Jan. 3, 1956 J. W. TAYLOR 2,729,091

KEY OPERATED LOCK MECHANISM

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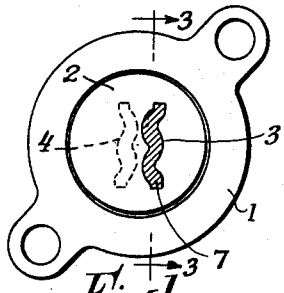


Fig.1.

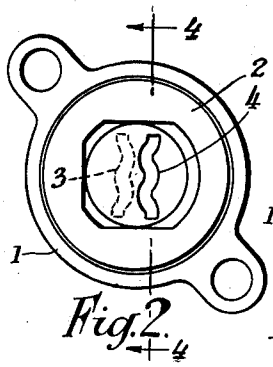


Fig.2.

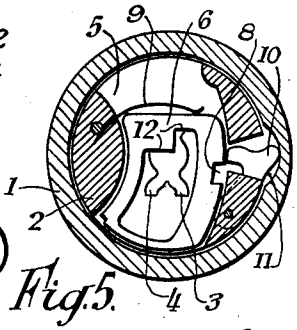


Fig.5.

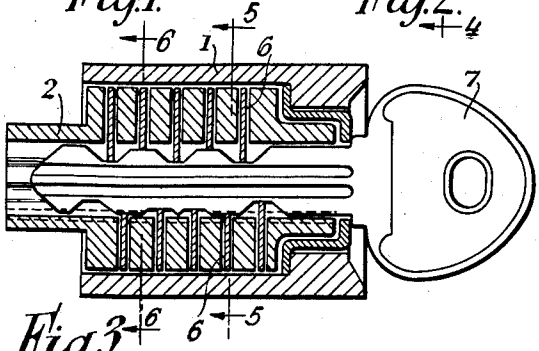


Fig.3.

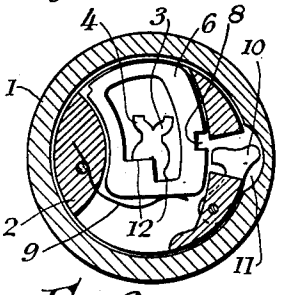


Fig.6.

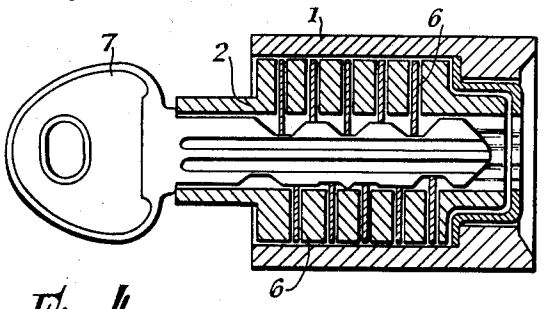


Fig.4.

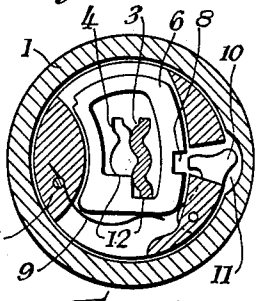


Fig.7.

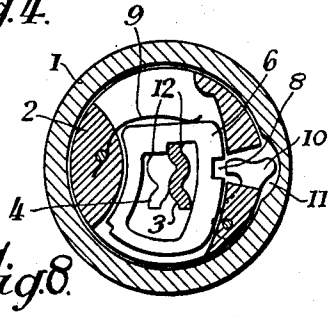


Fig.8.

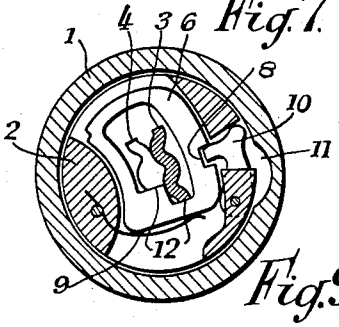


Fig.9.

