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(54) A key-change system for a cylinder lock

(57) A key-change system for a cylinder lock wherein auxiliary tumblers (5) are interposed between upper tumblers (3) and bottom tumblers (4) and removed to enable the key-change, the key means including both a plurality of change keys (8), each having a recess (81) on the back for selectively removing one of the auxiliary tumblers (5), and a key having no such recess (81) on the back, said recesses and the tumbler aligning means of the key means being arranged in said change keys in such a way that use of one of said plurality of change keys and subsequent use of a further change key prevents re-use of said one change key previously used.

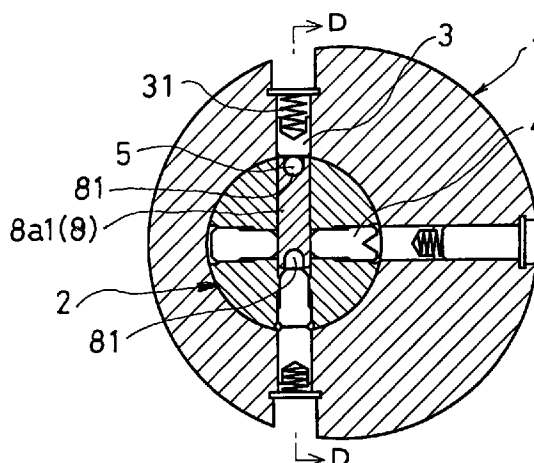


FIG. 8

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The invention relates to a key-change system for a cylinder lock wherein the cylinder lock comprises an upper tumbler, a bottom tumbler and an auxiliary tumbler interposed therebetween so that the auxiliary tumbler is removed to enable the key-change, and the key-change system also provides a function of a master key.

2. Prior Art

[0002] A key-change system for a cylinder lock generally refers to a construction key system or a special key system applied to cylinder locks for locking up a multiple dwelling house and a multiple accommodation facility, such as rental apartments, flats, hotels, etc., at the stages of under construction and thereafter. The construction key system is used or engaged in, for example, by a contractor in charge of interior finishing for a plurality of specific dwellings (e.g., apartments, or rooms of hotel) in the concerned building under construction. The contractor is allowed or enabled to keep a key of a single kind, i.e., a construction master key and lock and unlock the cylinder locks at the specific dwellings by use of the single kind of construction master key commonly. And when a dweller (or guest), who starts to live in or stays at a finished new apartment or a hotel room, once uses an owner key assigned exclusively to him to operate the cylinder lock, the construction master key is no longer effective or usable for the purpose. Furthermore, the special key system works in such manner that in case that a dweller of the new apartment or a guest staying at the hotel room loses an owner key, or changes to a next dweller or guest, when the cylinder lock is once operated by a new owner key (a second, third or sequential owner key, usually called "a change key"), the owner key previously used becomes no longer effective or usable.

[0003] A principle of the conventional key-change system will be explained with referring to a conventional cylinder lock shown in Figs. 14 to 20. A portion of the key having a larger width is defined as sides (or side surfaces), and that smaller in width as the back.

[0004] The cylinder lock x comprises a cylinder a having tumblers b therein, a plug c having tumblers d therein, and auxiliary tumblers e interposed between the tumblers b and d, the plug c also having recesses f for removing the auxiliary tumblers e.

[0005] The cylinder lock x has chambers for accommodating the tumblers b, d and the number of chambers is exemplified as six as shown. The cylinder lock x may be associated with a key serving as a construction key kc which has, on the sides and at the back, dimple-like cuts

kd to cause all the auxiliary tumblers e (which each placed in the respective chambers) to drop into the chambers in the plug c (accommodating the tumblers d) and be aligned at their tops with a share line L (boundary line) between the cylinder a and the plug c as shown in Figs. 14 and 15. The construction key kc is used to operate the cylinder locks at the specific dwellings or hotel rooms of the building under construction.

[0006] When a fresh dweller (or a hotel guest) after the construction finished inserts a first key k1 (delivered up to them as an owner key) into the plug of the cylinder lock, the first key k1 causes, with a flat part kd1 on the side, one e (e1) of the six auxiliary tumblers, for example, nearest the inlet of the key hole, to be urged up into the chamber in the cylinder a accommodating the tumbler b, i.e., to be expelled from the plug c and be aligned at the lower end with a share line L as shown in in Figs. 16 and 17. The key k1 is then turned to rotate the plug c, and the auxiliary tumbler e (e1) falls in a recess f by a spring biasing the tumbler b in the cylinder a during rotation of the plug c, thereby causing the auxiliary tumbler e (e1) to be removed from the concerned chamber (see Fig. 19). A second auxiliary tumbler e2 in the condition shown in Fig. 18 may fall in the recess f to be removed from the concerned chamber in the same manner as seen in Fig. 19, and other auxiliary tumblers e3 to e6 may be consecutively removed in the same manner.

[0007] For instance, with the first auxiliary tumbler e1 being removed, even when the construction key kc, which has the dimple-like cuts for causing all the auxiliary tumblers e to be dropped in the chambers in the plug c (accommodating the tumblers d), is inserted into the plug c, a tumbler b (b1) in the cylinder a corresponding to the auxiliary tumbler e1 falls in the chamber in the plug c (from which the auxiliary tumbler e1 has been removed) as shown in Fig. 20 and extends across the share line L. As a result, the construction key kc cannot rotate the plug c, i.e., the construction key is no longer able to operate the cylinder lock.

[0008] In brief, when the fresh dweller or guest after the construction finished uses the first key k1 transferred to him as an owner key to once operate the cylinder lock, use of the construction key kc is prevented at this stage and illegal unlocking of the cylinder locks can be prevented.

[0009] In case that the dweller or hotel guest who was given the first key k1 loses the key, or does not return the first key k1 to a manager or concierge when a next or new dweller or guest appears or exists, a second owner key k2 (usually called a "change key") is handed over or transferred from the manager to that dweller or guest having lost the first key k1 or the new dweller or guest of hotel.

[0010] The second key k2 has a flat part kd2 which extends in continuation to a part corresponding to that of the first key k1 to remove the auxiliary tumbler e (e1) and enables removal of a second auxiliary tumbler e (e2) as shown in Fig. 18. When the first dweller or guest

having lost the first key k1 or a next or new dweller or guest uses the second key k2 to operate the cylinder lock, only the second key k2 becomes effective or usable at this stage similarly to the foregoing key-change from the construction key to the first key k1. In other words, not only the construction key kc but also the first key k1 are prevented from being used, whereby preventing the illegal unlocking of cylinder locks.

[0011] The key-change can be continued to a final key, i.e., carried out, for example, six times to a sixth key for a cylinder lock including six auxiliary tumblers e.

[0012] As seen from the above, the conventional key-change system using the conventional cylinder locks is so structured that when the cylinder lock is once operated by use of a new key, the patterns of the tumblers in the cylinder lock for unlocking the same are changed and cannot be recovered. Hence, the conventional key-change system is not applicable to the master key system described hereunder.

[0013] The master key system provides that a plurality of cylinder locks each mounted to respective dwellings or hotel rooms can be locked and unlocked by use of a common key of a single kind. The master key system is essential to crime prevention and security for the multiple dwelling houses, multiple accommodation facilities, such as rental apartments and hotels.

[0014] To enable operating a plurality of cylinder locks by use of a common master key of a single kind (other than specific keys (change-keys) each assigned to respective cylinder locks) as in the master key system, it is necessary to provide an unlocking pattern applicable commonly to all of the cylinder locks concerned irrespective of specific conditions of those cylinder locks. Therefore, the master key system is not usable for the rental apartments, hotel, etc., adopting the conventional key-change system using the conventional cylinder locks in which the unlocking patterns are changed and cannot be recovered. In other words, the multiple dwelling houses, etc., employing the master key system cannot make use of the key-change system.

[0015] Moreover, the conventional master key system has a fear that the master key when lost or stolen could be used for illegally unlocking every house, resulting in that not only the master key but also the cylinder locks and keys for all the dwellings or rooms concerned are to be replaced with new ones.

SUMMARY OF THE INVENTION

[0016] An object of the present invention is to provide a key-change system for a cylinder lock wherein the auxiliary tumblers in the cylinder lock can be selectively removed by use of separate keys, so that an unlocking pattern, which is provided commonly in all the concerned cylinder locks as a condition for providing a function of master key, can be kept, whereby only the construction key (which is used during construction of buildings) is prevented from being further used by use of

the owner key (change key), but, use of the master key and grand master key controlling the owner key is not prevented, thereby providing the key-change system having the function of master key not achieved conventionally. Hence, the key-change system according to the present invention is quite useful for the multiple dwelling houses and multiple accommodation facilities such as rental apartments and hotels. And the key-change system according to the present invention which does not need replacement of cylinder locks for a long time is unique and economical particularly for hotels for which the master key system is essential and indispensable, and in which people frequently go in and out and sometimes lose keys of rooms.

