Oct. 12, 1965 F. E. BEST 3,210,976

CYLINDRICAL LOCK

Filed Dec. 13, 1961 3 Sheets-Sheet 1

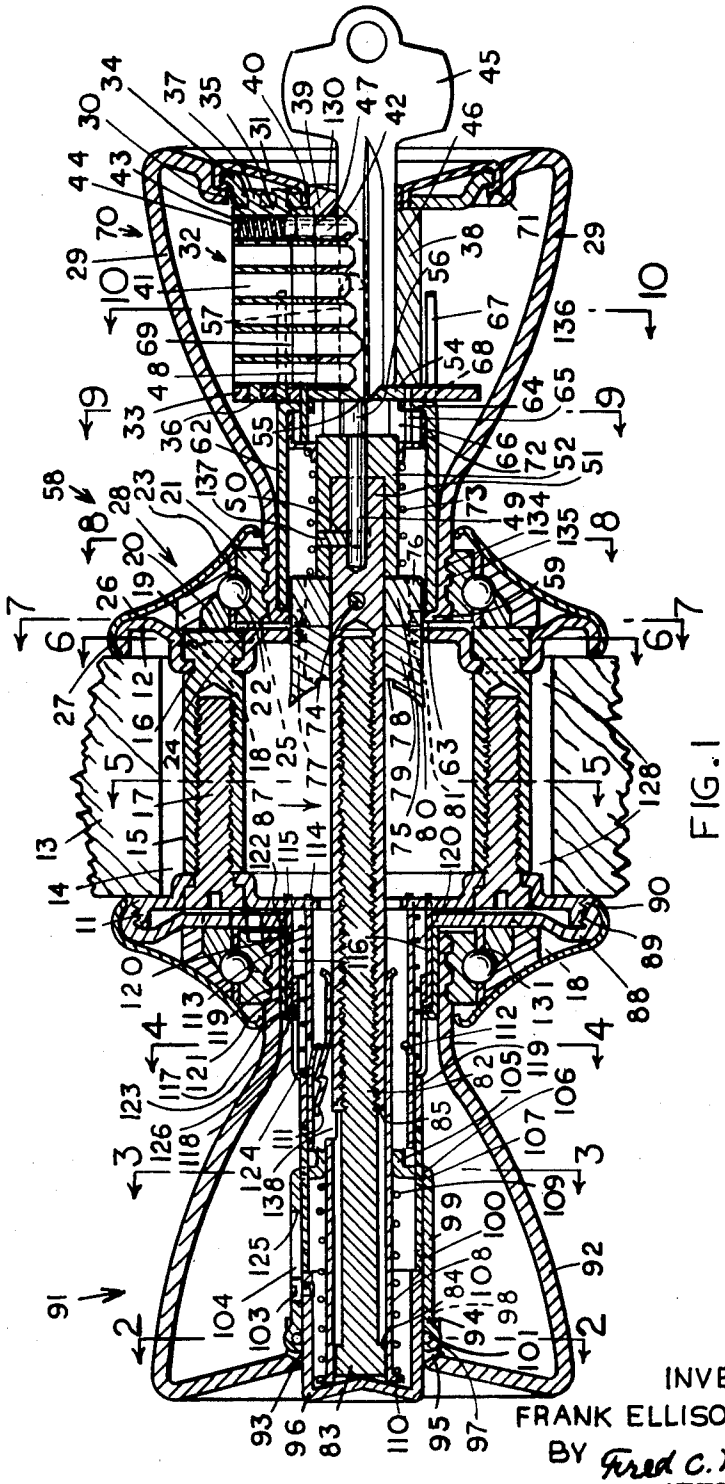


FIG. 1

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CYLINDRICAL LOCK

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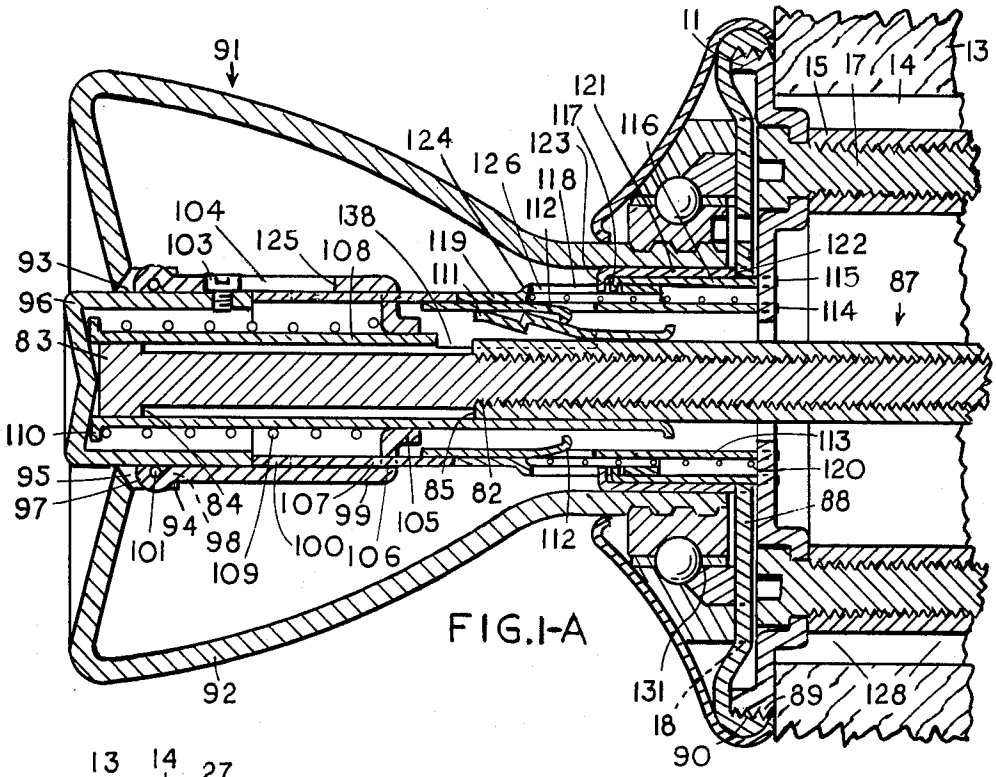