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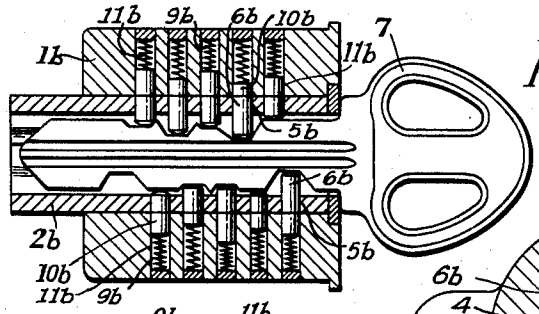


Fig. 11.

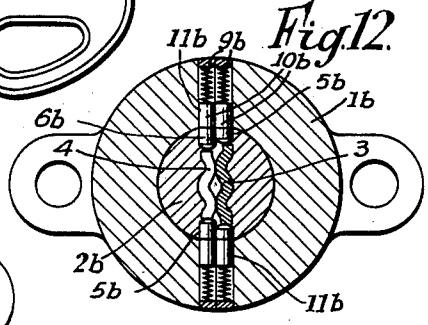


Fig. 12.

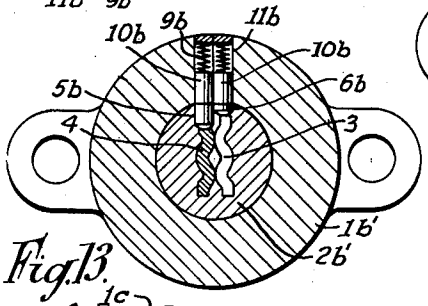


Fig. 13.

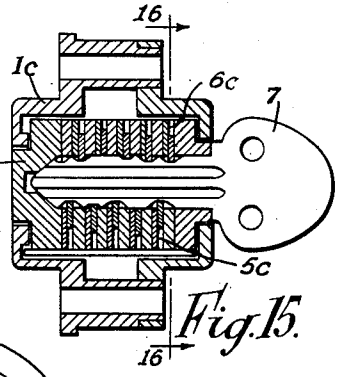


Fig. 15.

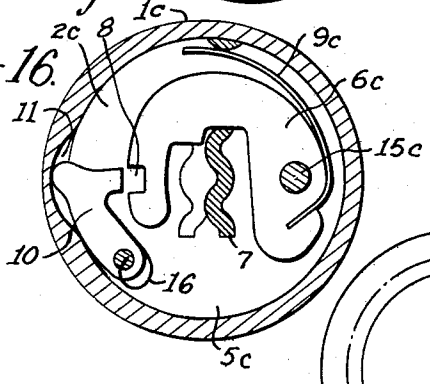


Fig. 16.

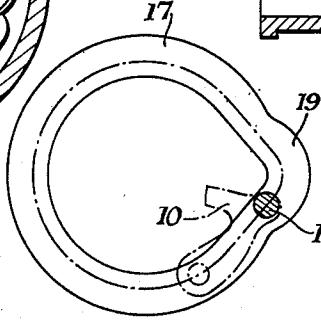


Fig. 17.

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Fig. 14.

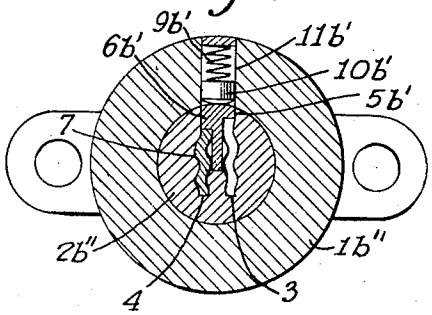


Fig. 10.

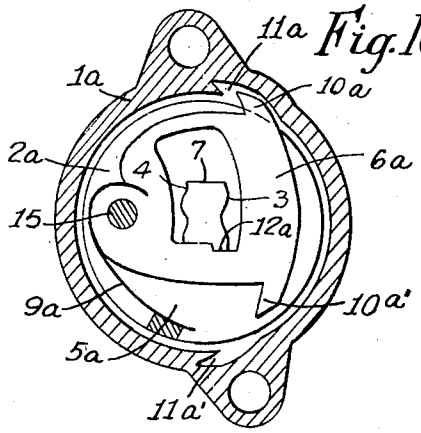


Fig. 18

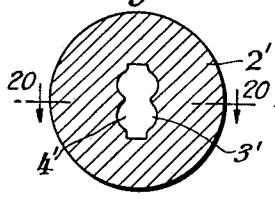


Fig. 19.

