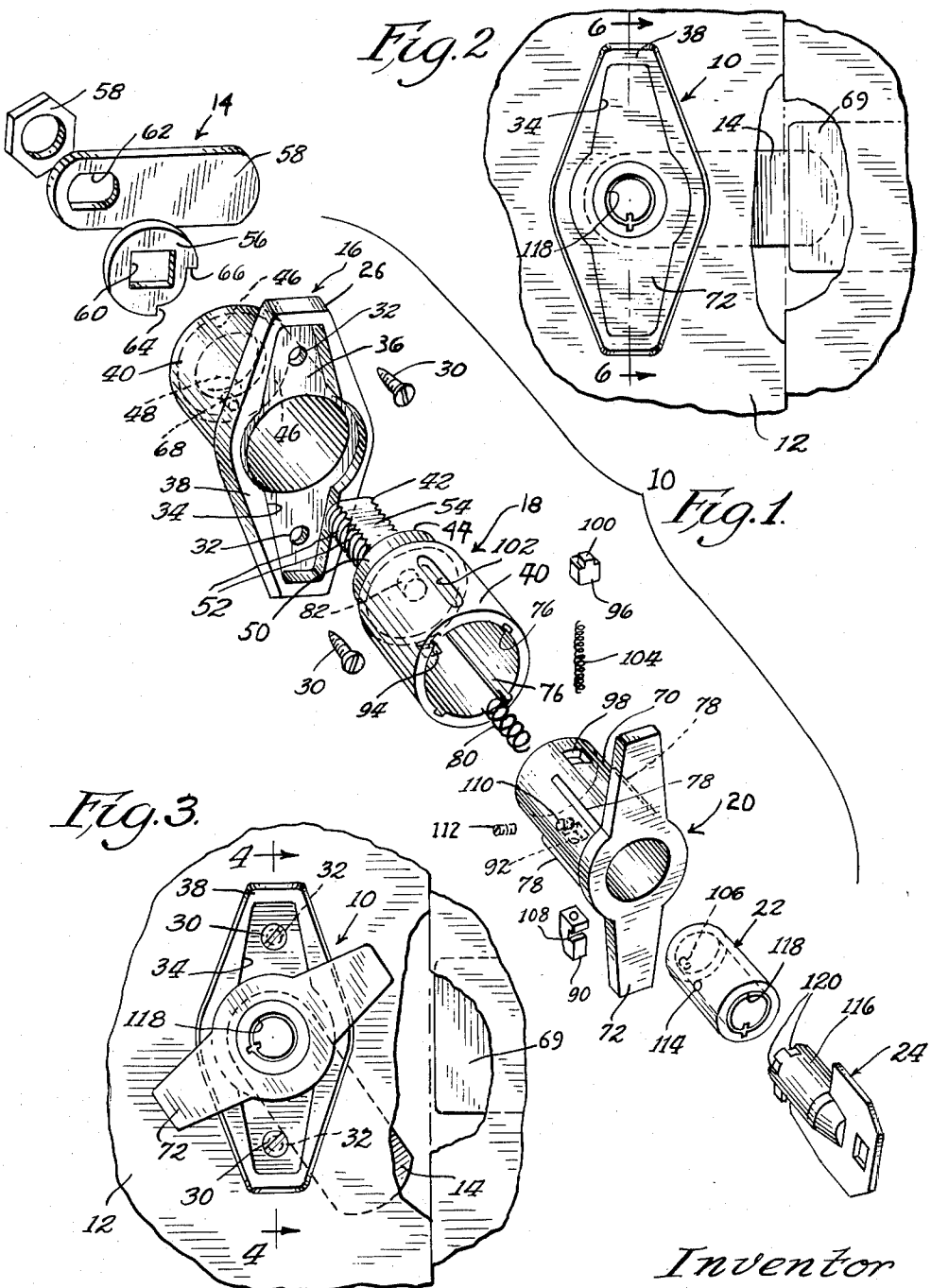
Feb. 15, 1966 W. J. KERR 3,234,765

NESTED HANDLE CAM-TYPE DOOR LOCK ASSEMBLY

Filed Dec. 20, 1963 2 Sheets-Sheet 1



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Fig. 4.