[0017] Another object of the invention is to provide a key-change system for a cylinder lock wherein with respect to necessity of replacement of all the cylinder locks for crime prevention upon the master key's or grand master key's being lost or stolen as in the conventional key-change system, a second master key or second grand master key serving as a change key defined in claim 3 can be used to unlock the cylinder locks for preventing illegal unlocking by use of a first master key or first grand master key while an owner key in use is usable ever since, whereby the invention shows such an excellent effect that the master key's or grand master key's being lost or stolen can be disposed without taking the uneconomical measures of replacement of all cylinder locks concerned upon change of master key as in the conventional master key system.

[0018] Further objects, characteristics and advantages of the present invention will be clarified by the following explanation.

[0019] To achieve the above objects, a key-change system for a cylinder lock according to the present invention comprises a cylinder lock having a plug and a cylinder accommodating therein upper and bottom tumblers respectively, and a fitting key which is inserted into a key hole in the plug to cause the upper and bottom tumblers to be aligned with a share line between the cylinder and plug, so that the plug is enabled to be rotated in the cylinder to allow the cylinder lock to be unlocked, and also auxiliary tumblers being interposed between the upper and bottom tumblers and removable therefrom to enable the key-change, wherein the key includes both change key having a recess on the back for removing the auxiliary tumblers and a key having no such recess on the back, so that use of a new change key prevents re-use of a change key previously used.

[0020] The change key referred to herein may include an owner key, which is assigned to each dweller (or guest) of the respective dwellings (or rooms of hotel), and a second master key or second grand master key of a set of master keys or grand master keys which are a controller's key controlling the cylinder locks at all dwellings or rooms of hotel concerned.

[0021] In the present invention, the auxiliary tumbler is removed when the change key having on the back the

recess for removing the auxiliary tumbler is applied, but not so upon use of another change key having not that recess.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

Fig. 1 is a systematic view showing correlation between an owner key and a master key in the first embodiment of the present invention.

Fig. 2 is a longitudinally sectional side view showing a cylinder lock for embodying the key-change system according to the present invention or a cylinder lock in which key-change is practicable, and a construction key being inserted into the cylinder lock.

Fig. 3 is a longitudinal section taken in the line A - A in Fig. 2.

Fig. 4 is a longitudinally sectional side view showing the same cylinder lock with a master key inserted thereinto.

Fig. 5 is a longitudinal section taken in the line B - B in Fig. 4.

Fig. 6 is a longitudinally sectional side view showing the same cylinder lock with a first owner key inserted thereinto.

Fig. 7 is a longitudinal section taken in the line C - C in Fig. 6.

Fig. 8 is a longitudinal section showing the owner key turned 90° clockwise in Fig. 7.

Fig. 9 is a longitudinal section taken in the line D - D in Fig. 8.

Fig. 10 is a longitudinally sectional side view showing the same cylinder lock with a second owner key inserted thereinto.

Fig. 11 is a simplified systematic view showing correlation between master keys and grand master keys controlling the same in the second embodiment of the present invention.

Fig. 12 is a partially longitudinally sectional side view of a first grand master key.

Fig. 13 is a partially longitudinally sectional side view of a second grand master key.

Fig. 14 is a longitudinally sectional side view showing a conventional cylinder lock (for which key-changing is practicable) with a construction key inserted thereinto.

Fig. 15 is a longitudinal section taken in the line α - α in Fig. 14.

Fig. 16 is a longitudinally sectional side view of the same cylinder lock with a first owner key inserted thereinto.

Fig. 17 is a longitudinal section taken in the line β - β in Fig. 16.

Fig. 18 is a longitudinally sectional side view of the same cylinder lock with a second owner key inserted thereinto.

Fig. 19 is a longitudinal section taken in the line γ -

γ in Fig. 18.

Fig. 20 is a longitudinally sectional side view of the same cylinder lock with a construction key inserted thereinto after the cylinder lock was unlocked with a first owner key by inserting the same into the cylinder lock.

DETAILED DESCRIPTION OF THE DISCLOSED EMBODIMENT

Embodiment 1

[0023] A first example of embodiments of the key-change system for a cylinder lock according to the present invention will be detailed with referring to Figs. 1 through 10.

[0024] Fig. 1 is a systematic view showing correlation between an owner key 8 and a master key 7, Fig. 2 a longitudinally sectional side view showing a cylinder lock for embodying the key-change system according to the present invention or a cylinder lock in which key-changing is practicable, with a construction key 6 being inserted into the cylinder lock, Fig. 3 a longitudinal section taken in the line A - A in Fig. 2, Fig. 4 a longitudinally sectional side view showing the same cylinder lock with a master key 7 inserted thereinto, Fig. 5 a longitudinal section taken in the line B - B in Fig. 4, Fig. 6 a longitudinally sectional side view showing the same cylinder lock with a first owner key 8a1 inserted thereinto, Fig. 7 a longitudinal section taken in the line C - C in Fig. 6, Fig. 8 a longitudinal section showing the owner key 8a1 turned 90° clockwise in Fig. 7, Fig. 9 a longitudinally sectional side view taken in the line D - D in Fig. 8, and Fig. 10 a longitudinally sectional side view showing the same cylinder lock with a second owner key 8a2 inserted thereinto.

[0025] 1 is a cylinder forming a cylinder lock for realizing the key-change system according to the present invention, 2 a plug rotatably fit into the cylinder, 3 upper tumblers fit in a plurality of chambers in the cylinder 1 with springs 31, and 4 bottom tumblers which are fit in a plurality of chambers in the plug 2 and adapted to be aligned at their upper ends with a share line L (boundary line) between the cylinder 1 and the plug 2 by dimple-like cuts (described later) formed on a key correspondingly to the bottom tumblers 4 when the key is inserted into a key insertion hole 21 in the plug 2, so that the key is turned to cause the plug 2 to be rotated in the cylinder 1 and operate the cylinder lock. The structure is the same as of the conventional pin tumbler type of cylinder lock and also includes an additional line of chambers, which accommodate upper and bottom tumblers to show the same function as above in association with a key at its one side, the other side and at the back similarly to a known key of the conventional cylinder lock, and a blank chamber accommodating a blank pin, whereby providing functions of a master key and a grand master key. The additional line of chambers are

the same as in the conventional cylinder lock with a function of a master key, for which a concrete explanation is omitted here.

[0026] An auxiliary tumbler 5 (51 to 56 specifically) in the form of a ball is interposed between the upper and bottom tumblers 3 and 4 and may be otherwise in the form of a pin or a disc.

[0027] The auxiliary tumblers 5 will be specifically designated by reference numbers 51 (for a first one), 52 (second), 53 (third), 54 (fourth), 55 (fifth) and 56 (sixth) respectively for convenience of explanation.

[0028] 6 is a construction key which has at the side a plurality of dimple-like cuts 6d for causing the auxiliary tumblers 5 to drop in the chambers accommodating the bottom tumblers 4 and be aligned at the tops of auxiliary tumblers 5 with the share line L.

[0029] 7 is a master key which controls or excels (as having the same function as of) an owner key (described later) as seen in the systematic view shown in Fig. 1 and is flat at the side to cause the auxiliary tumblers 5 to be pushed out of the plug 2 and cause the tops of the bottom tumblers 4 to be aligned with the share line L as seen in Fig. 4.

[0030] 8 (8a1 to 8a6 specifically) are a set of owner keys which are assigned or delivered up in the order to a dweller(s) by a controller, for example, of the apartment house. An owner key 8a1 first used by the dweller of an apartment A has at the side a flat portion, which pushes out, for example, a first auxiliary tumbler 51 among possible six auxiliary tumblers 5 (placed in a chamber in the plug nearest an inlet of the key hole) of the chamber accommodating the bottom tumbler 4 (4a), and at the back a recess 81 which can accommodate the auxiliary tumbler 51 pushed out toward an upper tumbler 3 and remove the auxiliary tumbler 51 when the key 8a1 is drawn out of the plug 2 (see Figs. 7 to 9). The key 8 when employing a reversible key usable upside down as shown may be provided symmetrically at the back with two recesses 81 serving as the first recess 81. The pair of recesses are provided, as shown by a phantom line in Fig. 9 for convenience' sake, also on an owner key 8a2 (which is used when the first dweller loses the first key 8a1, or is used by a second dweller when the first dweller changes to the same) for serving as a second recess 82; on an owner key 8a3 (to be used when the first dweller loses the second key 8a2, or to be used by a third dweller when the second dweller changes to the same) for serving as a third recess 83; similarly on an owner key 8a4 for serving as a fourth recess 84; on an owner key 8a5 for serving as a fifth recess 85; and on an owner key 8a6 for serving as a sixth recess 86.

[0031] The owner key is generally designated by 8, and for the convenience of explanation specifically called 8a1 for the one that is first used by the first dweller of the apartment A, 8a2 for that one that is used when the first dweller loses the first key 8a1, or is used by the second dweller when the first dweller changes to the same, and similarly 8a3, 8a4, 8a5 and 8a6 in the

order.