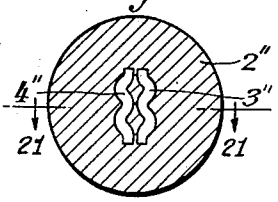


Fig. 20.

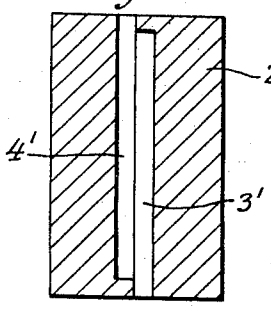


Fig. 21.

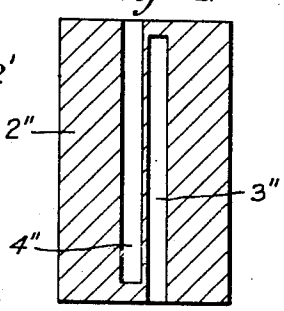
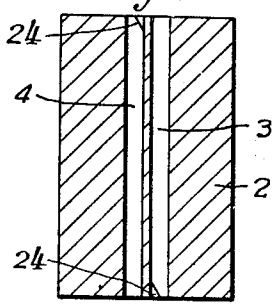


Fig. 22



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United States Patent Office

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KEY OPERATED LOCK MECHANISM

Jack William Taylor, New Denham, England, assignor to Ingersoll Limited, London, England

Application February 18, 1952, Serial No. 271,992

Claims priority, application Great Britain February 19, 1951

4 Claims. (Cl. 70—358)

This invention relates to key operated lock mechanism and is particularly concerned with plug and cylinder type lock mechanism incorporating a series of tumblers or equivalent members which are moved as a result of insertion of the appropriate key to permit rotation of the plug within its associated cylinder.

In the case of plug and cylinder type lock mechanism as at present constructed where it is desired to operate the lock from both sides of the door, it is the practice to fit two such cylinders one on the inside and one on the outside of the door. Such an arrangement has the disadvantage of adding considerably to the cost, whilst the cylinders project from the faces of the door to such an extent as to render them unsightly and has the further disadvantage that grips can be applied to the projecting parts to forcibly rotate the complete mechanism and thereby to operate the lock without using a key.

Furthermore in cases where front and rear entry of the key was possible the number of key changes was reduced to such a degree as to render the key mechanism virtually useless for security purposes.

The chief object of the present invention is to evolve a key operated lock mechanism and particularly key operated mechanism of the plug and cylinder type which can be associated with a lock that the cylinder does not project unduly from either side of the door and at the same time can be operated from either inside or outside, preferably through the medium of the same key, the cylinder being of substantially the same length as the more usual cylinder in which the plug is operable from one side only.

Key operated lock mechanism in accordance with the present invention includes two key holes or key slots enterable from opposite sides of the lock mechanism, the key slots being laterally spaced apart an amount such that the key when inserted from either side of the door will contact and operate the same set of tumblers or other operating components.

The advantages gained with the invention do not reduce the key changes at all, on the contrary they may even be increased.

In the case of plug and cylinder lock mechanism the key holes will be disposed laterally on opposite sides of the axis of rotation of the plug, the plug and cylinder being of more or less normal length as used for operation from one end only. It is preferred that the key slots shall not extend completely through the plug so that only one key slot will be observable from each end, but if from the point of view of manufacture it is found easier to cut the slots completely through the plug the end of each slot remote from the entrance is preferably so shaped as to prevent entry of a key from that end. Furthermore, although it is contemplated that two slots will actually be used these slots may, in fact, be combined but will provide two key passages of identical cross sectional shape.