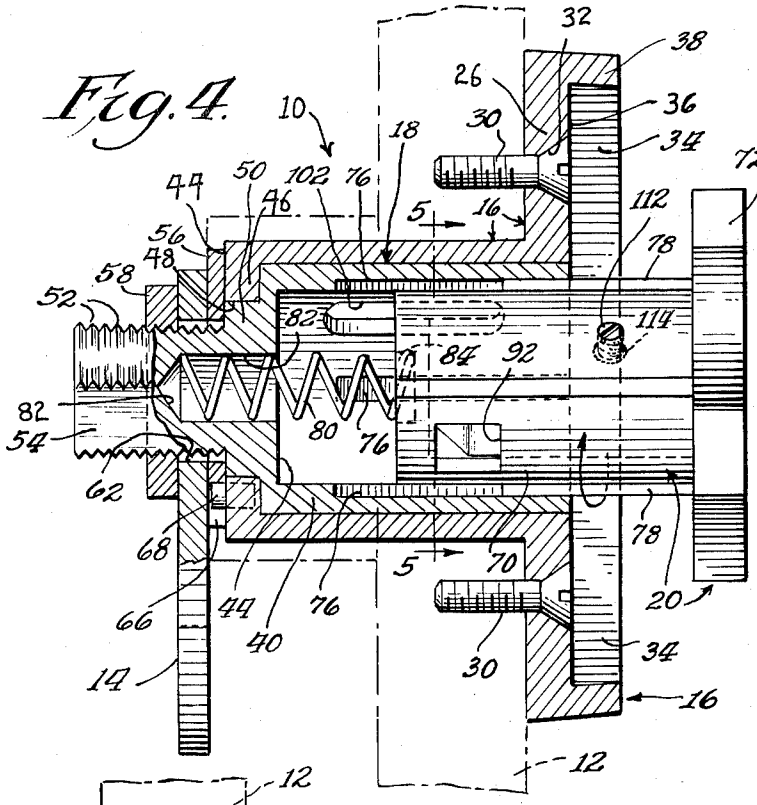


Fig. 6.

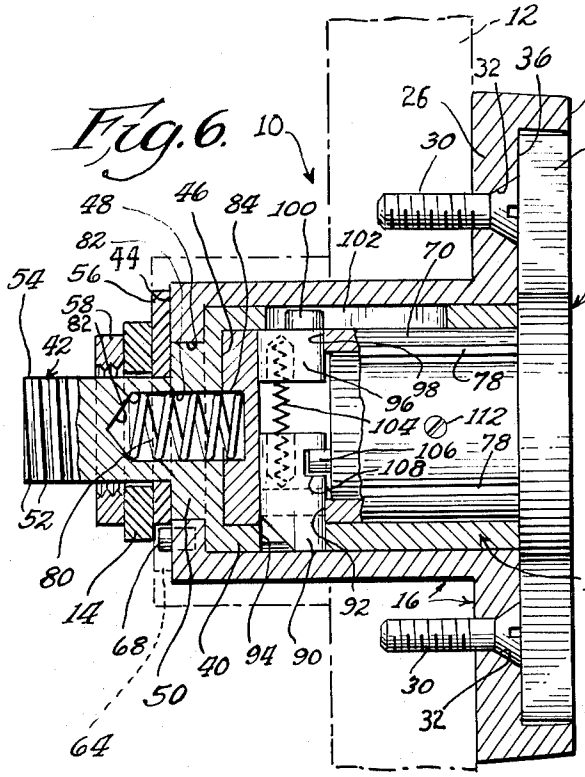
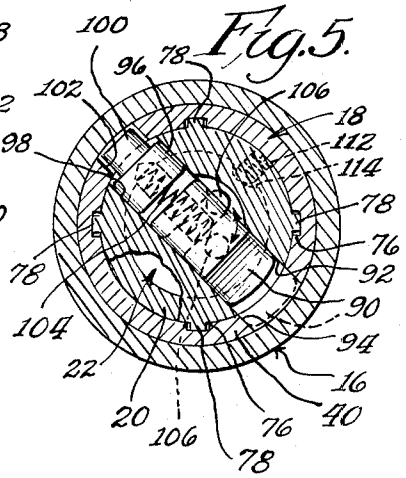


Fig. 5.



