Oct. 28, 1941. E. N. KENNEDY 2,260,674

LOCK

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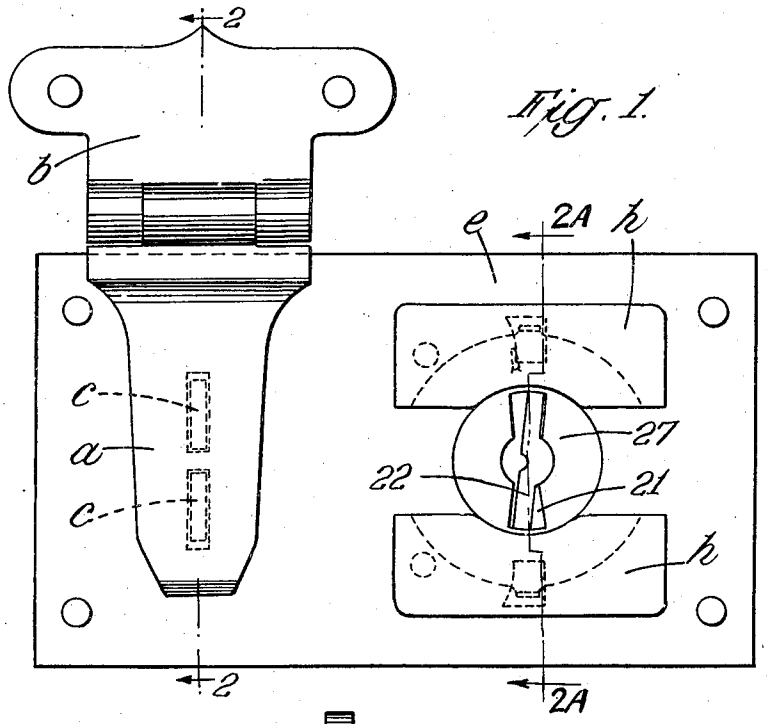

Fig. 1.

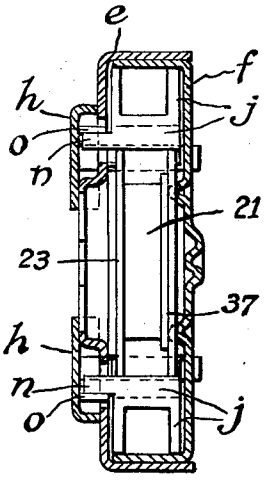

Fig. 2A.

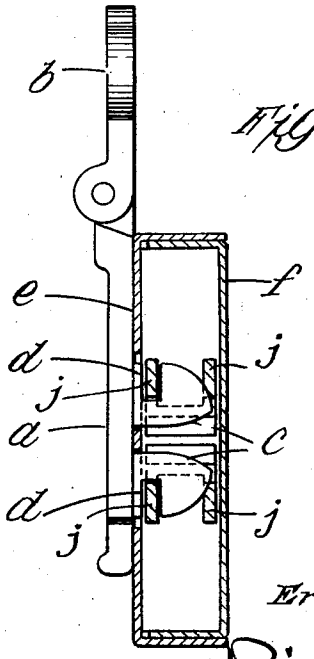

Fig. 2.

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Fig. 3.

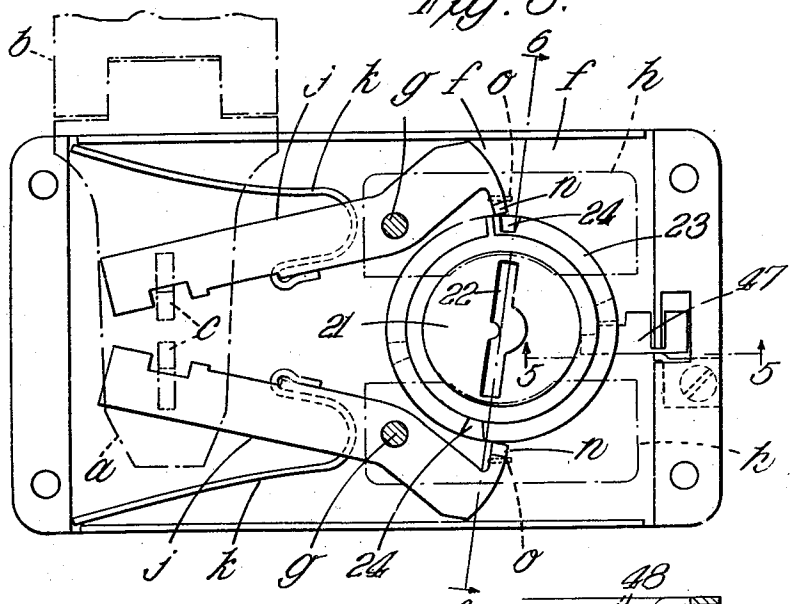

Fig. 5.