In order that the invention may be clearly understood and readily carried into effect the invention is hereinafter

described with reference to the accompanying drawings in which:

Figures 1 and 2 are views in elevation of a plug and cylinder lock mechanism having two laterally arranged key slots, the views being taken from the front and rear of the mechanism respectively;

Figure 3 is a cross-sectional view corresponding to line 3—3 of Figure 1 and showing a key inserted in one of the key slots from one side of the lock mechanism;

Figure 4 is a cross-sectional view corresponding to line 4—4 of Figure 2 and showing a key inserted in the other key slot from the opposite side of the lock mechanism;

Figure 5 is a cross-sectional view corresponding to line 5—5 of Figure 3 and showing a tumbler of one set in locking position;

Figure 6 is a cross-sectional view corresponding to line 6—6 of Figure 3 and showing a tumbler of the other set in locking position;

Figure 7 is a cross-sectional view similar to Figure 6 but showing the key inserted, as shown in Figure 3, and the tumbler in unlocked position;

Figure 8 is a cross-sectional view similar to Figure 5 but showing the key inserted, as in Figure 7, and the tumbler in unlocked position;

Figure 9 is a cross-sectional view similar to Figure 7 and showing the plug in partial rotation within the cylinder to unlock or release the lock mechanism;

Figure 10 is a cross-sectional view transversely through a modified lock mechanism embodying pivoted tumblers;

Figure 11 is a cross-sectional view longitudinally through a modified lock mechanism embodying pin tumblers;

Figure 12 is a cross-sectional view of Figure 11;

Figure 13 is a cross-sectional view similar to Figure 12 but showing only one set of pin tumblers;

Figure 14 is a cross-sectional view similar to Figures 12 and 13 but showing modified pin tumblers;

Figure 15 is a cross-sectional view longitudinally through another modification of the lock mechanism;

Figure 16 is a diagrammatic cross-sectional view corresponding to line 16—16 of Figure 15;

Figure 17 is a diagrammatic view of a constructional feature of the lock mechanism shown in Figures 5–9 and 16;

Figure 18 is a cross-sectional view transversely through a plug and illustrating one arrangement of the key slots;

Figure 19 is a cross-sectional view similar to Figure 18 and illustrating another arrangement of the key slots;

Figure 20 is a cross-sectional view corresponding to line 20—20 of Figure 18;

Figure 21 is a cross-sectional view corresponding to line 21—21 of Figure 19, and

Figure 22 is a cross-sectional view similar to Figures 20 and 21 and illustrating a modified form of locking the inoperative ends of the key slots.

Referring in the first case to Figures 1 to 9 of the accompanying drawings, the lock mechanism includes a cylinder 1 containing a rotatably mounted plug 2 the plug being formed with two key slots 3 and 4 which are laterally spaced on opposite sides of the plug's axis of rotation. In these figures the position of the key is indicated by cross hatching and as will be seen clearly from the drawings the plug is formed with a series of arcuate shaped recesses 5 which are spaced apart throughout the length of the plug each recess containing an arcuate shaped tumbler 6 of the pivotless type, that is to say, the tumblers have no pivotal connection with the plug, but turn about a mythical centre point disposed outside the plug's periphery.

Each tumbler is formed with a central opening through which the key 7 can pass, the key being of asymmetrical cross sectional shape and being notched or serrated on

both edges, this asymmetrical cross sectional shape preventing the key being inserted into the key slot upside down.

The edges of the key are serrated or notched to a depth which will impart the necessary lift to all the tumblers as a result of introduction of the key into the plug as to permit of rotation of the plug within the cylinder under the controlling turning movement of the key so as to actuate the lock and it will be appreciated that the depth of the notches or serrations on opposite sides will provide the desired combination.

Each tumbler **6** is formed with a peripheral notch **8** and normally these notches will be out of alignment, the tumblers normally occupying the positions shown in Figures 5 and 6, Figure 5 showing a tumbler which is movable upwardly whilst Figure 6 illustrates a tumbler which is movable by the key in the opposite direction. The tumblers are normally maintained in the positions shown in Figures 5 and 6 by means of blade springs **9**.