[0032] As seen in Fig. 9, the cylinder lock is operated by the first owner key 8a1 to accommodate the auxiliary tumbler 51 in the recess 81 on the key. Then, the owner key 8a1 is pulled out of the cylinder lock, so that the auxiliary tumbler 51 is removed from the cylinder lock (but cannot be returned or put back).

[0033] Next, the owner key 8a2 secondly delivered up does, as seen in Fig. 10, have at the side a flat portion which pushes out, for example, a second auxiliary tumbler 52 (nearer the inlet of the key hole) from a chamber differing from that chamber (which had accommodated the auxiliary tumbler 51 removed by the first owner key 8a1) toward or into a corresponding chamber in the cylinder containing the upper tumbler 3. The owner key 8a2 has further at the back a recess 82 for removing the auxiliary tumbler 52.

[0034] Other owner keys 8a3 to 8a6 thirdly and thereafter delivered up in order are provided on their back with recesses 83 to 86 respectively for removing auxiliary tumblers 53 to 56. Those structures are provided similarly in the cylinder locks for other apartments B, C, etc.

[0035] Next, the key-change system according to the present invention will be detailed, with referring to the shown embodiment based on the foregoing structures, with respect to a multiple dwelling house along a course of processes from construction of the house to transfer of ownership of specific apartments to dwellers.

[0036] At the stage of construction of the multiple dwelling house, when a contractor, for example, in charge of interior finishing does, as shown in Fig. 2, insert a construction key 6 possessed by him into the cylinder locks which lock up specific apartments subjected to interior finishing, the construction key 6, which has the dimple-like cuts on the side, causes all the auxiliary tumblers 5 in the cylinder lock (at every apartment of the multiple dwelling house) to fall in the chambers accommodating the bottom tumblers 4 and be aligned at the upper ends of the auxiliary tumblers 5 with the share line L by means of the dimple-like cuts. Hence, a master key for the construction key 6 can be made or prepared by including the dimple-like cuts as a common element, and the master key (designated by a reference numeral 7 in Fig. 4) is usable for locking and unlocking the cylinder locks at every apartment or a plurality of cylinder locks in a limited extent during the interior finishing.

[0037] The master key 7, which is flat wholly at the side surface, is inserted into the cylinder lock during the interior finishing, so that all the auxiliary tumblers 5 in the cylinder lock (at every apartment of the multiple dwelling house) are, as shown in Figs. 4 and 5, pushed out of the chambers accommodating the bottom tumblers 4, i.e., the upper ends of the bottom tumblers 4 are aligned with the share line L irrespective of existence or non-existence of the auxiliary tumblers 5. Hence, the master key 7 is usable for locking and unlocking the cylinder locks at every apartment or a plurality of cylinder

locks in a limited extent during the interior finishing.

[0038] In the conventional cylinder lock wherein the key-change is possible using recesses formed on the plug for removing the auxiliary tumblers, when a master key is inserted into the cylinder lock to unlock the same, all the auxiliary tumblers are removed, so that the cylinder lock can thereafter be locked and unlocked only by use of the master key or a final owner key. The cylinder lock in the key-change system according to the present invention does not have at the plug and master key the recesses for removing the auxiliary tumblers. Hence, when the cylinder lock is unlocked by inserting the master key, the auxiliary tumblers are not taken out of the cylinder lock. Therefore, when the master key is pulled out, correlation among all the upper, bottom and auxiliary tumblers does not change at all.

[0039] The interior finishing completes and a dweller of the apartment A receives from a controller of the multiple dwelling house a first owner key 8a1 among a series of owner keys which are to be used in fixed order. When the dweller inserts the owner key 8a1 into the cylinder lock at his apartment to unlock the cylinder lock, as shown in Figs. 6 and 7, the owner key 8a1 does, with a flat portion at the side, push out a first auxiliary tumbler 51 among the auxiliary tumblers 51 to 56 from the plug, and does, with a recess 81 on the back, accommodate the auxiliary tumbler 51 pushed out to the upper tumbler for removing the auxiliary tumbler 51 upon pulling out the key of the plug 2. In detail, in the midst of the unlocking operation, the auxiliary tumbler 51 falls in the recess 81 by a spring 31 urging the upper tumbler 3, as seen in Figs. 8 and 9. And when the first owner key 8a1 is pulled out of the plug 2, the auxiliary tumbler 51 leaves the recess 81 to be removed.

[0040] In the state where the auxiliary tumbler 51 has been removed from the cylinder lock, even when the construction key 6 having the dimple-like cuts (for causing all the auxiliary tumblers 5 to fall in the chambers containing the bottom tumblers) is inserted into the plug, the upper tumbler 3 corresponding to the removed auxiliary tumbler 51 enters the chamber in the plug (from which the auxiliary tumbler 51 has been removed) and extends across the share line, so that the plug 2 cannot be rotated, and the cylinder lock cannot be unlocked by the construction key 6, which is the so-called construction key utility state.

[0041] In that state with the auxiliary tumbler 51 having been removed, the master key 7 (which is flat wholly at the side to enable the upper ends of the bottom tumblers 4 to be aligned with the share line irrespective of existence or non-existence of the auxiliary tumblers 5) is usable for locking and unlocking the cylinder locks, and the function of master key works to the final stage of key-change performed through the key-change operation described later.

[0042] In case that the dweller possessing the first owner key 8a1 loses the key, the key is stolen, or the dweller does not return the key even when a next

dweller appears, the first dweller having lost the first owner key 8a1 or the new dweller will receive a second owner key 8a2 (which is usually called a "change key") from a controller of the house.

[0043] The second owner key 8a2 does, as seen in Fig. 10, have a part (differing from that part of the first owner key 8a1 removing the auxiliary tumbler 51), i.e., a flat portion (and a recess 82) for removing the second auxiliary tumbler 52. The dweller having lost the first owner key 8a1 or the new dweller uses the key 8a2 to unlock the cylinder lock, so that similarly to the foregoing key-change from the construction key 6 to the first owner key 8a1, use of the first owner key 8a1 is prevented at this stage, thereby preventing illegal unlocking of the cylinder locks.

[0044] The key-change can be similarly continued to a final owner key 8a6 having a part for removing a final auxiliary tumbler 56. The key-change can be performed six times for a cylinder lock using six auxiliary tumblers 5. Those features and effects can be similarly provided in the cylinder locks at other apartments B, C, etc.

[0045] The key-change function is similar to the conventional cylinder lock with key-changing being possible but differs therefrom in that the function of master key can be kept to the final key-change operation.

Embodiment 2

[0046] Next, a system for disposing or preventing losing or theft of a first master key or a first grand master key controlling or excelling the master keys as practical application of the key-change system according to the present invention will be explained with referring to Figs. 11 to 13 and Figs. 1 through 10.

[0047] Fig. 11 is a simplified systematic view showing correlation between master keys, which control each group of cylinder locks at a plurality of apartments, etc., and grand master keys controlling or excelling the master keys. The master key 7 includes first master keys 7a1, 7b1 to be first used and second master keys 7a2, 7b2 to be used when the first master keys 7a1, 7b1 are lost or stolen. Also, the grand master key 7G does as shown in Figs. 12 and 13 include a first grand master key 7G1 to be first used and a second grand master key 7G2 to be used when the first grand master key 7G1 is lost or stolen. The grand master keys 7G1, 7G2 have at the side and the back dimple-like cuts 7d for locking and unlocking all the cylinder locks concerned.

[0048] In every cylinder lock concerned, all the owner keys 8a to 8f including a key(s) to be changed employ keys adapted to cause the first and second auxiliary tumblers 51 and 52 to be pushed out of the plug so as to cause the upper ends of the bottom tumblers 4 to be aligned with the share line. And the first and second auxiliary tumblers 51 and 52 are not used in a usual key-change.

[0049] The grand master key 7G1 to be first used is provided at the side with a dimple-like cut for causing

the first auxiliary tumbler 51 to fall in a chamber accommodating a bottom tumbler 4, and the second grand master key 7G2 is adapted to cause the first auxiliary tumbler 51 to be pushed out of the plug and also cause a corresponding bottom tumbler 4 to be aligned at its upper end with the share line. The second grand master key 7G2 is provided at the back with a recess(es) 7G21 as shown in Fig. 13 for accommodating the auxiliary tumbler 51 pushed out toward the upper tumbler.

[0050] The grand master key 7G1 to be first used has at the side a dimple-like cut for causing a first auxiliary tumbler 51 in every cylinder lock concerned to fall in a chamber accommodating the bottom tumbler 4 and can operate all the concerned cylinder locks by means of the dimple-like cut as a common element.