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NESTED HANDLE CAM-TYPE DOOR LOCK ASSEMBLY

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8 Claims. (Cl. 70—208)

The present invention relates generally to door lock assemblies for cabinets and has particular reference to a lock assembly of the nested handle cam-type wherein the usual rotatable lock shaft is given added impetus by means of an operating leverage-applying handle which is located on and accessible from the outside of the door to which the lock assembly is applied and which, when the door is in its locked condition, may be pushed manually into a recess provided for it on the door where it is inaccessible for manipulation until released for actuation by means of the proper lock-operating key. By "cam-type" is meant a lock assembly which employs a locking cam in the form of a radially disposed arm which is fixed to and turns with the rotatable lock shaft and which, as it approaches its locking position, slides behind an inclined locking shoulder and, under the impetus afforded by the handle to which it is operatively connected in driven relationship, draws the lock shaft and, consequently, the entire lock assembly and the door to which it is applied rearwards to compress the resilient sealing gasket which is disposed between the marginal or edge region of the door and the door jamb. Such lock assemblies are widely used in connection with the doors of refrigerated vending machine cabinets.

The cabinet doors of vending machines, particularly refrigerated vending machines, are heavily gasketed and, upon closure thereof, it is necessary to compress the gaskets tightly so that there will be no heat losses around the door jambs. The degree of pressure which must be exerted by the marginal region of a given door against its sealing gasket to effect the necessary hermetic seal is appreciable, considering the size of the average refrigerated vending machine cabinet door. For this reason, sufficient torque cannot be applied to the lock shaft through the medium of the key-operated lock cylinder of the door-locking mechanism to move the locking cam to its operative or locked position. To supply the added degree of torque necessary to turn the lock shaft and the cam, it has been customary to provide a leverage handle which turns with the lock shaft, the handle being disposed on the front side of the door. To prevent unauthorized manipulation of the handle when the door is locked, an elongated recess is provided in the lock housing, and the handle and lock shaft are slidably keyed or otherwise connected together so that when the door is in its locked condition, the handle may be radially aligned with the recess and then moved thereinto and retained therein so that access to the handle for turning purposes is precluded. Since the handle, when nested within the recess, lies flush with the rim of the recess, it is necessary that the handle be spring-pressed outwardly at such time as the operating key has been turned and the lock cylinder has attained its unlocked condition. Release of the handle is the sole function of the lock cylinder and its associated key. Thus, it is essential that, when the lock cylinder is in its unlocked condition, the handle shall spring forwardly out of the recess to a position where it may be manually engaged for shaft-turning purposes.

Present-day lock assemblies of the type under consideration are possessed of at least one serious limitation, namely, that there is a tendency for the handle to remain nested within the recess and not become projected for subsequent manipulation despite the fact that the handle is yieldingly urged forwardly by spring means. Thus,

although the lock cylinder is in its position of handle-release, the handle remains inaccesible and it is necessary for the operator to pry the handle from the recess, utilizing a knife blade or similar tool for this purpose.

The above-noted limitation is largely occasioned by structural factors that are associated with the design of present-day nested handle lock assemblies. Invariably, the lock barrel and the handle are integrally formed, the barrel constituting a tubular shank for the handle. This barrel or shank is axially slidable in the lock housing for handle retracting and projecting purposes. The lock shaft and the lock barrel are usually splined together in such a manner that any angular axial deflection of the lock shaft transmits such deflection to the barrel and the latter will then bind in the lock housing in which it is slidable. When the locking cam on the lock shaft moves behind the fixed locking shoulder provided in the cabinet, the compressional force which is applied to the sealing gasket is of an appreciable magnitude and this compressional force is transmitted to the lock shaft through the locking cam which operates in the manner of an elongated moment arm to apply magnified bending force directly to the lock shaft which, in turn, transmits this force through the splined connection to the axially shiftable spring-pressed barrel on which the handle is formed. The barrel thus has a tendency to bind in the lock housing so that it, together with the handle whiih is integral therewith, cannot be projected from the recess for manual manipulation purposes.

The present invention is designed to overcome the above-noted limitation that is attendant upon the construction and use of conventional nested handle-type lock assemblies by affording a novel form of splined connection between the lock shaft and the lock barrel, the terminal portion of the splined connection being axially fixed but rotatable in the lock housing so that the binding forces which are applied thereto tend to restrict only the turning movement of the barrel in the lock housing and not the axial shifting movement thereof. The barrel is thus free to spring forwardly under the influence of its biasing spring as soon as it is released by the operation of the lock cylinder, and any binding force which may be applied to the terminal portion of the spline connection is easily overcome with practically no effect on the part of the operator in the normal operation of turning the handle.