The plug carries a pivoted talon **10**, the outer extremity of which enters a recess **11** formed in the inner surface of the cylinder and thus prevents rotation of the plug within the cylinder when the tumblers are in the position shown in Figures 5 and 6. On the tumblers being given the requisite lift by the insertion of the appropriate key they will be moved into the position shown in Figures 7 and 8 where the notches **8** are all in alignment and in this position the opposite or inner end of the talon is free to enter the notches **8** and the outer end to move clear of the recess **11** of the cylinder. If the key is given a slight preliminary movement the plug will be turned slightly in the cylinder in which case the walls of the recess **11** will cam the talon into a position in which it enters the aligned notches and is moved clear of the recess **11**, thus permitting continued rotational movement of the plug to actuate the lock.

Assuming that the key and plug have to be turned through 360° to actuate the lock, the talon will return to the position shown in Figures 7 and 8 and to release the talon from the aligned notches and permit withdrawal of the key, a spring **16** may be associated with the talon, as shown in Figure 16, which will cause the latter to return into engagement with the recess **11**. Alternatively the talon may engage a suitable cam track **17** in the cylinder such as is shown in Figure 17.

In order that the tumblers will be given the correct lift irrespective of the direction of entry of the key into the plug, the inner key engaging edge of each tumbler is formed with two faces **12** which are stepped relative to one another, the step being of a particular depth to suit the particular combination chosen.

In Figure 10 a modified form of lever tumbler is shown, which tumbler **6***a*, although still movable in an arcuate path within the recess **5***a* within the plug **2***a*, nevertheless is pivotable about the fulcrum **15** carried by the plug **2***a*. In this case each tumbler is formed with two peripheral projections **10***a* and **10***a'* which enter grooves or recesses **11***a* and **11***a'* in the cylinder **1***a* these grooves and projections being preferably of the undercut or dovetail formation shown. The springs **9***a* normally hold the tumblers in the position shown in which all the projections **10***a* are in engagement with their adjacent recess. On the key being inserted in the respective key slot **3** or **4**, and presuming it is the correct key which will engage the tumbler edges **12***a* to impart the correct amount of lift to all the tumblers, the projections **10***a* will be moved clear of the recess **11***a* thus permitting the plug to turn in the cylinder. If the lift, however, is abnormally large the opposite projection **10***a'* will enter the recess **11***a'* thus still preventing turning movement. It is essential, therefore, that the lift imparted to the tumblers shall be no less and no more than that for which the key mechanism is designed thus making for greater security. As there will be two sets of tumblers movable in opposite directions the dovetail shape of the projections and recesses will

tend to cause the parts to engage further if an attempt is made to turn the plug forcibly in either direction by means other than the correct key.

In Figures 11 to 14 the invention is shown applied to a plug and cylinder lock mechanism of the pin tumbler type and as the plug is again formed with two key slots which are laterally spaced on opposite sides of the plug's axis of rotation, it is necessary to arrange the pin tumblers in laterally connected pairs or dual pin tumblers. Figures 11 and 12 show two diametrically disposed sets of fixed pairs of pin tumblers, Figure 13 shows only one set of connected pairs of pin tumblers, and Figure 14 shows pin tumblers spanning both key slots and having dual key engaging edges.

Referring to Figures 11 and 12, the lock mechanism comprises a cylinder **1***b* within which the plug **2***b* is mounted and provided with key slots **3** and **4**. The plug is provided with recesses or slots **5***b* and the cylinder with recesses or slots **11***b* within which the pairs of pins **6***b* having key engaging ends and drivers **10***b* of the pin tumblers are slidably mounted and biased by springs **9***b*. The structure shown in Figure 13 is identical except that the cylinder **1***b'* and plug **2***b'* accommodate only one set of the dual or pairs of pin tumblers.