[0051] In case that the grand master key 7G1 is lost or stolen, when the second grand master key 7G2 shown in Fig. 13 (which adapted to cause the first auxiliary tumbler 51 to be pushed out of the plug and also cause the bottom tumblers 4 to be aligned at their upper ends with the share line) is inserted into the cylinder locks to operate the same, the first auxiliary tumbler 51 falls in the recess 7G21 formed at the back of the key in the midst of the unlocking operation and leaves the recess to be removed when the grand master key 7G2 is pulled out.

[0052] In case that a master key 7 or an owner key 8 (which adapted to cause the upper ends of bottom tumblers 4 to be aligned with the share line irrespective of existence or non-existence of the auxiliary tumblers 5) is inserted into the cylinder lock from which the first auxiliary tumbler 51 has been removed, the cylinder lock can be locked and unlocked by the master key 7 or owner key 8 which keys therefore do not need to be changed or replaced.

[0053] In case that the first grand master key 7G1 which has been lost or stolen is inserted into the cylinder lock from which the first auxiliary tumbler 51 has been removed, the upper tumbler 3 in the concerned chamber falls into the chamber (from which the auxiliary tumbler 51 has been removed) and extends across the share line, so that the plug 2 cannot be rotated and the cylinder lock is brought into the state that unlocking is impossible, whereby preventing illegal unlocking by use of the first grand master key 7G1 having been lost or stolen.

[0054] In case of the master key 7, the same operation as the foregoing grand master key will do by use of the second auxiliary tumbler 52.

[0055] In this embodiment, the two auxiliary tumblers 51 and 52 among those used in the key-change system referred to in embodiment 1 are made use of and the times of key-changing by owner keys are reduced. But, measures for disposing or preventing losing or theft of the master keys or grand master keys may be taken by use of any chambers other than those for the tumblers 51 and 52, so that reduction of times of key-changing can be avoided.

[0056] A key-change system for a cylinder lock wherein auxiliary tumblers 5 are interposed between upper tumblers 3 and bottom tumblers 4 and removed to enable the key-change, the key including both change key 8 having a recess 81 on the back for removing the auxiliary tumblers 5 and key having no such recess 81 on the back, so that use of a new change key prevents re-use of a change key previously used.

Claims

1. A key-change system for a cylinder lock comprising the cylinder lock having a plug (2) and a cylinder (1) accommodating therein upper and bottom tumblers (3, 4) respectively, and a fitting key which is inserted into a key hole (21) in the plug (2) to cause the upper and bottom tumblers (3, 4) to be aligned with a share line (L) between the cylinder (1) and the plug (2), so that the plug (2) is enabled to be rotated in the cylinder (1) to allow the cylinder lock to be unlocked, and also auxiliary tumblers (5) being interposed between the upper and bottom tumblers (3, 4) and removable therefrom to enable the key-change,

characterized in that the key includes both change key (8, 7G2) having a recess (81 —86, 7G21) on the back for removing the auxiliary tumblers (5) and key (6, 7) having no such recess on the back, so that use of a new change key prevents re-use of a change key previously used.

2. A key-change system for a cylinder lock as claimed in claim 1, characterized in that the change key is an owner key (8) for a dweller of each of apartment of multiple dwelling house and multiple accommodation facility.
3. A key-change system for a cylinder lock as claimed in claim 1, characterized in that the change key is a second master key (7a2, 7b2) of master keys (7) or a second grand master key (7G2) of grand master keys for a controller controlling cylinder locks at all of the apartments of multiple dwelling house and multiple accommodation facility.

