

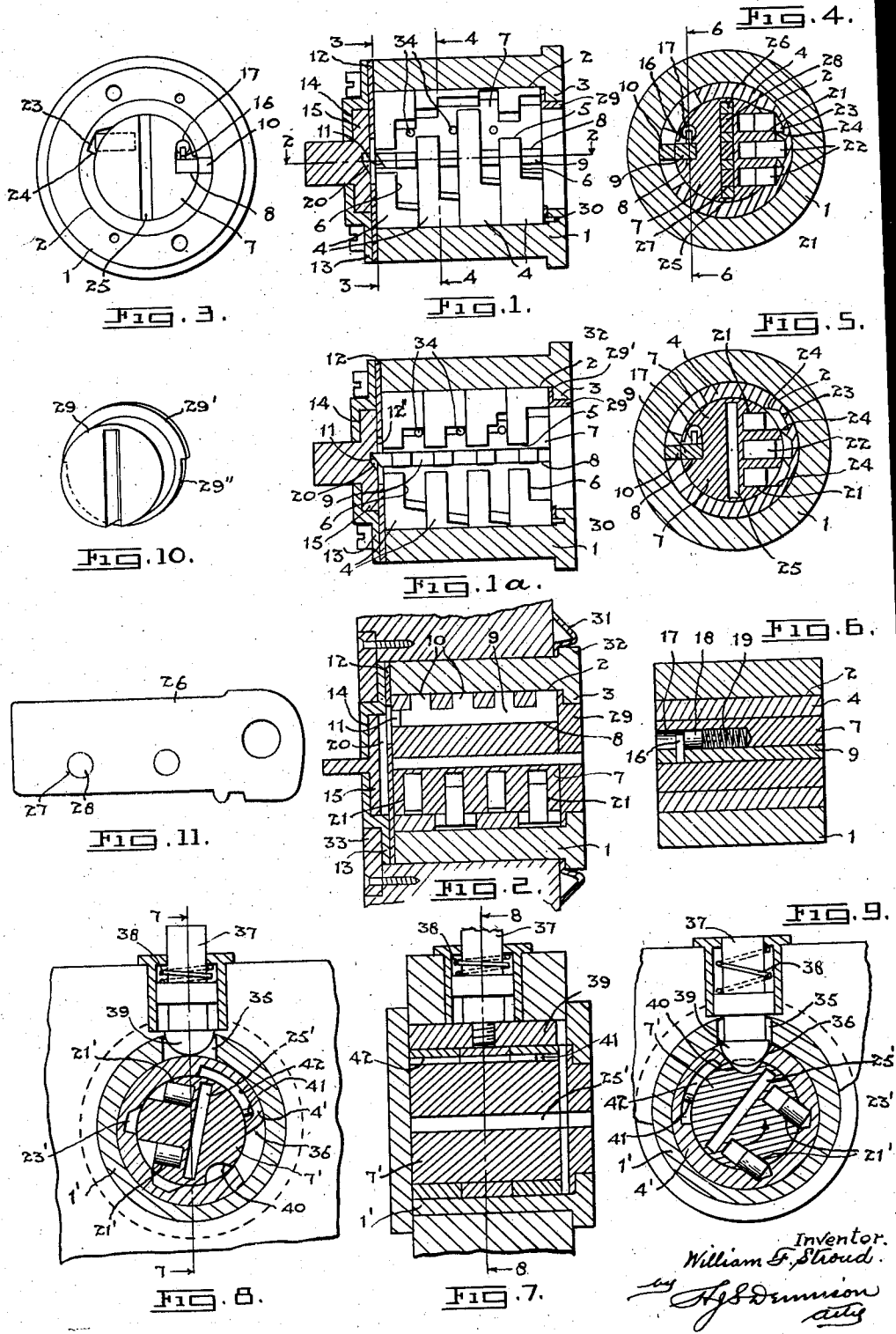
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MAGNETIC LOCK

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MAGNETIC LOCK

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This invention relates to improvements in the cylinder or barrel type of lock in which the key is inserted into a rotatable cylindrical member which is adapted to co-operate with a member connected with a latch to operate the latch to unlock the door to which it is attached.

The principal object of the present invention is to devise a novel form of structure which will present a multiplicity of combinations of locking elements so that such may be selectively arranged in the controls.

A further object is to devise a form of lock which it will be practically impossible to manipulate without having the proper key.

A further important object is to devise a lock of simple and economical construction which will give the maximum of protection.