The pin tumblers of each pair are respectively aligned with the two key slots **3** and **4** and are connected together so that they will be moved jointly when a key is inserted in either of the key slots. It is more convenient from the point of view of obtaining a particular combination to construct the pin tumblers separately and to connect them together in pairs, by what might be termed a pin and slot connection, so that they will be moved jointly by introduction of the key into the plug from either end and will be given a lift appropriate to free the plug and permit of its rotation within the cylinder.

On the other hand, it is more convenient from the point of view of manufacture and assembly to form the dual pin tumblers integrally and this structure is shown in Figure 14 wherein pins **6***b'* and drivers **10***b'* are slidable in slots or recesses **5***b'* in the plug **2***b''* and slots or recesses **11***b'* in the cylinder **1***b''*, the pin tumblers being biased by a spring **9***b'*. The pins **6***b'* have dual key engaging edges and span both key slots **3** and **4** of the plug. The pin **6***b* may be of any suitable cross-sectional shape, such as for example, square or hexagonal and is of the stepped formation shown in the illustration.

Referring now to Figures 15 and 16, a more simple type of lever tumbler mechanism is shown, each tumbler **6***c* being pivoted at **15***c* within the slots **5***c* in the plug **2***c* and having associated with it a suitable blade spring **9***c*; the tumblers being notched as at **8** for the entry of a talon **10** pivotally associated with the plug, the cylinder **1***c* being again formed with a recess **11** in its inner surface for the entry of the talon therein to prevent rotation of the plug within the cylinder until all the tumblers have been moved into the position shown in Figure 16 by the insertion of the appropriate key in which position all the notches **8** are aligned, entry of the talon into the notches **8** being brought about by initial turning movement as described in connection with Figures 5 to 9. Re-entry of the talon into the recess **11** at the termination of turning movement of the key is brought about by means of a spring **16** (Figure 16) or a cam track **17** (Figure 17) in the end of the cylinder with which cam track a projection **18** on the talon engages, the cam track being formed with an operative part **19** which brings about the said re-engagement of the talon in the recess **11**.

It will be observed that the previously described figures illustrate alternative ways in which the two laterally positioned key holes may be formed in a plug and these modifications are more particularly shown in Figures 18 to 22. In Figures 18 and 20, a single slot is formed which provides two key passages **3'** and **4'** which are laterally positioned in a plug **2'**. In Figures 19 and 21 two key slots **3''** and **4''** are provided in a plug **2''**. Fig-

ures 20 or 21 and 22 illustrate two alternative ways in which introduction of the key into both slots from both ends of the plug is effectively prevented. In Figures 20 and 21 the slots do not project throughout the full length of the plug. In Figure 22 the slots project completely through the plug, but the end opposite to the mouth is reduced in width as at **24** for the purpose of preventing key entry from that end.

I claim:

1. Key operated lock mechanism comprising a cylinder having a bore, a plug revolvably mounted in the bore of said cylinder, pin tumblers movably mounted in said plug, said plug having two laterally spaced key slots extending longitudinally thereof, said pin tumblers comprising two similar sets respectively disposed on opposite sides of the axis of the lock mechanism and jointly spanning both of said key slots for cooperation with a double edge key and having key engaging surfaces cooperating with a key in either of said slots, said key slots having key receiving openings respectively at opposite ends of said plug, and means under the control of said pin tumblers for preventing rotation of said plug within said cylinder until all of said pin tumblers have been moved the correct amount, whereby the proper key may be inserted in either of said slots for moving said pin tumblers to release said means and permit rotation of said plug within said cylinder.

2. Key operated lock mechanism as defined in claim 1, wherein the ends of said key slots opposite said key receiving openings being at least partially closed to prevent insertion of a key in each slot from both ends of said plug.

3. Key operated lock mechanism as defined in claim 1, wherein said plug has integrally fixed projections to at least partially close said key slots opposite said key receiving openings to prevent insertion of a key in each slot from both ends of said plug.

4. Key operated lock mechanism as set forth in claim 1, wherein the tumbler key engaging surfaces being stepped to provide the required movement by the key in either of said slots.

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