The provision of a lock assembly of the character briefly outlined above being among the principal objects of the invention, various other objects and advantages, not at this time enumerated, will become more readily apparent as the following description ensues.

In the accompanying two sheets of drawings forming a part of this specification, one illustrative embodiment of the invention has been shown.

In these drawings:

FIG. 1 is an exploded perspective view of a lock assembly constructed in accordance with the principles of the present invention;

FIG. 2 is a front elevational view of the lock assembly, the handle of the assembly being shown in its locked position;

FIG. 3 is a front elevational view similar to FIG. 2 but showing the handle in its unlocked and turned position;

FIG. 4 is an enlarged longitudinal sectional view, partly in elevation, taken on the line 4—4 of FIG. 3 in the direction indicated by the arrows;

FIG. 5 is a transverse sectional view taken on the line 5—5 of FIG. 4; and

FIG. 6 is a sectional view similar to FIG. 5 with the parts in a different position.

Referring now to the drawings in detail, the lock assembly of the present invention is designated in its entirety by the reference numeral 10 and in FIGS. 4 and 6 it is shown as being operatively installed in the door panel 12 of a cabinet which may be of the refrigerated vending machine type. As best seen in FIG. 1, the lock assembly comprises six principal parts or assemblies, these parts including (from left to right as seen in FIGS. 4 and 6) a locking cam 14, a lock housing 16, a sleeve and lock shaft unit 18, a barrel and handle unit 20, a lock cylinder 22, and an operating key 24.

The lock housing 16 is of generally cylindrical design and the forward end thereof is provided with an integral, generally diamond-shaped rim flange 26 which fits flush against the outside face of the door panel 12 when the lock assembly is properly installed upon the cabinet door. The cylindrical portion of the lock housing 16 projects through an opening in the panel 12 and two mounting screws 30 extend through countersunk holes 32 in the rim flange 26 and into the door panel 12 and serve to clamp the lock housing against the door panel. The lock assembly is thus entirely supported on the door panel 12 and the mounting screws 30 constitute the sole means for holding the assembly in place.

The rim flange 26 has an appreciable vertical extent and a small width. The front face of this rim flange is provided with a shallow recess 34 for reception of the handle part of the barrel and handle unit 20 in a manner that will be described presently. The recess 34 has a bottom wall 36 and a continuous marginal confining side wall 38 which encompasses said handle part when the latter is nested within the recess 34.

The sleeve and lock shaft unit 18 includes a cylindrical cup-shaped sleeve portion 40 and a lock shaft 42, the latter projecting axially and rearwardly from the rear end wall 44 of the sleeve portion. The rear end of the cylindrical lock housing 16 is formed with an inturned rim flange 46. The latter defines a central opening 48 through which the lock shaft projects and within which it is rotatable. The sleeve portion 40 of the unit 18 is nested within the cylindrical lock housing 16 and the rear end wall 44 is formed with a circular boss 50 which projects into the central opening 48.

The lock shaft 42 is provided with interrupted screw threads 52, these threads being interrupted by oppositely disposed flats 54 which lend a generally square cross-sectional configuration to the lock shaft. The lock shaft 42 receives thereon a stop washer 56, the locking cam 14 and a nut 58 in the order named, the washer and cam being formed with generally square openings 60 and 62, respectively (see FIG. 1), in order to establish a driving connection with the shaft. The stop washer 56 is formed with opposed shoulders 64 and 66 which cooperate with a rearwardly projecting stop pin 68 on the rim flange 46 in limiting the angular turning movement of the lock shaft to approximately 90°. The nut 58 serves to clamp the assembly of the washer 56 and the cam 14 against the rear end face of the boss 50 and prevents forward shifting of the sleeve portion 40 of the unit 18 with respect to the lock housing but allows the sleeve portion to rotate in either direction under the influence of the barrel and handle unit 20 as will be described presently. It is to be understood that the locking cam 14 is movable between the locking position wherein it is shown in FIG. 2 and wherein it is disposed behind a fixed inclined locking shoulder 69, a fixed part within the interior of the cabinet compartment, and a position of release such as has been shown in FIG. 3, the extreme positions of the cam being determined by the angle subtended between the two shoulders 64 and 66. As the cam moves behind the inclined locking shoulder, it is pressed or forced rearwardly, thus pulling the lock shaft together with the entire lock assembly and the door, rearwardly to compress a resilient sealing gasket against the door jamb as is customary with locks of the type under consideration.

