May 31, 1932. M. FALK 1,860,708

MASTER KEY DISK LOCK

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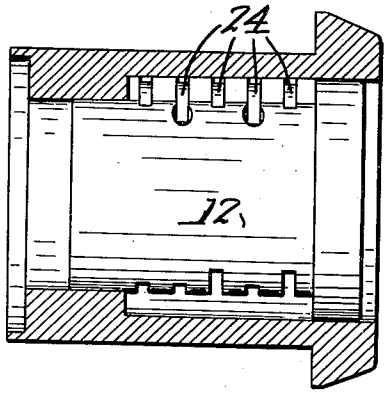


Fig. 1.

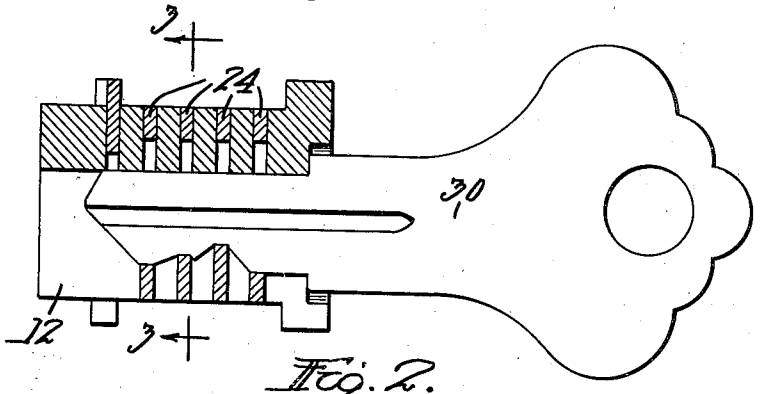


Fig. 2.

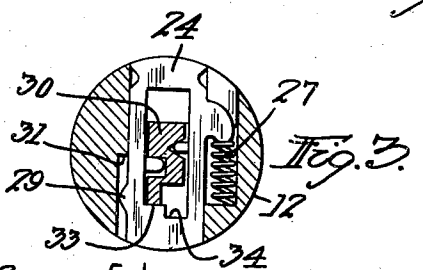


Fig. 3.

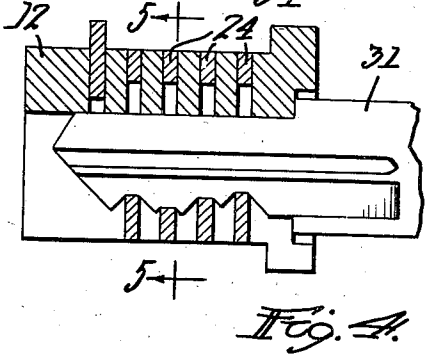


Fig. 4.

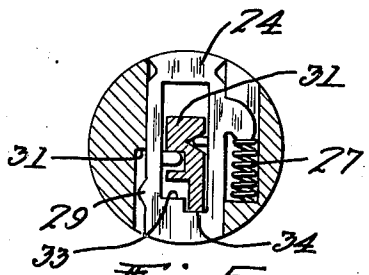


Fig. 5.