FIG. 1-A

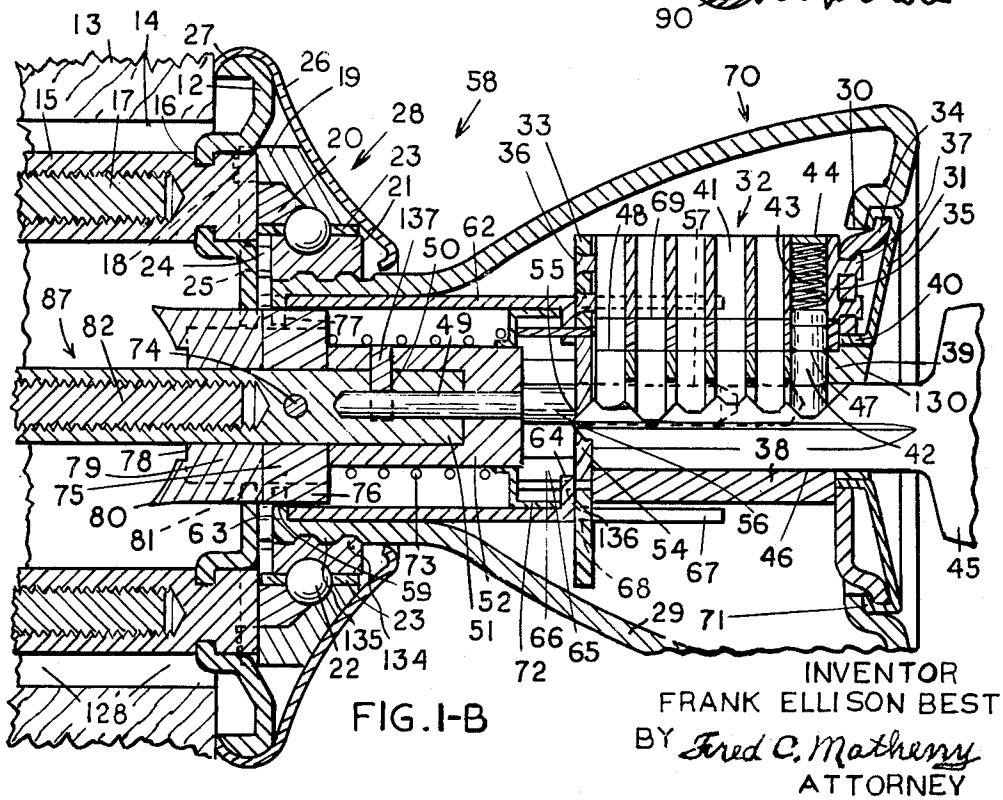


FIG. 1-B

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CYLINDRICAL LOCK

Filed Dec. 13, 1961 3 Sheets-Sheet 3

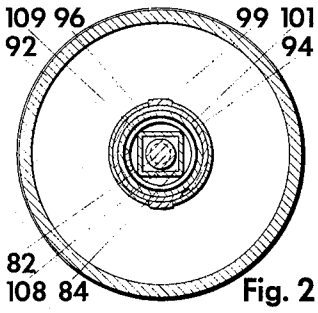


Fig. 2

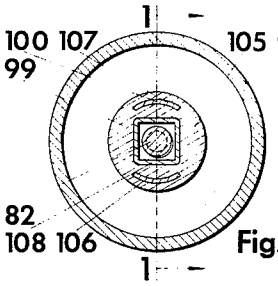


Fig. 3

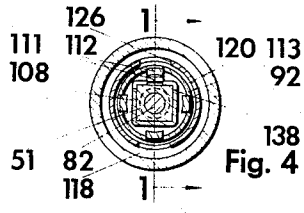


Fig. 4

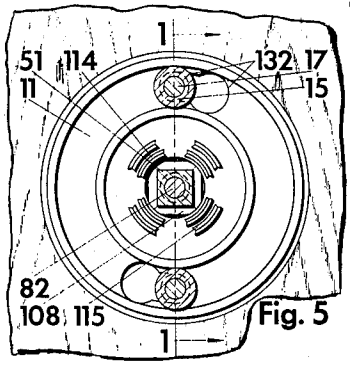


Fig. 5

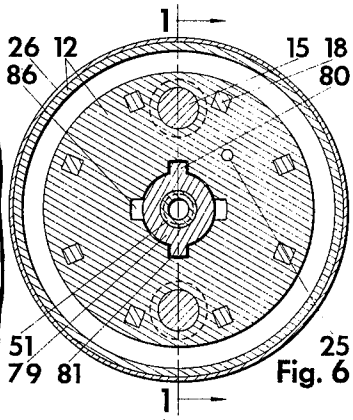


Fig. 6

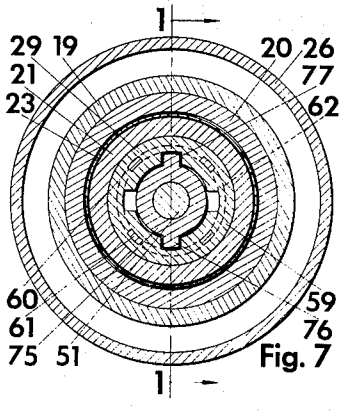


Fig. 7

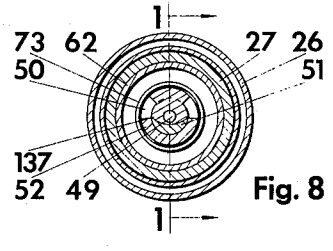


Fig. 8

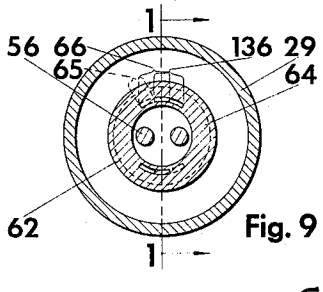


Fig. 9

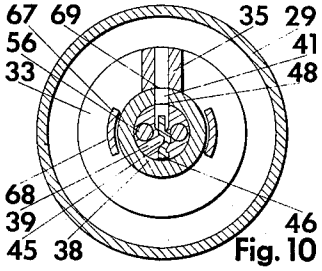


Fig. 10

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United States Patent Office 3,210,976 Patented Oct. 12, 1965

3,210,976

CYLINDRICAL LOCK

Frank Ellison Best, P.O. Box 103, Indianapolis, Ind.

Filed Dec. 13, 1961, Ser. No. 159,066
17 Claims. (Cl. 70—451)

My invention comprises improvements in cylindrical locks.

A primary purpose of my invention is to make improvements in the method and means of mounting the knobs or handle means to the chassis of the lock frame, and to provide a more rigid, positive, and friction-free mounting.

Another object is to mount the said knobs on bearings located outside of the knob neck, outside of the chassis frame and underneath the roses or escutcheons so as to leave ample space within the knobs and between the side plates of the chassis for more rugged internal mechanisms of the lock than now obtains.

Another object is to do away with all externally showing spanner and screw holes and unsightly notches, etc., in order to beautify its external appearance.