The principal feature of the invention consists in the novel construction and arrangement of a central rotatable key-operated member surrounded by a plurality of freely rotatable rings, the co-operative operation of said rings and central member being controlled by magnetically operated members each having a recess adapted to be aligned to co-operate with and to interlock with a locking member, said central rotatable member having magnetic elements adapted to engage and move said ring members into co-operating alignment in co-operation with a key member having certain areas of non-magnetic material.

In the accompanying drawing

Figure 1 is a part longitudinal section and part plan view of the rotatable inner portion of my improved lock in its locked position.

Figure 1^a is a similar view to Figure 1 showing the inner portion in its unlocked position.

Figure 2 is a longitudinal mid-sectional view of my improved lock taken on the line 2—2 of Figure 1.

Figure 3 is an end elevational view of the lock structure with the inner end cap removed and showing the mechanism on the line 3—3 of Figure 1.

Figure 4 is a cross sectional view through the lock taken on the line 4—4 of Figure 1, and showing the magnetic members in engagement with the rings surrounding the central core.

Figure 5 is a view similar to Figure 4 showing the magnetic members withdrawn from engagement with the encircling ring member.

Figure 6 is a longitudinal sectional view taken on the line 6—6 of Figure 4.

Figure 7 is a longitudinal sectional view taken on the line 7—7 of Figure 8 showing a modified

form of lock structure with the locking bolt arranged in a locking position.

Figure 8 is a cross sectional view through the lock structure shown in Figure 7 taken on the line 8—8 of Figure 7.

Figure 9 is a cross sectional view similar to Figure 8 showing the arrangement of the several parts when the locking bolt is in the unlocked position.

Figure 10 is a perspective view of the disc for limiting the movement of the key.

Figure 11 is an elevational view of a key showing the magnetic plugs.

Numerous types of magnetic locks have been proposed, some of which have proposed the use of a magnetized pin which moved to interlock with an adjacent element and it has been proposed to control such magnetic pin by means of a key having a body of magnetic material with non-magnetic inserts or a body of non-magnetic material with magnetic inserts, such inserts arranged to be brought into register with the magnetic pin to cause them to function.

The present invention however differs materially from these known structures. In the device herein shown and referring particularly to Figures 1 to 6 a preferably cylindrical body 1, formed of steel or other suitable magnetic material, is formed with a cylindrical central orifice 2 opening at one end from the cylinder and terminating at a flange 3 at the other end.

Arranged within the cylindrical orifice 2 are a plurality of split spring rings 4 each of which is divided transversely by an opening 5 and each of which has a circumferential notch 6 extending either side of the opening 5 in a circumferential direction and each notch being of a differing length. Said notches are preferably substantially half the width of each of the rings 4 and such notches are arranged so that the notch in one ring is spaced from the notch of the other ring by the intervening ring material.

These spring rings are inserted into the orifice 2 under slight tension so that they will not turn therein unless some pressure is applied.

A cylindrical block 7 is freely rotatable within the assembled rings 4 and it is formed with a longitudinal slot 8 which is preferably of rectangular cross section and opens to the perimeter.

A bolt 9 of rectangular cross section is slidably mounted in the longitudinal slot 8 and has a plurality of upwardly or radially projecting teeth 10 which teeth are of a slightly lesser dimension than the width of the notches 6, and the width of the bolt 9 and its lugs 10 are of slightly lesser

dimension than the circumferential width of the openings 5 through the spring rings 4. One end of the bolt 9 is provided with a bevelled end 11.

A thin metal plate 12 is arranged to close the cylindrical orifice 2 and it is rigidly secured to the open end of the cylindrical body 1 and thus retains the block 7 and its surrounding spring rings within the orifice 2. Said plate has a quadrangle opening 12' therethrough which permits the bevelled end 11 of the bolt 9 to project outwardly through the plate when the block 7 and the rings are in predetermined relative position.

A plate 13 is rigidly secured to the end of the member 1 holding the thin plate 12 rigidly thereto and the plate 13 is provided with a cylindrical recess 14 in which is rotatably mounted a cylindrical member 15 which has a transverse radial notch 20 in its face adjacent to the plate 12 which is adapted to receive the bevelled end of the bolt 9 when it projects through the orifice in the plate 12 so that the member 15 will be rotated with the cylindrical block 7 when the block 7 and member 15 engage.

The bolt 9 is provided with a laterally extending pin 16 which extends through the slotted side of a cylindrical orifice 17 arranged longitudinally parallel with the longitudinal slot 8 in the member 7 and which opens thereto. The pin in the bolt 9 extends through the intercommunicating slot and engages a block 18 operated by a coil spring 19 housed in the recess 17. This spring pressing against the pin 16 urges the bolt so that its bevelled end engages the thin plate 12 and when the bolt is turned to such a position as to register with the opening through the plate 12 then the bolt extends through and enters the notch 20 which is arranged in the face of the member 15.