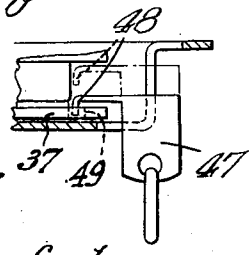

Fig. 4.

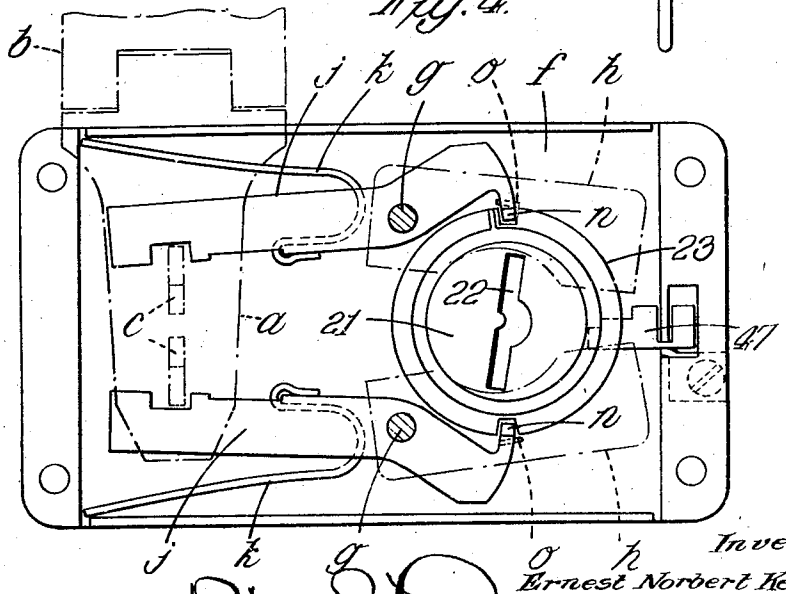

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Fig. 6.

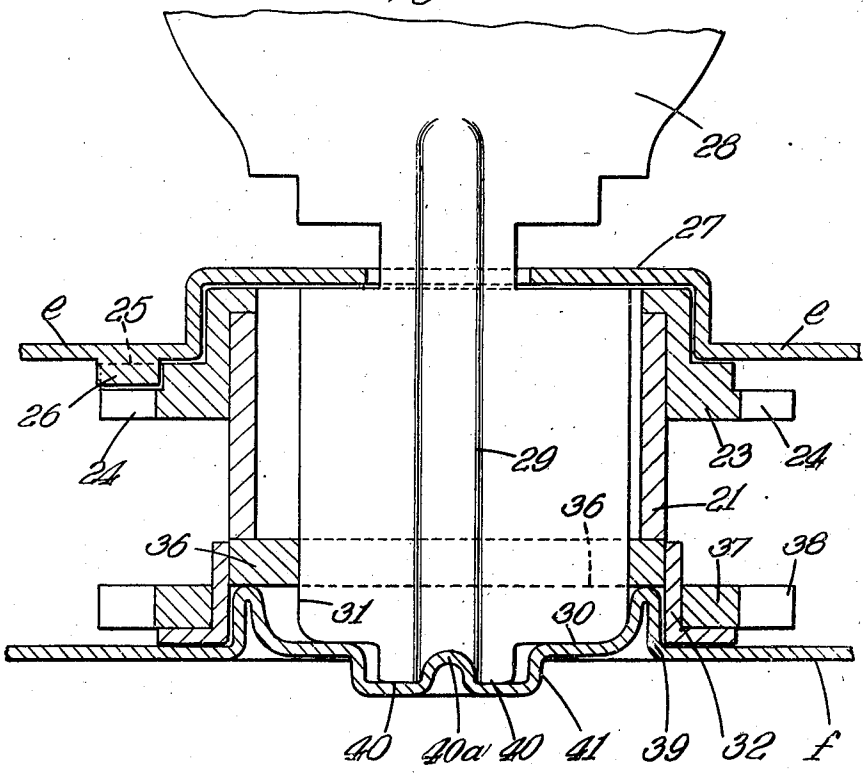

Fig. 15.