Another object is to make it necessary to remove the lock core from the knob or handle by use of a "control" key before the lock can be assembled on or dissembled from the door.

Another object is to simplify its structure and reduce the number of units and parts in said lock.

Another object is to reduce the carpenter's time and effort in mounting the lock on the door.

These and other objects and novel features of my invention will become apparent to those making a study of my invention of which a preferred structural embodiment is illustrated in the accompanying drawings, in which:

Views

FIG. 1 is an axial section of a knob set embodying my invention.

FIG. 1A is a fragmentary view in axial section, on a larger scale than FIG. 1, showing the left half or inside knob assembly of said knob set.

FIG. 1B is a fragmentary view in axial section, on a larger scale than FIG. 1, showing the right half or outside knob assembly of the knob set shown in FIG. 1.

FIGS. 2 to 10 inclusive are transverse sections of said knob set as taken on lines **2—2** to lines **10—10** respectively of FIG. 1.

Description

This new preferred illustrative embodiment of my invention comprises stator frame plates **11** and **12** clampable to a door **13** through a hole **14** therethrough by means of internally threaded studs **15** headed into plate **12** at **16**, and clamp screws **17**, screwed through plate **11** and into studs **15**, thus completing the chassis **128** of said cylindrical lock.

Outside knob assembly 70

Staked at **18** to plate **12** is external bearing race member **19** enfolding and clamping external race member **20** between said plate **12** and said race member **19**. Inner race member **21**, balls **22** and cage **23** complete the ball bearing mounting of the knob **29** which is screwed tightly to race member **21**. Race member **21** has a holding hole **24** alignable with hole **25** in plate **12**, through which an instrument such as a nail set can be inserted to hold said race member **21** from rotation while the knob **29** is being firmly screwed to said race member **21** or unscrewed therefrom. It is intended to prepare the mating threads **134** and **135** on race member **21** and knob **29** respectively with great care, craftsmanship, and precision so that the screwing of the knob **29** into race member **21** tightly by hand will constitute all the securing the union of these parts will require, against any shaking or vibration of the knob that will develop during the life of the lock.

Finished escutcheon **26** compressed securely on to plate **12** at **27** completes the housing of the bearing as a whole referred to as bearing **28**, which is thus completed before the finished knob is lastly assembled to complete the outside knob assembly **70**.

Nested within the outer end of knob **29** in recess **30** is the face plate **31** of my novel lock core referred to in its entirety as core **32**.

This core is of the type referred to as "lock controlled assembly" and dates back over 40 years to my basic invention thereof, Patent No. 1,384,022, issued July 5, 1921, in which the assembly of the lock core into its housing and removal therefrom is lock and key controlled.

It consists of annular end plates **33** and **34** to which body **35** is staked at **36** and **37** respectively. Finished face plate **31** is crimped around end plate **34** at **71**.

Inwardly from body **35** is annular sleeve **38** and central of sleeve **38** is key plug **39**.

Separating annular end plate **34** and head **130** of key plug **39** is inwardly protruding annular extension **40** of face plate **31**.

Drilled through body **35**, sleeve **38**, and into key plug **39** are a number of tumbler holes **41** for the accommodation of tumbler pins **42**, springs **43**, and caps **44** shown in one said hole **41** only, although it is to be understood that all pin tumbler holes **41** are to be combinated.

Key stop **54** staked to the end of key plug **39** at **55** acts also as a retaining plate to hold the key plug **39** in place. Throw pins **56** integral with sleeve **52** are adapted to slide lengthwise in holes **57** in key plug **39** and key stop **54**. They also act to tie the said key plug **39**, key stop **54**, and sleeve **52** as one unit rotatively, so that the rotation of the key plug **39** will also rotate sleeve **52**, while permitting throw pins **56** to slide freely longitudinally.

As an "operating" key **45**, notched to match the combination of the tumbler pins **42** is positioned in key way **46**; a "break" **47** between pins **42** is brought into alignment with the "operating" shear line **48** of the lock core and the key plug is thus released for "operation" either way, limited only by the lazy motion provided, as shown in FIG. 8 by stamping **137** in slot **50** of sleeve **52** plus spindle rotation required to thus unlatch the door with said key **45** by means not illustrated, in the area of **87**.