Inventor
Morris Falk
By Attorneys
Coulter Fay & Hanley

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MASTER KEY DISK LOCK

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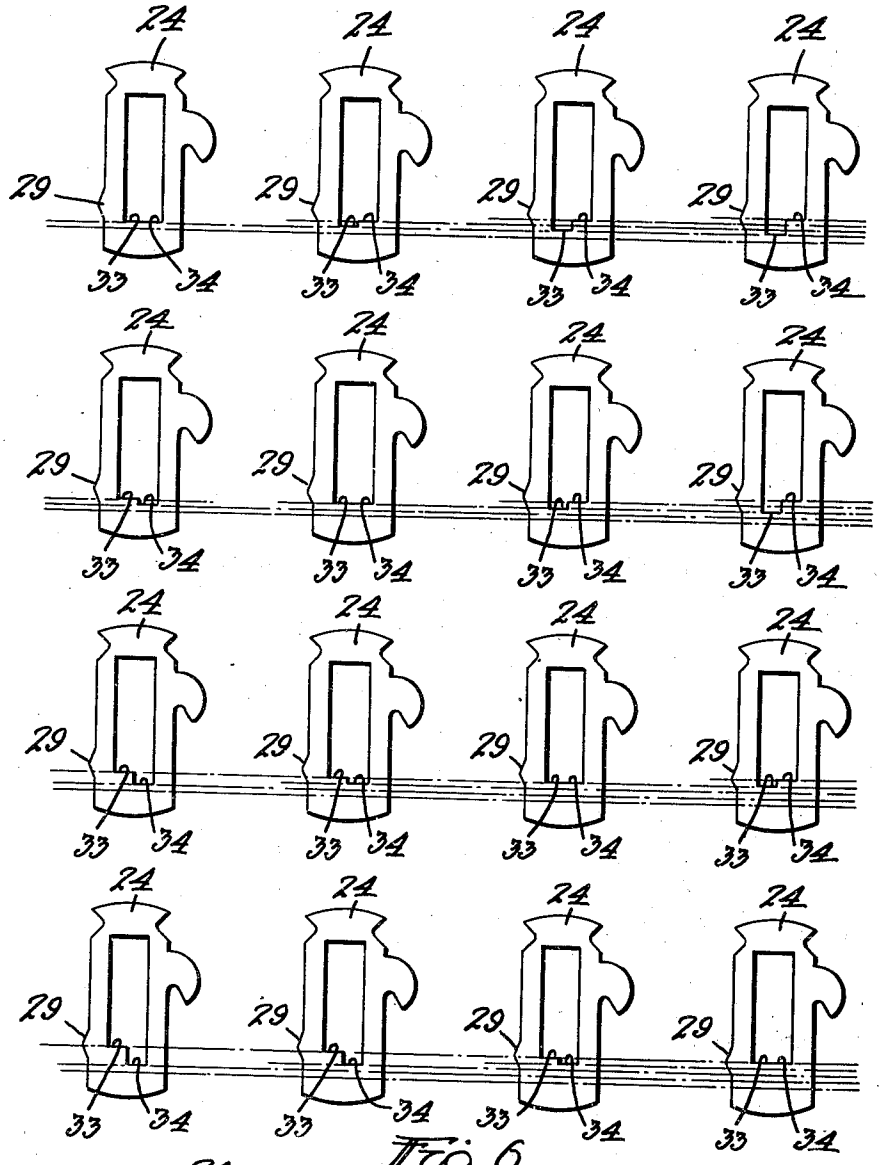


Fig. 6.

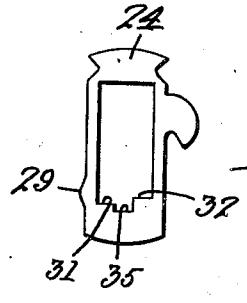


Fig. 7.

Inventor
Morris Falk
By Attorneys
Southgate Fay & Hanley

Patented May 31, 1932 1,860,708

UNITED STATES PATENT OFFICE

MORRIS FALK, OF FITCHBURG, MASSACHUSETTS

MASTER KEY DISK LOCK

Application filed December 20, 1928. Serial No. 327,437.

This invention relates to a cylinder lock of the disk type, and the chief object is to enable the manufacturer or anyone who is familiar with lock work, to set the combinations in a number of cylinder locks where each and every lock is of a different key change and so constructed that one master key will open them all. Heretofore on cylinder locks, this could be accomplished only on pin tumbler type locks by splitting the pins, whereby one section of the pins would line up with the use of the regular key, and the other section with the use of the master key. On the disk type lock, owing to its construction, the disks cannot be split.

Another object of the invention is to provide these disks in such form that they will not fall out when the cylinder is removed and yet cannot be tampered with in any ordinary way.

Reference is to be had to the accompanying drawings in which

Fig. 1 is a side view of a lock constructed in accordance with this invention, with the case in section, showing it in locked condition;

Fig. 2 is a longitudinal sectional view with the ordinary key in position unlocking the cylinder;

Fig. 3 is a transverse sectional view on the line 3—3 of Fig. 2;

Fig. 4 is a longitudinal sectional view showing the lock unlocked by the master key;

Fig. 5 is a transverse sectional view on the line 5—5 of Fig. 4;

Fig. 6 is a view of a set of sixteen disks, and

Fig. 7 is a view of a disk showing how the invention can be used for cooperation with a grand master key as well as a master key.

I have designed a special disk, dividing the section of the disk that comes in contact with the key in two parts, using different steps or cuts on one half of the disk to give the various changes on the lock when used with the regular key, and on the other half to be used exclusively for a master key, specially milled, to come in contact with this half of the lever only. By having various depths or steps on this side of the lever, a cylinder can be set up so the disks on the master key side shall have the same combination in any number of locks, and on the other side, or the regular key side, each cylinder will have a different combination. Thus a key of one cylinder will not open the others, while on the opposite side the disks are set up with one particular combination and the master key cut to this particular combination will open all the various locks set this way. For example, when a lock is set up to a certain combination, certain numbers are used to go by. The disks are generally cut to correspond to these particular numbers, and to make each lock a different combination, we change one or more numbers on the disks. If the numbers remain the same, it is understood that the locks will be the same and will interchange, one with another. What is done in this case is to have the numbers changed in every lock on the regular key side and on the master side to have the numbers or combinations alike on as many locks as necessary for any particular job.