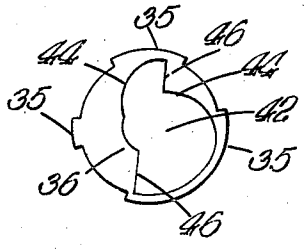

Fig. 16.

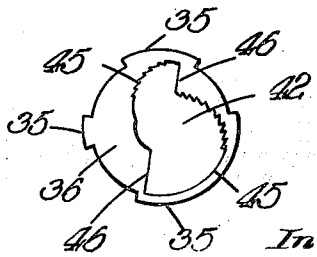

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Fig. 7.

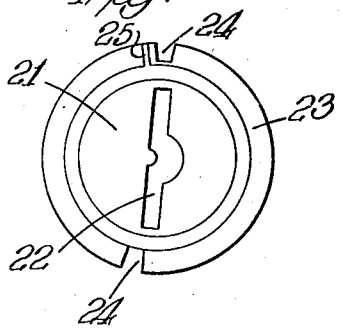


Fig. 11.

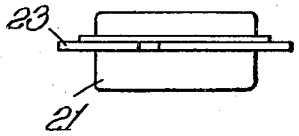


Fig. 8.

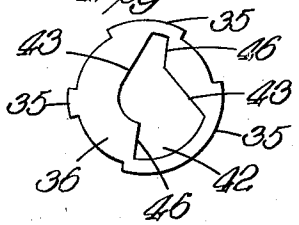


Fig. 12.

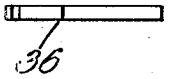


Fig. 9.

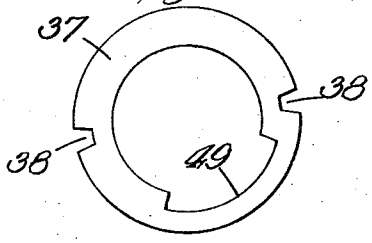


Fig. 13.

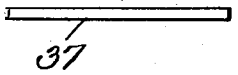


Fig. 10.

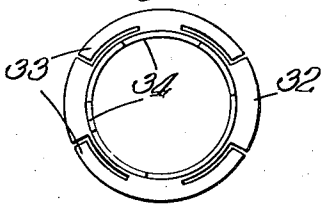
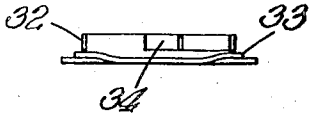


Fig. 14.



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Patented Oct. 28, 1941 2,260,674

UNITED STATES PATENT OFFICE

2,260,674

LOCK

Ernest Norbert Kennedy, Piccadilly, London, England

Application November 17, 1938, Serial No. 241,075
In Great Britain November 19, 1937

5 Claims. (Cl. 70—355)

This invention relates to locks and its object is to provide an improved construction whereby unauthorized operation of the lock may be rendered extremely difficult, a characteristic of the construction being the small number of working parts and the cheapness with which they can be manufactured and assembled in comparison with known mechanisms producing comparable results.

A further object of the invention is to provide means whereby a lock may be altered readily so that it may be operated by any one of a number of keys and the arrangement may be such that the mechanism of the lock may be set by means of a key and thereafter can be unlocked only by the use of that particular key.

According to the present invention a lock is provided with a locking member, rotatable about the same axis as the key of the lock, formed with a wall, parts of which are at progressively decreasing distances from said axis, and with one of which parts a key ward may engage after said key has been turned through a predetermined angle, which part and which angle vary according to the length of said ward, said rotary member remaining stationary while the key is turned through said predetermined angle, and thereafter turning as one with the key, by which it is thus brought to the "unlocked" position. The wall may be a surface inclined to a radius from said axis, a curved surface of decreasing radius, a series of smaller surfaces corresponding with said curved surface, or a series of steps corresponding with said inclined surface or with said curved surface. The rotary locking member may be formed with an aperture to receive the key, said aperture being bounded, at least in part, by said wall.