Pin **49** is a forced fit in stamping **137** and spindle **51** and secures stamping **137** in rigid position in said spindle **51**, best seen in FIG. 8. However stamping **137** is free floating in slot **50** so that the said spindle **51** can be freely turned by knob **92** or other means not illustrated, in the area of **87**, not shown, far enough to take up the lazy motion of the stamping **137** in said slot **50** in either direction, and thus unlatch the door by said means not illustrated, in the area of **87** even when said key **45** is removed from the lock core **32**, in spite of the fact that the removal of said key **45** leaves the key plug **39** locked against independent rotative motion in lock core **32** by the tumbler pins **42** crossing and thus locking shear line **48** under pressure of tumbler springs **43** and also in spite of the fact that the manual pushing of push button **96** locks knob **29** against rotation by pushing prongs **80** of ring **79** into notches **77** in flange **59** of said knob **29**, best seen in FIG. 7. Also see FIG. 6.

The inwardly extending flange **59** of knob **29** also has a plurality of holes **60** through which extension **61** of cylinder **62** may extend, FIG. 7, and be secured as by staking at **63**, FIG. 1.

Cylinder **62** has an inwardly extending flange **64**, FIGS. 1 and 9, with holes **136**, adapted to admit the insertion of at least one hook shaped sleeve extension **66**, which is rigid with the sleeve **38** of lock core **32**, and then, upon

rotation of the sleeve **38** and its extension **66**, 15 degrees counter clockwise relative to said cylinder **62** as viewed in said FIG. 9, engage lugs **65** of said sleeve extension **66** with the flange **64** to thus retain the said core **32**, FIG. 1, in the said knob **29**. The cylinder **62**, FIG. 1, also has a plurality of prongs **67**, FIG. 10, which fit in holes **68** in plate **33** to prevent said core **32** from rotating within the knob **29**.

Between body **35** and sleeve **38**, FIG. 1, lies "control" shear line **69**.

When a "control" key is inserted in the lock combinated to the same number as the "control" shear line **69** of the core **32**, the sleeve **38** is free to turn rotatively 15 degrees clockwise as viewed in FIG. 9 and lugs **65** are free to move rotatively to thus unlock the core **32** from flange **64** so that the core **32**, FIG. 1, can be pulled out of the knob **29**, lengthwise.

Between sleeve **52** and cylinder **62**, FIG. 1, is a stepped ring **72** and spring **73**.

Secured to spindle **51** by pin **74** is ring **75**, FIG. 1, having two prongs **76**, FIG. 7, that fit into two or four notches **77** in flange **59** of knob **29**.

The spindle **51** is square to the left of line **78** as viewed in FIG. **1** and round to the right of said line **78** as viewed in said FIG. 1.

Trapped between line **78** and ring **75** is ring **79**, free floating on spindle **51** but locked against rotation by two prongs **80** thereof mating with notches **81** in frame plate **12**.

Into spindle **51** is screwed door thickness adjusting screw **82** having a square head **83**.

In factory assembling spindle **51**, with screw **82**, sleeve **52**, rings **75** and **79** attached thereto, into plate **12** with knob assembly **70** attached thereto, first put spring **73** in position and then slip prongs **76** and **80** into notches **81** and **77**, far enough to permit turning the knob assembly **70** rotatively 90 degrees either way from their position as shown in FIG. 1. Then ease off and let spring **73** seat prongs **76** in shallow recesses **86**, FIG. 6.

Thus is factory-assembled the outside unit of the lock designated unit **58**.

In the field, before assembling unit **58** to the door, lay the spindle **51** crosswise of the door at its edge and turn square-headed door thickness adjusting screw **82** to precisely measure the thickness of the door between head **83** and **84** and the end of the spindle **51** at **85**. This is the only door thickness adjustment necessary.

Elements in the area of 87

Elements in the area of **87**, as a whole, to be disposed along spindle **51** between plates **11** and **12** constitute subject matter for a separate application serial number for Letters Patent Serial No. 334,343 and are deemed not to be pertinent to this application. Said other application will make suitable reference to this application and clearly describe and identify said elements. I am herein showing and claiming a knob set and spindle means and not elements in the area of **87** that lie between plates **11** and **12** and ride spindle **51** and studs **15**.

Inside knob assembly 91

Clamp plate **11** and secondary plate **88**, FIG. 1, have mating threads **89** and **90** respectively by means of which the inside knob assembly **91** of the said knob set is screwed onto inside clamp plate **11**, in the assembly of this unit to the door.

Enfolding secondary plate **88** is an escutcheon **26** and nested beneath said escutcheon **26** are bearing members **19**, **20**, **21**, and **22** previously described.

Race member **19** is staked to secondary plate **88** at **18**.