Example.—Disk set-ups

Regular key side	Master key side
23232	14324
12123	14324
12234	14324
32432	14324
31442	14324
43321	14324

While these combinations can be set to a number of locks on the master side alike, it can also be changed at any time to another number on this particular job (or building) or on another job, so the master key and locks can be changed for each job where a number of different cylinder locks are want-

ed, so that each one of the regular keys will operate only one lock, and the master key will operate them all. Heretofore the use of the disk or wafer type of lock has been limited to a great extent to automobiles, or other units where individual changes were sufficient and master keyed locks not necessary. By being able to master this type of lock, its uses are now unlimited, and it can be used for front door in building, apartment offices, padlocks, trunks, and various other uses.

Another useful improvement on this type of cylinder disk lock is this: Heretofore, when this type plug was removed from the cylinder and the key withdrawn, the disks would all drop out, with the result that many disks would get lost or the combination become changed so as to make the lock useless, unless it was put together again by someone who is familiar with this type of work. I have, therefore, designed a special cylinder plug and special disks which make it impossible for the disk to drop out when the plug is removed from the shell, and the key withdrawn.

The invention is shown as applied to a plug 12 of the ordinary kind slotted in the usual way. It is provided with a series of disks 24 in slots in the plug, each disk being pressed outwardly by a spring 27.

In this case each disk is of a general rectangular shape, as usual, but has a projection 29 on one side which engages a shoulder 31, in the slot in the plug 12 when the spring forces the disk out so as to hold the disk in the position shown in Fig. 1. On account of the projection 29 it is possible to move the disk carefully and get it out of the plug in spite of this projection when the plug is out of the lock. However, such procedure requires some pressure and movement of the parts so that the disks cannot get out of place accidentally. Therefore these plugs can be assembled with the disks in them and shipped with no external means for holding the disks in position. This gives the automobile manufacturer the opportunity of having these plugs assembled with no chance of losing time by the disks coming out and solves a very important problem for him. Also, as the projection 29 is rigid, it is not easy to get the disk out and it cannot be done by ordinary picks and the like.

When assembled in the lock, said disks 24 requires a slight pressure to push the disk into the slot until the projection 29 gets beyond the undercut 31 in said plug, then the disk will start working freely again, and the projection, coming up against the shoulder 31 of the undercut in the plug, stops the disk from coming out in the usual handling when the key is removed. However, said disk can be removed at all times by applying pressure on the back of said disk to put it through the slot through the upper part of said plug. By this construction the disk is not weakened by any slit in the periphery.

The principal feature of the invention involves the employment of this type of lock for use with a master key. For that purpose I have provided in addition to the ordinary key 30 a master key 31. The two keys look about alike and the two handles are exactly alike except that one may be marked to indicate that it is a master key, but the shaft of the ordinary key is arranged so that the cam projections which operate the disks are in a straight line along the left-hand side as shown in Fig. 3. But in Fig. 5 the master key is shown in position, and in this case the cam portions are on the right-hand side. In this way the two keys when put into the same hole at different times will engage the disks in different areas.

I take advantage of this fact to operate these locks ordinarily by the key 30 through surfaces 33 on one side of the bottom of each disk. These surfaces are at different distances from the top of the slot through the disk, as appears in Fig. 6, to provide for the different combinations. Also in the bottom and at different distances from the top of the slot are another series of surfaces 34 on the right-hand side of each disk designed to cooperate with the master key and provide for unlocking any number of locks which are arranged for that particular master key.

In Fig. 6 is shown a set of sixteen of these disks each set of four arranged horizontally, being for the same lock. It will be seen that the first lock is unlocked by an ordinary key having the numbers 1—1—1—1 and by a master key having the numbers 1—2—3—4. The next horizontal set is unlocked by an ordinary key having the numbers 2—2—2—2, but by the same master key, and the other two sets are arranged similarly. In this way all four of these locks will be capable of being unlocked by the same master key, but each one has to have a different ordinary key.

In this way without material extra expense disk locks of this character can be set up to be used with two sets of keys, the ordinary and the master key.

In Fig. 7, I have shown the disk wider somewhat and three areas on it, the areas 31 and 32 as before for an ordinary key and a master key, and between them a third area 35 for a grand master key. When the whole series of locks are set up with this type of disk, they can be employed as is usually the case with pin-tumbler locks for master keys and grand master keys.

Although I have illustrated and described only two forms of the invention, I am aware of the fact that other modifications can be made therein by any person skilled in the art without departing from the scope of the invention as expressed in the claim. There-

fore I do not wish to be limited to the exact form shown, but what I do claim is:—

A disk lock having a plug and a series of locking disks carried thereby, each disk having a rigid convex projection on one side with gently sloping sides and the plug having an undercut in its wall against which said projections are adapted to engage, whereby the disks are not likely to be removed accidentally but can be removed by the application of force.

In testimony whereof I have hereunto affixed my signature.

MORRIS FALK.