Preferably the rotary locking member is circular and has at its periphery one or more notches arranged to receive a corresponding tongue or tongues on the bolt or bolts of the lock. If desired a plurality of coaxially arranged rotary locking members may be employed.

The rotary locking member may be formed of at least two relatively rotatable parts, e. g. an inner part with which a key ward may engage as above set forth and an outer part in the periphery of which is or are formed the notch or notches to receive the tongue or tongues on the bolt or bolts.

The arrangement of the parts should be such that when being turned by the key in the operation of locking or unlocking the outer part of the rotary locking member is not subjected to any frictional or other force tending to displace it angularly relatively to the inner part.

The invention will now be described with reference to the accompanying drawings wherein Figure 1 is a front elevation of one form of lock; Figure 2 is a cross-section on the line **2—2**, Figure 1; Figure 2A is a cross sectional view along the line **2A—2A**, Figure 1. Figures 3 and 4 are front elevations of the interior mechanism of the lock shown in two different positions; Figure 5 is a fragmentary section on the line **5—5**, Figure 3; Figure 6 is an enlarged cross-section of the locking elements, on the line **6—6**, Figure 3; Figures 7, 8, 9 and 10 are face views and Figures 11, 12, 13 and 14 are corresponding side views, respectively, of details of the mechanism; and Figures 15 and 16 are face views corresponding with Figure 8 but showing modifications thereof.

The latch mechanism forming part of the improved lock shown in Figures 1 to 4 comprises a hasp *a* which is hinged to a base plate *b* in the usual manner and is influenced by a spring (not shown) so that it tends to turn away from the lock, and which is formed with two oppositely facing hooks *cc*, formed with notches *d*, Figure 2, in which may engage channel section latch members *jj* movable, against the action of springs *kk*, by the engagement of parts *oo* on knobs *hh* with offset tongues *nn* on said latch members *jj*, the latter being pivotal about pins *gg* which are integral with the knobs *hh* and are pivotal in the front and back portions *e* and *f* of the lock body or casing. According to the present invention the locking of the latch members *jj* in their position of engagement is effected by the mechanism now to be described.

21, Figures 6, 7 and 11, is a rotary member or distance piece, the axial depth of which is varied according to the number of rotary locking members to be employed. This distance piece **21** is formed with a key hole **22** and with a peripheral flange **23** formed with notches **24**, **24** in which the tongues *nn* on the latch members *jj* may engage, and with an upstanding lug **25**, which coacts with a lug **26** on the front portion *e* of the lock body to limit rotation, the upper end of the distance piece **21** fitting into a cylindrical recess within a boss **27** projecting forwardly from the front portion *e* of the lock body and thus providing a bearing for said rotary distance piece **21**. It is to be observed that the general plane of the keyhole **22** is diametral, but that it is substantially semi-cylindrical at the centre; this ensures that a correspondingly formed key **28**, Figure 6, must always be inserted with the concave side of its semi-

cylindrical central rib **29**, towards the left, Figures 1, 2 and 4, hence such a key may have a ward **30** of greater radial length on one side of said rib and a ward **31** of shorter radial length on the other side thereof, thus enabling a large range of keys to be used, alternatively, with the same lock, as explained hereinafter.

32, Figures 6, 10 and 14, is an annulus of L-section, the circumferential flange portion of which is slit and offset in the axial direction to present spring fingers **33** . . ., Figs. 10 and 14, which as shown in the latter figure are offset upwardly; while the barrel portion of said annulus is notched in the axial direction, as at **34** . . . to receive corresponding lugs **35** . . . which project radially from a disc **36**, Figures 6, 8 and 12; further said barrel portion extends through a central aperture in a ring **37**, Figures 6, 9 and 13, which is formed with notches **38, 38**, corresponding with the notches **24, 24**, in the flange **23** of the rotary distance piece **21**, and for a like purpose. The diameter of the ring **37** is slightly less than that of the flange **23** of the distance piece **21** so that the tongues *nn* of the latch members *jj* do not bear against the periphery of said ring, thus avoiding friction. To centralize the elements of the locking mechanism the back portion *f* of the body or casing of the lock is pressed concentrically to present a rib **39**, Figure 6, outside which the annulus **32** is rotatable and inside which the key **28** may be rotated, the free end of said key having projections **40, 40** which may move in a recess **41**, while the corresponding end of its semi-cylindrical rib receives, and turns about, a central projection **40a**.