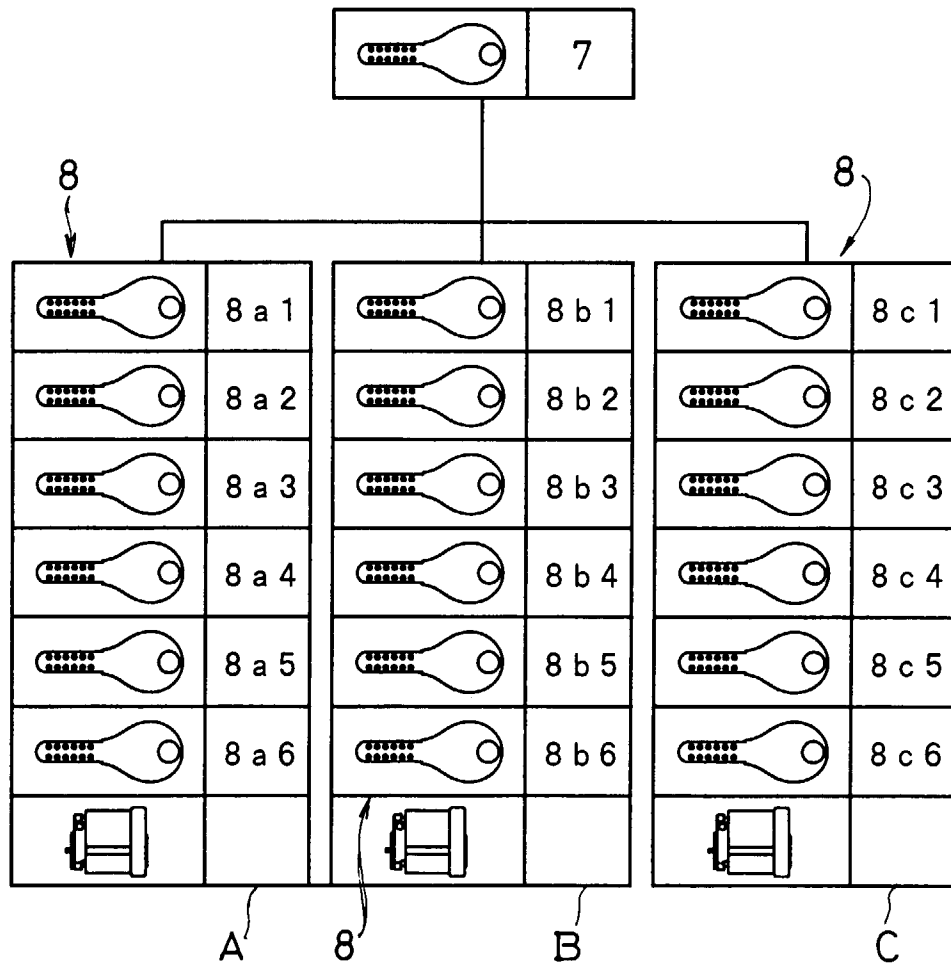


FIG. 1

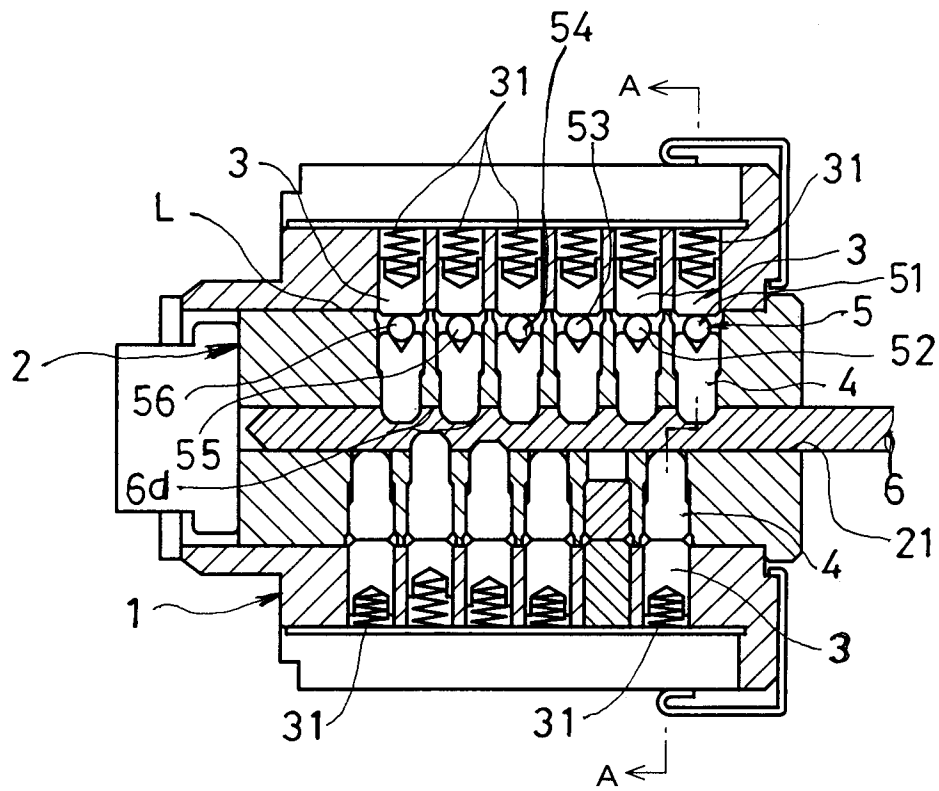


FIG. 2

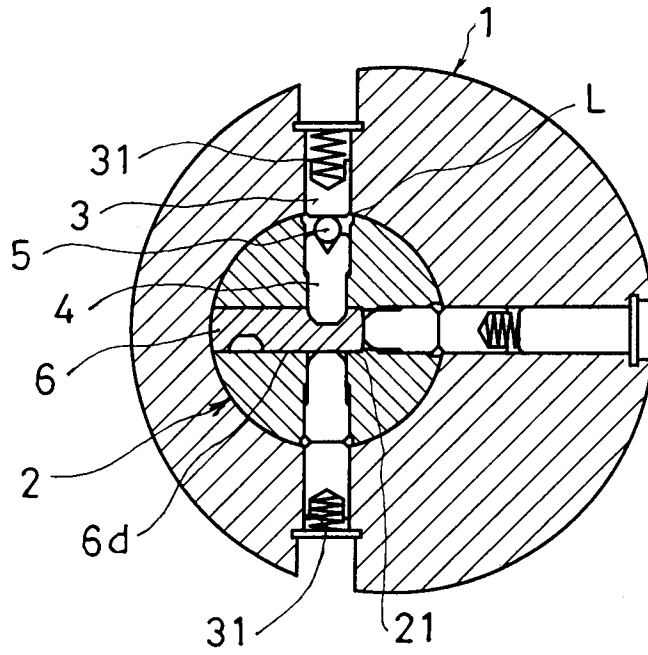


FIG. 3

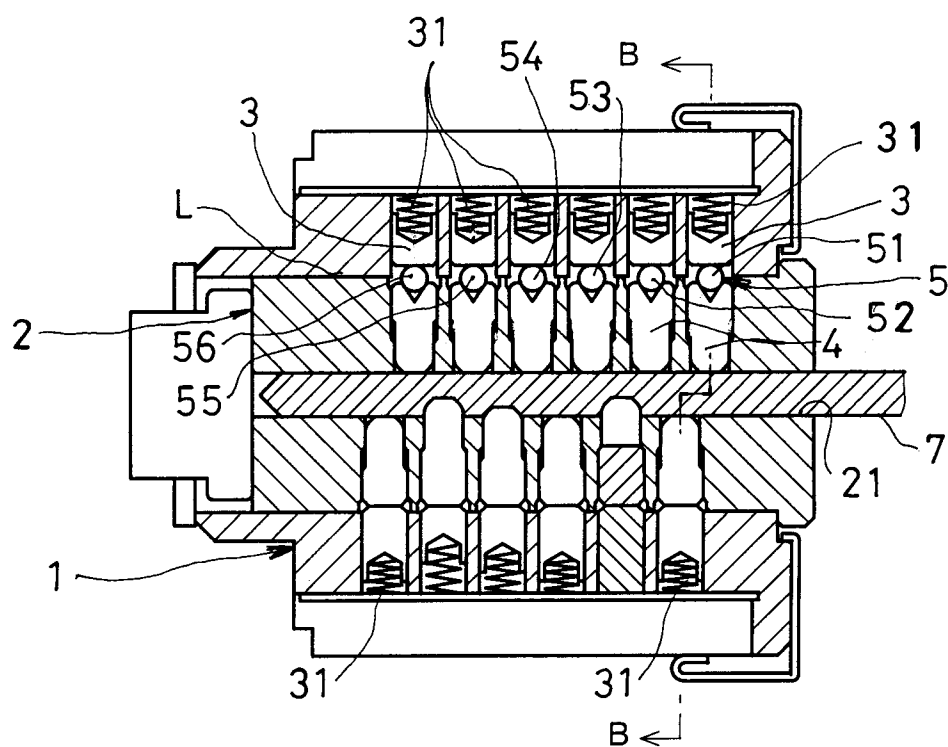


FIG. 4

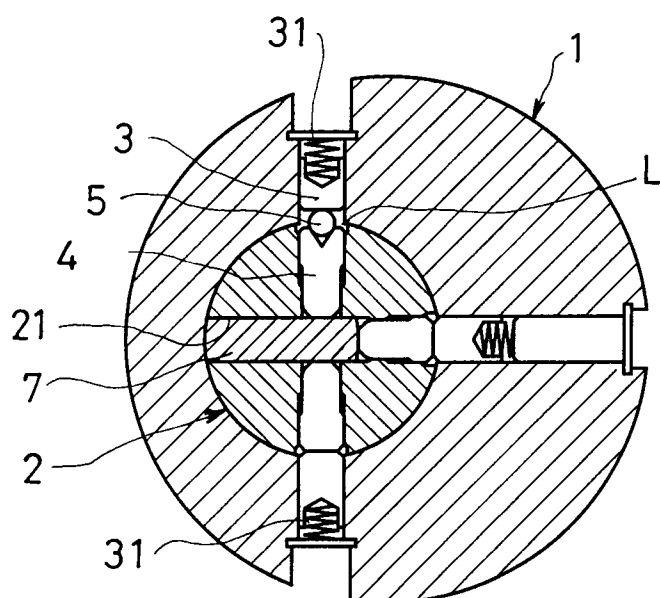
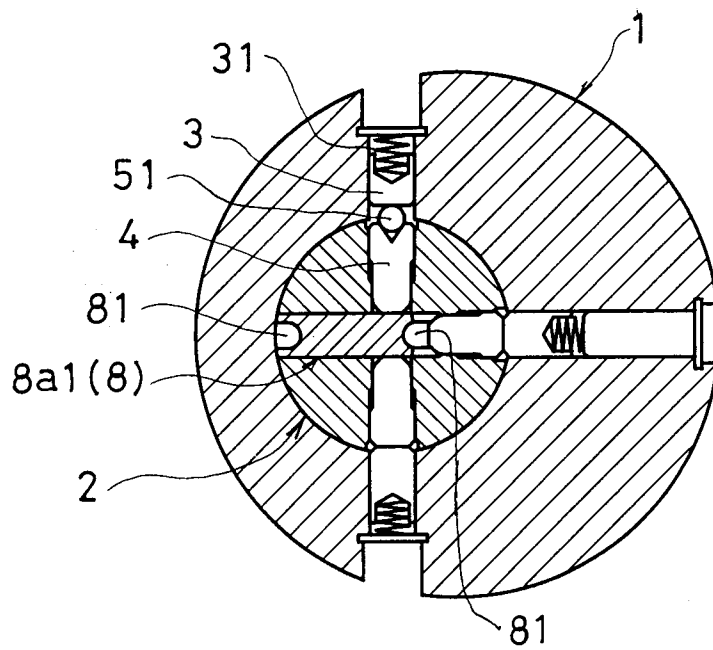
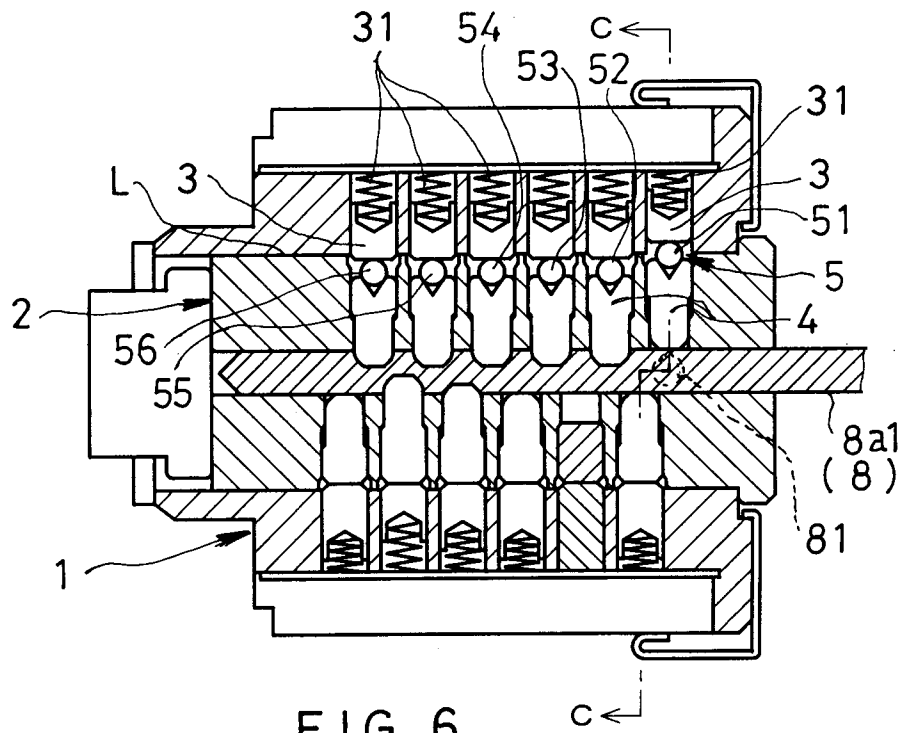