The rotatable cylindrical block 7 has drilled therein a plurality of small cylindrical openings 21. These openings are arranged preferably centrally of the width of each of the rings 4 and they may be arranged singly or in groups relative to each ring.

As illustrated in Figure 4, there is a group of three of such small cylindrical orifices arranged in the same transverse plane in the member 7 and in each of these orifices is arranged a small magnetized pin 22.

The rings 4 are each formed with notches 23 in their inner periphery, which notches align with one or more of the pin orifices 21 and the notches are each formed with shoulders 24 against which the pins 22 will engage when they are moved outwardly and these pins move outwardly under their own magnetic influence being attracted outward by the encircling heavy steel body 1.

The cylindrical block 7 is formed with a flat recess 25 extending therethrough from end-to-end and is adapted to receive a flat key 26. One of the flat faces of the recess 25 is arranged parallel with and in very close relation to the inward ends of the orifices 21 so that a key with magnetic portions, when placed in said slot will overcome the magnetic attraction of the outer casing 1 and the pins will move inwardly.

The key is preferably made of a non-magnetic material and has a plurality of plug inserts of magnetic material placed therein to align with certain of the holes 21 containing the magnetized pins and when said key is inserted in the key slot the selected magnetic pins will be attracted toward said key and they will be drawn

clear of the notches 23 in the rings 4 while other pins will engage the rings to turn same the required distance to align the openings 5 to allow the bolt 9 to move into operative engagement with the notch in the member 16 and thereby operate the lock. If a plain steel key is inserted in the key slot all the pins will be withdrawn from engagement with the operating rings and the lock will be inoperative. Likewise if an all non-magnetic key is inserted all the pins will engage the rings and some rings, if not all, will be turned an improper distance and the bolt openings 5 will not be aligned and the lock will still be inoperative, or if the magnetic inserts of the key do not register with the proper pins the result will be the same.

It will be understood that a lock may be constructed with one, two or three magnetic pins arranged to engage notches in the rings 4 and a lock may have any desirable number of rings. Consequently there will be a very wide range of selection in the matter of pin arrangement in respect to the rings and magnetic inserts in respect to the keys.

Orifices 21 with their magnetic pins will be arranged in the rotatable cylindrical block 7 relative to the several rings so that when one or more pins are in contact with and engaging the notches in the ring, such ring will be turned on the turning of the key so that the openings 5 of the several rings will be moved into alignment and upon these openings coming into alignment the spring 19 housed in the recess 17 will force the bolt 9 endwise. The bevelled end of the bolt engages the plate 12 and a further turning movement aligns the bolt with the opening 12'. The teeth 10 being aligned with the ring openings 5 will allow the bolt to move freely so that the bevelled end of the bolt extends through the opening in the plate 12 and engages the notch 20 of the rotatable member housed in the casing, which member is connected to a suitable form of latch lock.

At the opposite end of the structure to the plate 12 is arranged a flanged disc 29, the flange 29' of which engages the flange 3 of the body 1. A portion of such flange is cut away to form a slot 29'' and a pin 30 secured in the flange 3 extends into the slotted flange of the disc and thus limits its rotation.

A suitable escutcheon ring 31 surrounds the outer flange 32 formed on the body 1 to fit against the surface of a door or other structure into which the lock is placed and the body 1 will be held in the lock recess by any suitable form of plate 33 attached to the inner rotatable end of the structure.

It will be understood that the spacing of the notches 23 in the rings 4 and the variations in the length of the notches 6 in the rings 4 will lend a very wide range to the structure so that an infinite selection of keys may be had in a range of locks.

The rotation of the cylindrical block 7 relative to the rings 4 may also be limited by inserting pins 34 in the block 7 to extend into the notches 6, thus preventing the rings riding against the bolt.

In Figures 7, 8 and 9 I show a modification of this invention in which there is a central rotatable block 7' similar to the block 7 which has a key slot 25' and pin orifices 21' in which are housed magnetic pins.

Spring rings 4' which fit within the body 1' are provided with notches 23' in the inner pe-

ripheral surface to be engaged by the magnetic pins.

The steel body 1 is here shown of eccentric form and in the centre part thereof is arranged a slot 35.

An opening or slot 36 is arranged between the ends of the spring rings 4' and a bolt member 37 slidably mounted in the outer casing and urged inwardly by a spring 38 is formed with a rounded head 39 which slides in the slot 35 and enters the notch 36 in the rings and a notch 40 is formed in the member 7' to receive the inner curved end of the head when the notch 36 in the ring is brought into register with the slot 35 and the notch 39 is also in register.