From Fig. 6 it will be observed that as the elements **21, 36, 37**, and **32** are disposed in axial alignment and the pressure of spring fingers **33** acts upwardly, they force ring **37** upwardly against lugs **35** of disc **36**, the distance piece **21** serving as an abutment to prevent upward movement of disc **36**. As lugs **35** of disc **36** engage in notches **34** of the barrel portion of annulus **32**, it follows that when disc **36** is turned by key **28**, annulus **32** must turn as one therewith, while the frictional engagement of spring fingers **33** of the circumferential flange portion of annulus **32** with the surface of ring **37** tends to cause said ring to turn as one with annulus **32** and disc **36**.

The disc **36** Figs. 6, 8, 15 and 16 is formed with an aperture **42** to receive the key **28** and this aperture **42** is bounded, in part, by two surfaces **43, 43**, inclined to radii from the axis of the disc **36** with one of which the operative ward of the key **28** may engage after said key has been turned through a predetermined angle, according to the length of said ward, the disc **36**, annulus **32** and ring **37** remaining stationary, but the distance piece **21** rotating, while said key is turned through said predetermined angle, and thereafter turning as one with said key, by which said parts are thus brought to the "unlocked" position shown in Figure 4, where the tongues *nn* on the latch members *jj* may enter the notches **24, 24** in the peripheral flange **23** of the distance piece **21**, and the notches **38, 38** of the ring **37**, tongues *nn* extending substantially from the front portion *e* of the lock body or casing to the back portion *f* thereof, i. e. their dimension in that direction corresponds with that of latch members *jj*, as shown in Fig. 2A. This engagement of the tongues *nn* in the notches **24, 24** prevents the key from being turned while the latch members *jj* are in the "unlatched" position thus obviating accidental angular displacement of the disc **36** relatively to the ring **37**.

Figures 15 and 16 show similar discs **36**, that shown in Figure 15 being bounded, in part, by two curved surfaces **44, 44** of decreasing radius and that shown in Figure 16 by two corresponding stepped surfaces **45, 45**. Similarly the surfaces **43** shown in Figure 8 may be stepped. The aperture **42** is also bounded, in part, by surfaces **46, 46**, one of which lies on, and the other parallel with, a diameter, and which may be engaged by the ward or wards of a key to turn the parts to bring the notches **24, 24** and **38, 38** to such positions that the tongues *nn* of the latch members *jj* cannot engage therein, thus locking the lock. The locking and unlocking are effected by turning the key through almost 360°, the movement being limited, in either direction, by the lugs **25** and **26**.

It is to be understood that if a series of keys are to be employed which have a ward projecting from one side only, instead of a disc **36** a plate having only a single straight, curved or stepped surface may be used.

It will be appreciated that although the key **28** is turned through nearly 360° to effect the locking or unlocking, the parts **32, 36** and **37** are turned to a less extent according to the radial length of the operative ward of said key, for during the unlocking movement there is an idle movement of the key through a predetermined angle until the end of the operative ward engages the surface **43**, this angle increasing as the radial length of the ward decreases, hence by the provision of a series of keys with wards of progressively decreasing radial length various settings of the lock mechanism can be obtained by bringing the parts to the unlocked position by means of the key previously used, restricting the ring **37** against rotation, turning the key to the locked position, withdrawing the key and inserting another, which is then turned back to the unlocked position, and then releasing the ring **37**, which will thus be left in the unlocked position and the angular position of the disc **36** relatively to the notches **24, 24** and **38, 38** will have been re-set so that the lock can be operated only by said new key.

In order that rotation of the ring **37** may be restricted, for the purpose just mentioned there is slidably mounted on the back portion *f* of the body or casing of the lock a hooked member **47**, Figures 3, 4 and 5, the nose **48** of which may be caused to enter an arcuate recess **49**, Figure 9, in the ring **37**. In Figure 5 this member **47** is shown in broken lines in its normal position and in full lines with its nose **48** projecting into the arcuate recess **49** in the ring **37**.