Screwed securely to inner race member **21** is knob **92**, while inner race member **21** is being held against rotation by some instrument such as a nail set inserted through holes **24** in secondary plate **88** into hole **25** of said inner race member **21**.

Inner knob **92** has a hole **93** and a short inwardly extending sleeve **94** integral therewith having slots **95**, said hole **93** accommodating push button **96**, and said slots **95** accommodating tabs **97** extending out of the end **98** of cylinder **99** encircling push button **96** and roll-up **100**. Roll-up **100** is a short cylindrical tube having on its inner end two prongs **107**, FIG. 3, which extend through slotted holes **106** in an inturned end portion **105** of the cylinder **99**. Its function is to move a cylindrical member **119** inwardly so that a lug **123** will be clear of a slot **126**, as hereinafter explained, when lock core **32** is removed from its knob **29** and a push button **110** is depressed to its maximum position and held in that position during assembly and disassembly of the lock.

Tabs **97** and sleeve **94** form-fit around wire lock ring **101**, securing knob **92** to cylinder **99**.

Cap screw **103** screwed tightly in push button **96** travels in slot **104** in cylinder **99** to guide and limit the travel of push button **96**.

Cylinder **99** has an inwardly stepped cylindrical end **105** with slotted holes **106** for the axially moving prongs **107** of roll-up **100**, FIG. 3.

A thin metal tube of square cross section which can be made by a bending process and is herein termed a square fold-up **108** aligns screw head **83**, FIG. 1, non-rotatively with respect to spindle **51** while spring **109** holds said fold-up **108** tightly against said push button **96** at **110**.

Fold-up **108** is made of spring material and has a formed spring member **111** integral therewith which engages, when push button **96** is depressed, with one of four spring dogs **112** of cylindrical roll-up **113** in the form of a rolled tube of thin metal having one end thereof staked to frame plate **11** at **114**.

Notice that square fold-up **108** has a portion **138**, FIGS. 1 and 4, cut away to allow freedom of action of spring dog **112** when spindle **51** is rotated, and engagement of spring member **111** with spring dog **112** is broken.

Also staked to frame plate **11** at **115** is a cylindrical member **116** having inwardly extending tabs **117** that register with and extend into mating slots **118** of cylindrical member **119**.

The part of cylindrical member **119**, shown at the left in FIGS. 1 and 1A, fits snugly around the tubular member **113** and abuts against the ends of prongs **107** of roll-up **100**. The part of said cylindrical member **119** shown at the right is of enlarged diameter and has the longitudinally extending slots **118** provided in it, see also FIG. 4. Enlarging the diameter of this part of member **119** makes it possible to leave the slots **118** open at the left end, as indicated at **124**, FIGS. 1 and 1A, and also provides room between this enlarged part of said member **119** and the member **113** for a compression spring **120**. One end of spring **120** abuts against frame plate **11** and the other end thereof abuts against an internal shoulder of the cylindrical member **119** and yieldingly holds said member **119** tight up against the ends of the prongs **107** of roll-up **100**.

Another cylindrical member **121** staked to secondary plate **88** at **122** also has inwardly extending tabs **123** which also register with and extending into mating slots **118** of cylindrical member **119**. Since member **116** is secured to frame plate **11** and member **119** is secured to secondary plate **88** and since tabs **123** and **117** are all in the same slots **118** of cylindrical member **119** it is obvious that frame plate **11** and secondary plate **88** are locked together against independent rotation and since frame plate **11** is a stator plate, both said plates are, by the afore-described intermeshing of parts, thus made stator plates also, and knob assembly **91** cannot be removed from the door until tabs **123** are moved out of engagement with slots **118** by pushing push button **96** to its extreme position at which cap screw **103** contacts

end of slot **104** at surface **125** of cylinder **99**, when end **124** of slot **118** will pass through and will clear tabs **123**.

But push button **96** cannot move that far so long as lock core **32** is in the lock and thus it becomes necessary to remove core **32** with the control key before the push button **96** can move far enough so that tabs **123** clear ends **124** of slots **118** and then the inside knob assembly **91** can be removed from or assembled upon frame plate **11** by screwing plate **88** off or on to frame plate **11** respectively using escutcheon **26** of secondary plate **88** as a turning means, as a valve is turned.

The mating threads **89** and **90** are of such precision, and the looseness of fit of said tabs **123** in slots **118** are of sufficiently ample width so that when the mating threads **89** and **90** are screwed tightly together as will be accomplished in field assembly, tabs **123** cannot reach the walls **126** of slots **118**, and thus said tabs **123** will ride freely in said slots **118**.