The key to be inserted into the slot 25' is provided with suitable magnetic inserts to bring about the co-operation of the magnetic pins to engage the notches 23' in the ring 4', and upon the turning of the key and the rotation of the block 7' with the proper magnetic pins engaging the notches in the rings, the notches 36 of the rings will be brought into register with the slot 35 and the notch 40, thus operating the bolt.

The relative rotative movement of the rings and the block 7' is controlled by a radial pin 41 secured in the block 7' and extending into a circumferential slot 42 in the inner wall of each of the rings.

The rounded surface of the inner end of the bolt head will, upon the rotation of the member 7', be forced outwardly and this outward movement in locking the bolt is continued by the engagement of the rounded edges of the notch 36 in the rings. This moves the bolt outwardly to the position shown in Figure 8 from the unlocked position shown in Figure 9.

A magnetic lock such as described lends itself readily to mass production and when completed it forms a lock which is practically impossible to open without the proper key. The insertion of a plain piece of steel into the key slot will simply lift all the magnetic pins out of contact with their co-operating rings and as the key is closed in over the top it will be practically impossible for anyone to search the surface of the key slot adjacent to the pins to locate the various pins. These pins move noiselessly and they perform their function in a very simple manner.

What I claim as my invention is:

1. A magnetic lock comprising a cylindrical block having a longitudinal key recess and a plurality of orifices extending inward from its periphery toward said key recess, magnetized pins slidably mounted in said orifices, a plurality of rings rotatably encircling said block and having notches in their inner surface to receive and engage said pins to cause said rings and block to rotate together, a body of magnetic material having a cylindrical orifice and enclosing said rings and block and adapted to attract said magnetized pins to move outwardly to engage the notches in said rings, and a key having magnetic and non-magnetic portions adapted to register with certain of said pin orifices, and locking means operatively associated with said rotatable block and rings.

2. A device as claimed in claim 1 in which the rings encircling said rotatable block are each formed with a transverse slot, said slots being

adapted to be aligned by the co-operation of certain of said magnetized pins with the internal notches in said rings upon partial rotation of said cylindrical block, said locking means being arranged to co-operate with said transverse ring slots.

3. A device as claimed in claim 1 in which the rings encircling said rotatable block are each formed with a transverse slot, said slots being adapted to be aligned by the co-operation of certain of said magnetized pins with the internal notches in said ring upon partial rotation of said cylindrical block, said cylindrical block having a longitudinal slot adapted to register with the aligned slots in said rings, and locking means co-operatively associated with the longitudinal slot in said rotatable block and the aligned slots of said rings.

4. A device as claimed in claim 1 in which the rings encircling said rotatable block are each formed with a transverse slot, said slots being adapted to be aligned by the co-operation of certain of said magnetized pins with the internal notches in said ring upon partial rotation of said cylindrical block, said cylindrical block having a longitudinal slot adapted to register with the aligned slots in said rings, a bolt slidable in the longitudinal slot in said block and having restricting projections adapted to enter the aligned slots in said rings, means for restraining the longitudinal movement of said bolt during the rotative movements of said rings to align the slots therein, and means engaged by said bolt for operating the lock following the aligning of said ring slots.

5. A device as claimed in claim 1 in which the rings encircling said rotatable block are each formed with a transverse slot, said slots being adapted to be aligned by the co-operation of certain of said magnetized pins with the internal notches in said ring upon partial rotation of said cylindrical block, said cylindrical block having a longitudinal slot adapted to register with the aligned slots in said rings, a bolt slidable in the longitudinal slot in said block and having restricting projections adapted to enter the aligned slots in said rings, a plate arranged at one end of said cylindrical block and having an opening through which the bolt is adapted to project, spring means for moving said bolt in its slot, and a rotatable plate operatively connected with a lock and having a notch adapted to be engaged by said bolt when said bolt projects through the opening in the end plate.

6. A device as claimed in claim 1 in which the rings encircling said rotatable block are each formed with a transverse slot, said slots being adapted to be aligned by the co-operation of certain of said magnetized pins with the internal notches in said ring upon partial rotation of said cylindrical block, said rings each having a circumferential recess extending into one edge thereof and communicating with a transverse slot, said locking means including a bolt slidable in a slot arranged longitudinally of said cylindrical block and having upstanding teeth housed in the said circumferential recesses of said rings and adapted to move into said ring slots to effect the operation of the lock.

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