FIG. 5



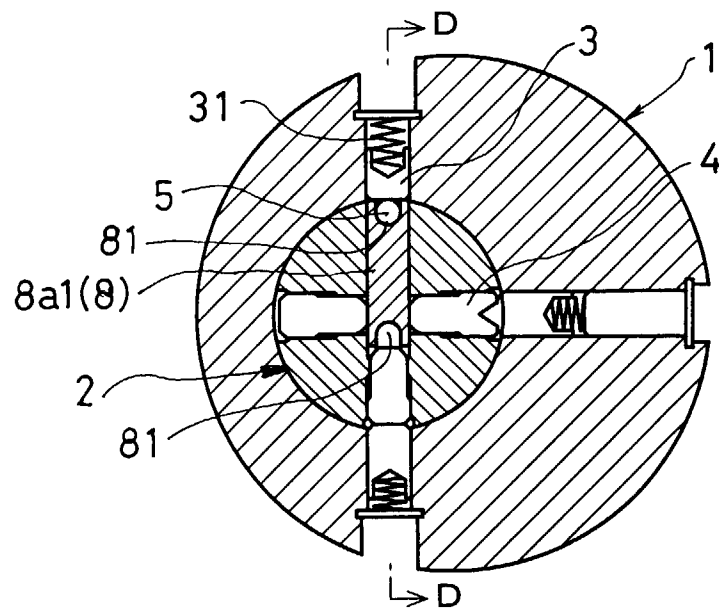


FIG. 8

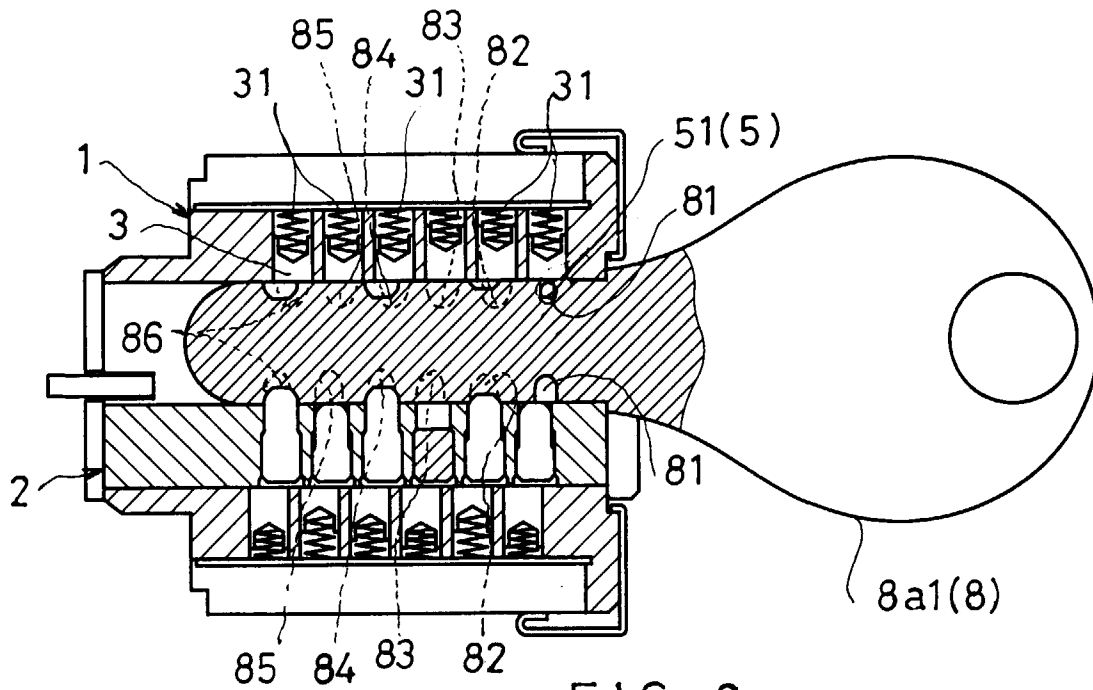


FIG. 9

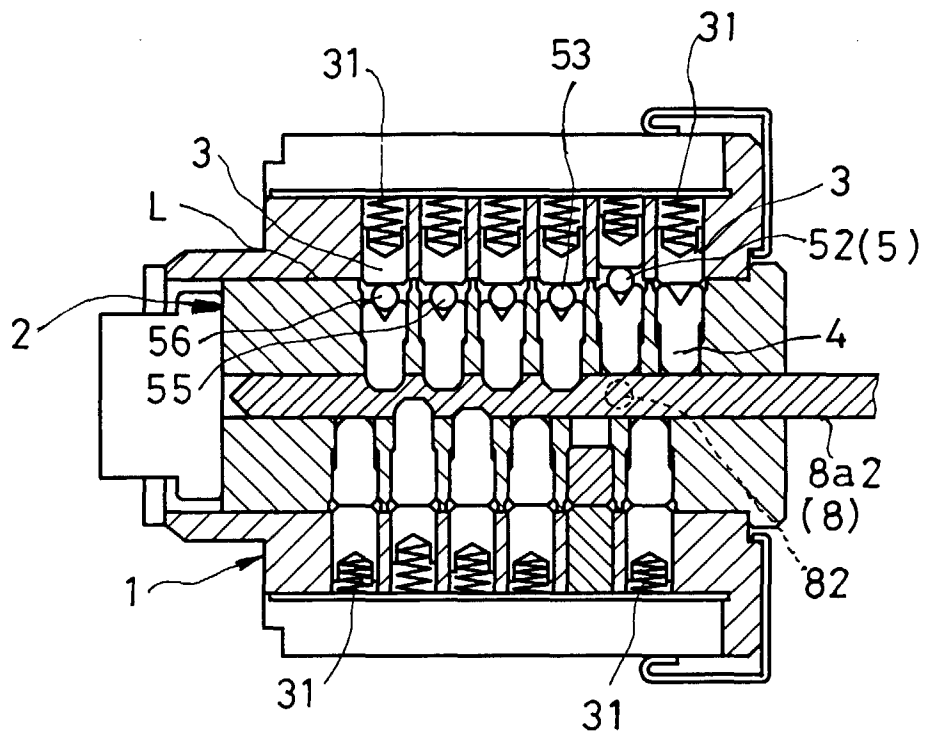


FIG.10

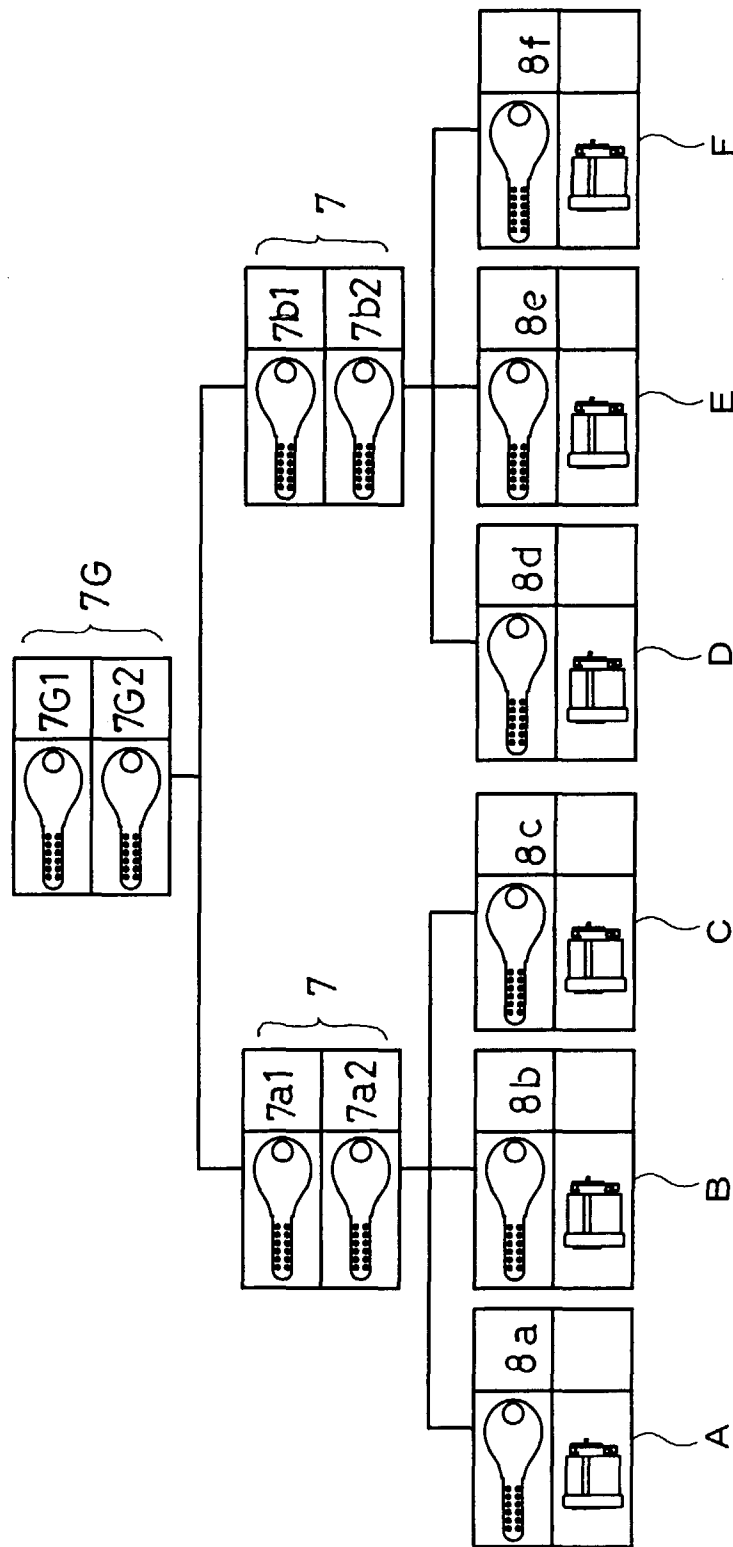


FIG.11

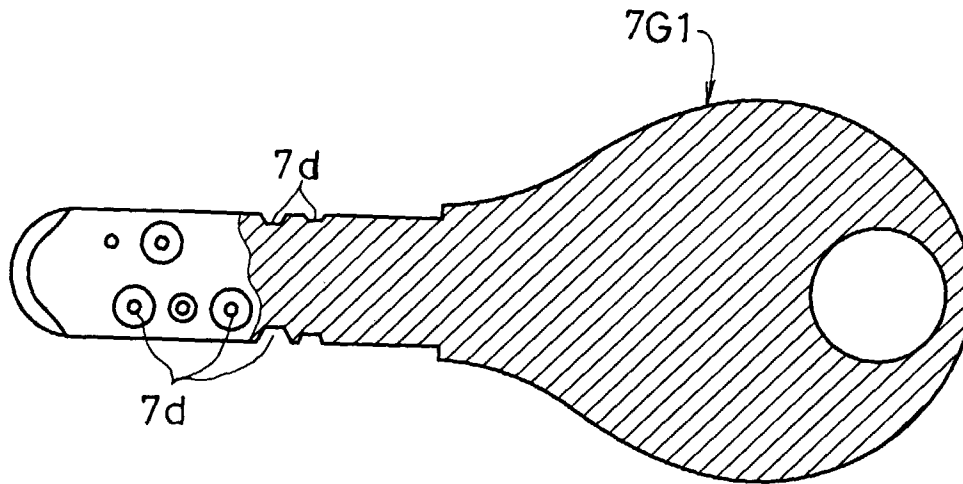


FIG. 12

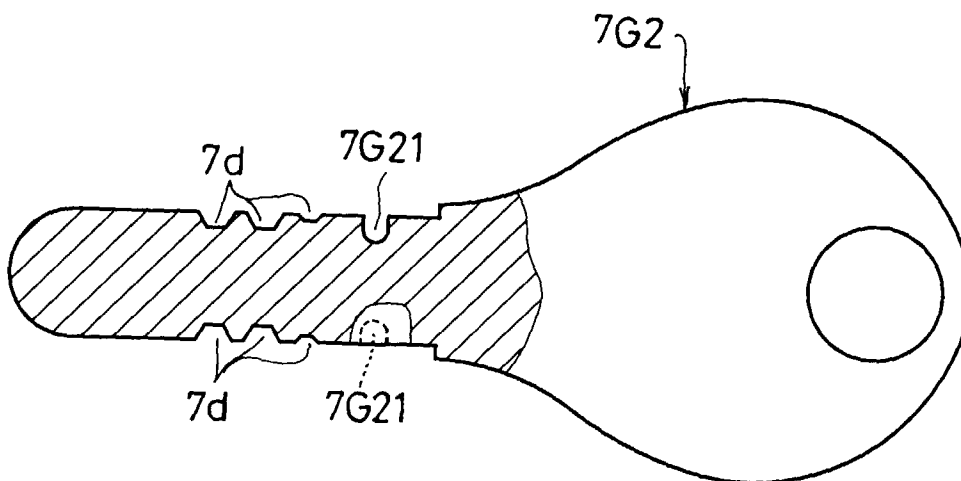


FIG. 13

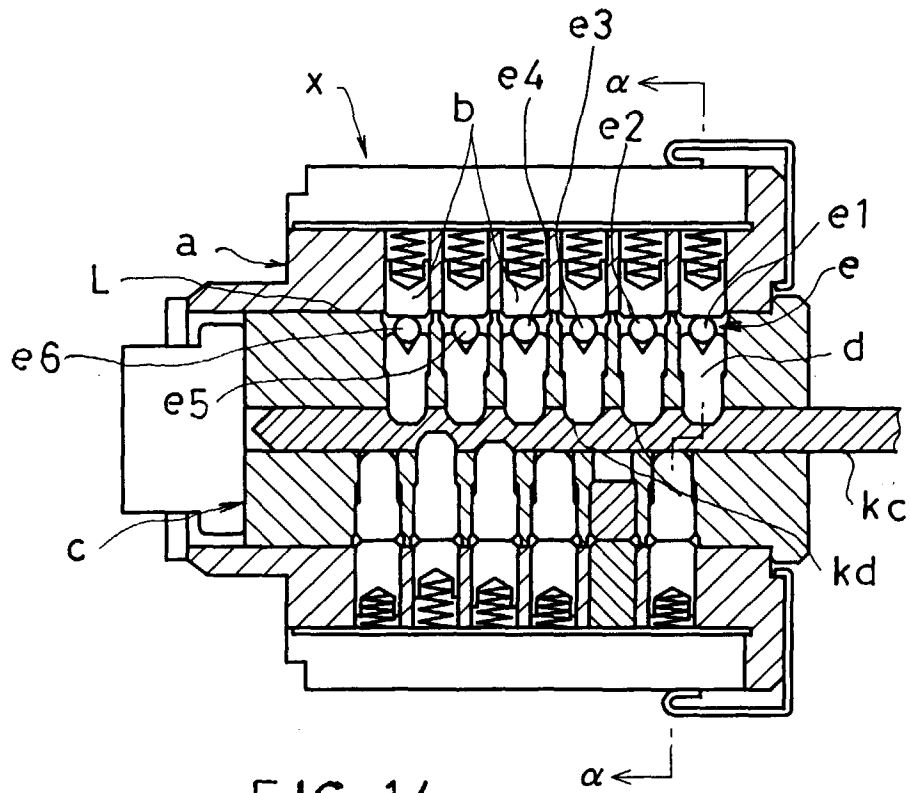


FIG. 14

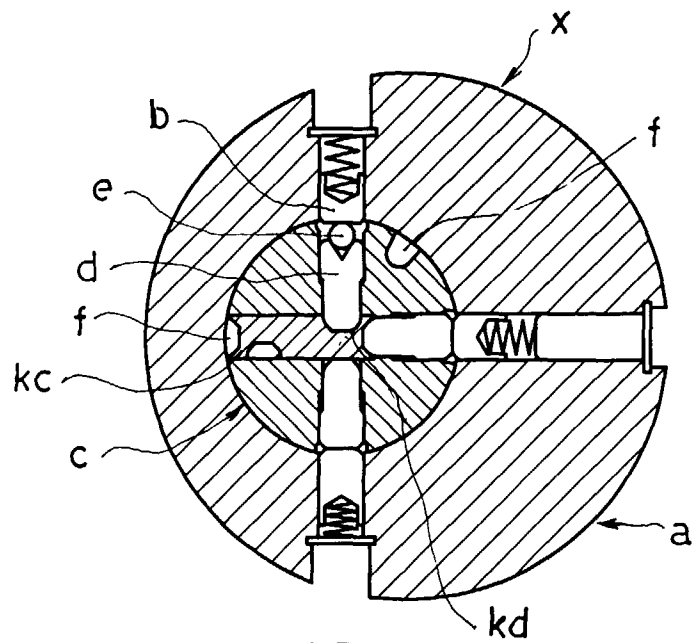
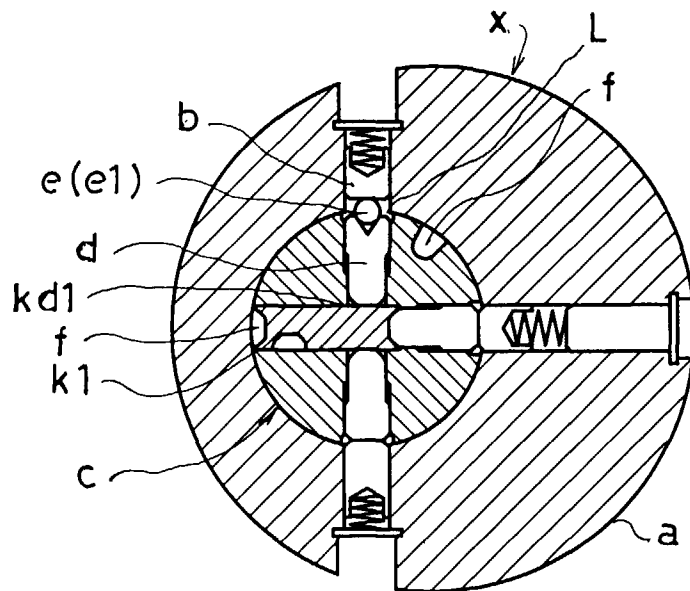
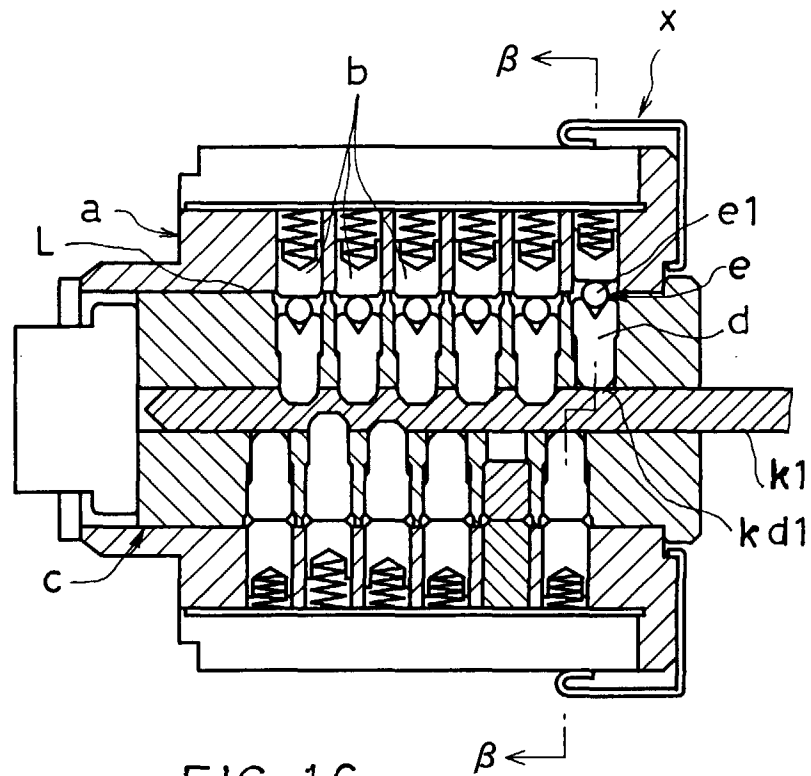


FIG. 15



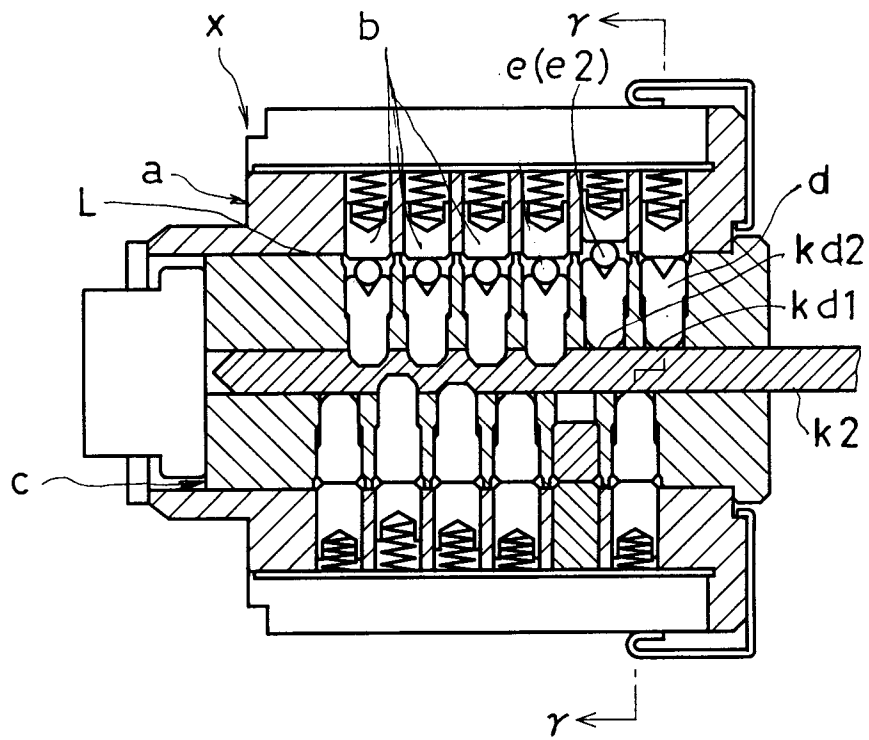