Thus so long as the core **32** is in the knob **29**, neither outside unit **58** nor inside unit **91** can be removed from the door **13**.

This will most effectively put an end to unauthorized disassembly of lock from the doors in colleges, dormitories, institutions, and the like that up to this time has so plagued the authorities.

It is recommended that cage **23** be provided with twelve equally spaced ball holes **131** so that 12, 6, 4, or 3 evenly spaced balls **22** may be selectively used as may be required in any particular cylinder lock. When the thickness of the door is equal to the adjusted distance from **84** to **85** as previously explained and plate **88** is screwed down tight to plate **11**, spring **73** will be slightly but sufficiently compressed to release prongs **76** out of notches **86**, FIG. 6, for free spindle rotation, as is required for operation of the lock.

Mounting of lock on door

The following procedure is recommended in mounting the lock to the door:

Mount the door to its frame on its permanent hinges.

Prepare the openings in the door **13** including hole **14** to receive the lock parts.

Adjust the screw **82** in spindle **51** as previously explained to measure the exact thickness of the door.

Now with the door part way open and a wedge between door and floor to thus fix the door firmly, place elements to occupy the area **87** in position.

Next, push outside knob assembly **70** through hole **14** of the door and elements to occupy the area **87** and while holding plate **12** tight against the side of the door in assembled position, slip bayonet holes **132** of plate **11**, FIG. 5, over screws **17** and rotate said plate **11** to bring said plate **11** into its permanent position as shown FIG. 5, and then tighten clamp screws **17** to thus secure the lock chassis to the door.

Next remove the core from the outside knob and then push the push button of the inside knob to its lowest position and hold it thus as the inside knob is mounted into its near-permanent place and hold it thus while the escutcheon **26** attached to plate **88** is being screwed down into permanent position on frame **11**, as shown FIG. 1.

Next place the core again in outside knob **29** and the mounting of said lock to said door is complete.

Operation of the lock

Pushing the push button **96** in inside knob **92** causes locking engagement between spring member **111** and spring dog **112**. It also causes prongs **80** to engage notches **77** to lock the outside knob **29** against rotation.

Turning the spindle by turning the inside knob or by key in lock core **32** or otherwise will release spring member **111** from its engagement with spring dog **112**, and spring **109** will return the push button to its original position as shown in FIG. 1.

If the inside door knob is left with push button depressed, an operating key in the outside core can turn the spindle and unlatch spring member **111** from its engagement with spring dog **112** and thus unlock the door.

Claims

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States of America is:

1. In a knob set for application to a door, a frame plate; means rigidly securing said frame plate to the door; a two piece outer bearing race having one part of larger diameter rigidly secured to the outer side of said frame plate and another part of smaller diameter adapted to be trapped between said part of larger diameter and said frame plate; a knob positioned perpendicularly to said frame plate, said knob having an externally threaded knob neck which extends coaxially into said outer bearing race when the knob and frame plate are in assembled relation; an internally threaded inner bearing race threaded onto the exterior of and rigid with the inner end portion of said knob neck; and close fitting radial and thrust type rolling contact bearing members disposed between said outer and inner bearing races, providing a long wearing, low friction, firm and wabble free mounting for said knob.

2. The knob mounting means as claimed in claim **1** in which the rolling contact bearing members are balls; and in which a thin flat ball cage is disposed between said outer and inner bearing races supporting said balls in spaced apart relation.

3. In a cylindrical lock for application to a door, an outer frame plate; an inner frame plate; means rigidly securing said two frame plates to a door; an outer knob rotatively supported by said outer frame plate, said outer knob having a lock receiving recess in its outer end; a secondary plate, said inner frame plate and said secondary plate having interfitting threaded parts whereby said secondary plate can be attached to said inner frame plate; an inner knob rotatively supported by said secondary plate; push button means carried by said inner knob; longitudinally movable spindle means connected with said push button means and extending between said two knobs; devices normally locking said secondary plate against rotative movement relative to said inner frame plate, said devices being releasable by movement of said spindle means toward said outer knob; and a key operated lock normally seated in and capable of being removably locked within the lock receiving recess in said outer knob, said lock when seated in said recess limiting longitudinal movement of said spindle means and thereby preventing the release of said secondary plate from said inner frame plate.