The key **28** has been described above as if its wards were of the same radial length throughout their axial depth, the operative edges of the wards may be stepped, however, in which event there will be provided for each operative step a corresponding disc **36** with its associated notched ring **37** and annulus **32**, and each such additional association of parts may be centred by a non-rotatable dividing member in the form of a apertured plate suitably mounted in the body or casing *ef* and formed around its aperture with a flange corresponding with and serving the same purpose as, the circular rib **39**.

With this multiple arrangement both wards of a key may be brought into operation, e. g.,

the first step of one ward and the next step of the other ward may be operative, and so on; hence the combinations of operative steps of the wards is such that the number of keys in the range may be increased enormously.

Similarly one or more circular ribs may be formed concentrically inside the rib **39** in the recess **41**, necessitating corresponding notches in the end of the key **28**, or concentric grooves may be formed in place of such ribs and the end of the key formed with projections, still further increasing the number of keys.

I claim:

1. In a key operated lock, at least one locking member formed of at least two concentric parts normally rotatable as one in either direction by friction but capable of relative rotation when said friction is overcome, means for holding one of said parts to permit relative rotation of said concentric parts by said key, said locking member having a circular portion concentric with its axis of rotation and of such diameter that the longest ward of said key will not intersect it, a base having a corresponding circular raised portion adapted to engage with said circular portion on said locking member as a bearing for the rotation of said locking member, and the relative angular position of said parts determining the angle through which said key must be rotated after its insertion into the lock and before it makes direct contact with said locking member and brings the lock into the unlocked position.

2. In a key operated lock, a lock body at least one locking member rotatable in said lock body about the same axis as the key of the lock, separate bearing surfaces in said lock body for said locking member and said key, said locking member comprising three concentric parts, one part rotatable about the axis of said key normally insuring that the other two parts rotate as one in either direction by friction, said two parts being capable of relative rotation when said friction is overcome, and one of said parts being formed with spring fingers adapted to hold said parts in spring pressed alignment, means for holding one of said parts to permit relative rotation of said concentric parts by said key, the relative angular position of said two parts determining the angle through which said key must be turned after its insertion into the lock and before it makes direct contact with said locking member and brings the lock into the unlocked position.

3. In a key operated lock, a lock body at least one locking member rotatable in said lock body about the same axis as the key of the lock, separate bearing surfaces in said lock body for said locking member and said key, said locking member comprising three concentric parts, one part rotatable about the axis of said key normally insuring that the other two parts rotate as one in either direction by friction, said two parts being capable of relative rotation when said friction is overcome, one of said parts being formed with upset resilient tongues arranged substantially circumferentially and adapted to hold said parts in spring pressed alignment, means for holding one of said parts to permit relative rotation of said concentric parts by said key, the relative angular position of said two parts determining the angle through which said key must be turned after its insertion into the lock and before it makes direct contact with said locking member and brings the lock into the unlocked position.

4. In a key operated lock, a lock body, at least one locking member rotatable in said lock body about the same axis as the key of the lock, separate bearing surfaces in said lock body for said locking member and said key, said locking member being formed of at least two concentric parts normally rotatable as one in either direction by friction but capable of relative rotation when said friction is overcome, means for holding one of said parts to permit relative rotation of said concentric parts by said key, the relative angular position of said parts determining the angle through which said key must be rotated after its insertion into the lock and before it makes direct contact with said locking member and brings the lock into the unlocked position, a further member coaxially aligned with said locking member and formed with a keyhole the general plane of which is diametral, and which has a lateral projection at the center, said further member being adapted to rotate as one with said key and having a notched periphery, and means for preventing rotation of said key except when the bolt is in the latched position.

5. In a key operated lock, a lock body, a plurality of locking members rotatable in said lock body about the same axis as the key of the lock, separate bearing surfaces in said lock body for said locking members and said key, a non-rotatable dividing member having a circular upset portion of such diameter that the longest ward of the key will not intersect it, said dividing member separating at least one pair of adjacent locking members, and serving as a bearing upon which one of said pair of adjacent locking members may rotate, at least one locking member being formed of at least two concentric parts normally rotatable as one in either direction by friction but capable of relative rotation when said friction is overcome, means for holding one of said parts to permit relative rotation of said concentric parts by said key, the relative angular position of said parts determining the angle through which said key must be rotated after its insertion into the lock and before it makes direct contact with said locking members and brings the lock into unlocked position.

ERNEST NORBERT KENNEDY.