the associated blocking means, spring means biasing said anti-tampering member to said release position, said anti-tampering means being drawn into holding position if subjected to predetermined magnetic forces.

6. A magnetic security lock comprising, in combination, a housing having an open end, a control shaft rotatably mounted within said housing about an axis and capable of axial displacement between first and second positions, an arm mounted on said shaft for pivotal movement on a pivot axis perpendicular to said shaft axis between shaft locking and shaft releasing positions, abutment means defined on said housing receiving said arm when in said shaft locking position, biasing means biasing said arm toward said shaft locking position, a pair of permanent magnets mounted on said arm, a magnet being mounted on each side of said pivot axis equidistant therefrom, torque transmitting means defined on said shaft adjacent said housing end, a key adapted to be received within said housing open end, a pair of permanent magnets mounted on said key, torque transmitting means defined on said key mating with said shaft torque transmitting means for transferring torque from said key to said shaft upon said key being placed in said housing end in a predetermined manner, said key mounted magnets being disposed adjacent said arm mounted magnets with like poles disposed toward each other to produce repulsion forces to overcome said arm biasing means and pivot said arm to said shaft releasing position.

7. In a magnetic security lock as in claim **6** wherein said biasing means comprises at least one magnet mounted on said shaft.

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