FIG.18

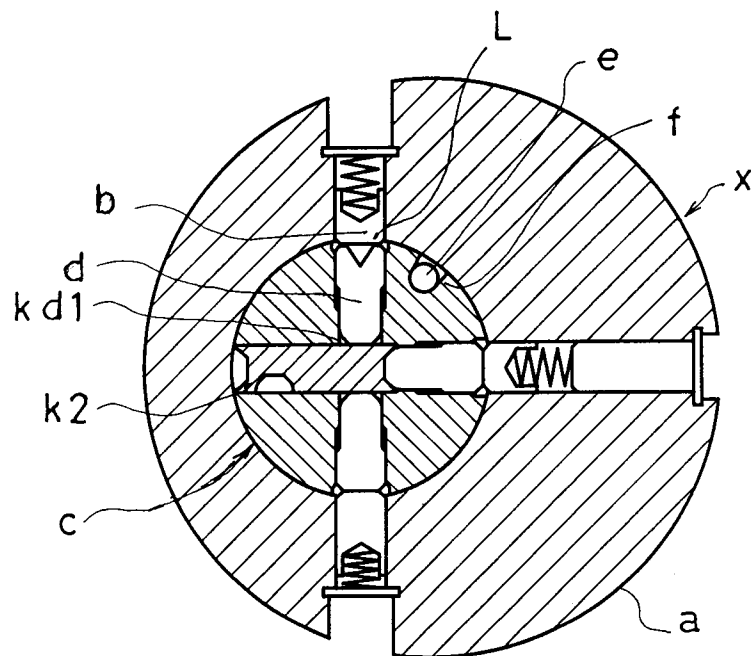


FIG.19

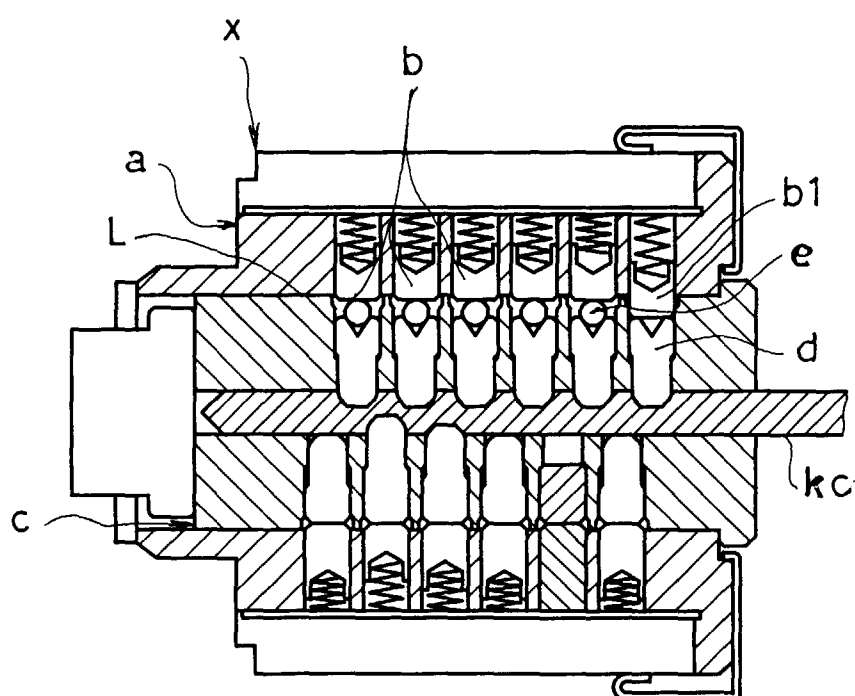


FIG. 20



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 11 9879

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 4 440 009 A (INNOVATIVE RESEARCH CORPORATION) 3 April 1984 * column 2, line 60 - column 3, line 7 * * column 4, line 45 - column 7, line 28; figures *	1-3	E05B27/00 E05B35/10
X	US 4 741 188 A (JERRY R. SMITH) 3 May 1988 * column 10, line 23 - column 17, line 61; figures *	1-3	
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A	EP 0 250 701 A (EVVA) 7 January 1988 * column 4, line 51 - column 6, line 32; figures 9-11 *	1	
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			E05B
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 17 February 1999	Examiner Vacca, R
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 98 11 9879

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The members are as contained in the European Patent Office EDP file on
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