4. In a cylindrical knob set, the combination of elements comprising an outside knob assembly means, and inside frame means, clamp means adapted to the clamping of said means together and to a door, an inside knob assembly means, adapted to be releasably secured to said inside frame means, and lock controlled means including a key operated lock in said outside knob assembly means adapted to the locking and unlocking of said inside knob assembly means to and from said inside frame means respectively, all of said means collectively constituting lock controlled assembly means in which the assembly and disassembly of said cylindrical knob set onto and from a door respectively is lock controlled.

5. In a cylindrical lock, the combination of elements comprising frame means capable of being applied to a door, outer and inner handle means connected with the frame means at the respective outer and inner sides of the door, movable spindle means extending between said two handle means, assembly devices locking said frame and handle means in assembled relation with the door, said devices being releasable by movement of said spindle means, push button means in the handle means at the

inner side of the door capable of moving said spindle means in releasing said assembly devices, and key operated lock means in the handle means at the outer side of the door controlling movement of said spindle means in preventing release of said assembly locking devices, all of said parts being cooperative in the formation of lock-controlled assembly means in which the assembly and disassembly of the said lock onto and from a door respectively is lock controlled.

6. A cylindrical lock as claimed in claim 5 in which said frame means comprises an inner frame plate and an outer frame plate, clamping means adapted to the clamping of said frame plates to each other and to a door, and secondary plate means securable to said inner frame plate.

7. A cylindrical lock as claimed in claim 6 in which the lock means carried by the outer handle means controls the locking and releasing of said secondary plate means relative to said inner plate means.

8. A cylindrical lock as claimed in claim 6 in which the key operated lock means carried by the outer handle means includes means operable by a control key controlling the locking and releasing of said secondary plate means and controlling the insertion and removal of said lock means into and from said handle means at the outer side of the door.

9. A cylindrical lock as claimed in claim 6 in which the lock means carried by the outer handle means includes means operable by a control key controlling both the locking and releasing of said secondary plate means relative to said inner plate means and the insertion and removal of said lock means relative to said outer handle means and in which said lock means also includes devices capable of holding said button means captive and means actuated by an operating key adapted to the rotation of said spindle means in the release of said button means.

10. A cylindrical lock as claimed in claim 5 in which said handle means comprises an outside handle and an outside handle neck and an inside handle and an inside handle neck and in which two bearings are provided respectively connecting said handle necks with the frame means, said outside handle having lock means and said inside handle having button means, said necks joining said handles to said respective bearing means in rotative assembly.

11. A cylindrical lock as claimed in claim 10 in which said handle necks have primary mating means and said bearings have secondary mating means adapted to receive the primary mating means on said necks in uniting said handles to said bearings.

12. A cylindrical lock as claimed in claim 10 in which said outside handle includes a lock core housing having a lock core receptacle therein adapted to the reception and removal of a key-insertable and key-removable lock core.

13. A cylindrical lock as claimed in claim 10 in which there is provided escutcheon means constituting an ornamental covering of said bearing means, secured to said frame means and surrounding without engaging the adjacent handle neck.

14. A cylindrical lock as claimed in claim 5 in which the lock means comprises a core housing, a core, and operating and control keys, said core housing being formed and nested in said handle means and said lock core being insertable and lockable in said core housing and unlockable and removable therefrom by means of the control key, said operating key being adapted to the turning of said spindle means.

15. In a cylindrical lock the combination of elements comprising outer and inner frame means capable of being applied to a door, outer and inner knob means, bearing means mounting said outer and inner knob means on said outer and inner frame means respectively, and outer and inner escutcheon means carried by the outer and inner frame means respectively and covering said bearing means, said frame means and bearing means and escutcheon means providing a structure capable of assembly by first, the joining of said frame means and bearing means followed by the assembly of said escutcheon means to said frame means and lastly by the securing of said knob means to said bearing means.

16. A cylindrical lock as claimed in claim 15 in which the inner frame means is a plate, a secondary plate is secured to said inner frame plate, and lock and key means is provided controlling the locking and releasing, respectively, of said secondary plate to and from the said inner plate.

17. A cylindrical lock as claimed in claim 15 in which said knob means includes a knob having a lock core housing in the outer end thereof adapted to receive a key-insertable and key-removable lock core, said lock core comprising two locks in one, the first of which is an operating lock responding to its own operating key and adapted to the turning of a lock spindle, and the second of which is a control lock responding to its own control key and adapted to the insertion and removal of the said lock core into and from, respectively, said lock core housing.

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