The barrel and handle unit 20 comprises a cylindrical lock barrel 70 and a handle part 72. The latter is conformably shaped to the shape of the recess 34, the handle part being in the form of a rim flange at the front open end of the barrel. The barrel 70, in effect, constitutes a tubular hub for the handle 72. It fits within and is telescopically slidable in the sleeve portion 40 of the unit 18 and a series of four cooperating spline recesses or grooves 76 and ribs 78 on the sleeve portion 40 and the barrel 70, respectively, establish a driving connection between the two parts. A spiral compression spring 80 has its ends seated in spring seats 82 and 84 which are formed in opposed relationship on the lock shaft 42 and the rear end wall of the barrel 70, respectively. The spring 80 thus serves yieldingly to project the barrel 70 forwardly to the position in which it is shown in FIG. 4.

The barrel and handle unit 20 is movable between a retracted position wherein the handle part 72 is nested within the recess 34 and the extended position of FIG. 4 wherein the handle is disposed an appreciable distance forwardly of the recess and is free from the confining wall 38 of the latter so that it is capable of being manually turned. In order to lock the handle in the recess and thus prevent unauthorized access to the handle part 72, a latch bolt 90 is slidable radially in a square opening 92 (see FIGS. 1 and 4) in the barrel 70 and is designed for latching engagement with the shoulder that is afforded by one side of a square opening 94 (see FIGS. 1, 4, 5 and 6) in the sleeve portion 40.

To prevent complete projection of the barrel 70 from the sleeve portion 40, a detent plunger 96 is radially slidable in a square opening 98 (see FIGS. 1 and 5) in the barrel 70 and has an extension 100 which projects radially outwardly beyond the confines of the barrel and rides in an elongated axial slot 102 (see FIGS. 1 and 4) in the sleeve portion 40. A spiral compression spring 104 is interposed and extends diametrically between the plunger 96 and the latch bolt 90 as shown in FIG. 5 and yieldingly urges these two elements apart.

The latch bolt 90 projects through the opening 94 and is yieldingly urged by the spring 104 against the cylindrical wall of the lock housing 16 when the barrel and handle unit 20 is in its retracted position. In order to withdraw the latch bolt 90 and allow the unit 20 to spring forwardly to its projected position, a conventional pin and slot connection including an eccentric pin 106 (see FIGS. 1 and 5) on the lock cylinder 22 and a slot 108 in the latch bolt 90 is provided.

The lock cylinder 22 is in the form of a conventional axial pin-tumbler lock sub-assembly of the type that is shown and described in United States Patent No. 1,619,252. No claim is made herein to any novelty of the lock cylinder 22 and reference may be had to the above-mentioned patent for a full understanding of the nature and operation of the same. Such lock cylinders are provided with various forms of output elements including eccentric pin output elements, lock cylinder having such an eccentric pin output element being shown in United States Patent No. 3,111,833, granted on November 26, 1963 and entitled "Draw Lock for a Sealed Cabinet Door." The eccentric pin 106 of the lock cylinder 22 has both radial and transverse clearance in the slot 108 as shown in FIG. 5 and, although the spring 104 is effective to project the latch bolt 90, the eccentric pin 106 is effective to retract it.

A small threaded hole 110 (see FIG. 1) in the barrel 70 receives a set screw 112 therethrough, the set screw cooperating with a depression 114 in the lock cylinder 22 for releasably holding the latter in its assembled relationship within the barrel (see also FIG. 4).

The key 24 (see FIG. 1) is of conventional construction and it constitutes a counterpart for the lock cylinder 22. The key shank 116 is designed for insertion into an annular keyway 118 in associated relation with the lock cylinder 22, the shank having tumbler pin-engaging

shoulders **120** at the rim thereof as is conventional in connection with axial pin-tumbler lock cylinders.

In the operation of the herein described lock assembly **10**, the service operator of the vending machine with which the assembly is associated will insert the key **24** in the keyway **118** and, by turning it, will withdraw the latch bolt **90** from the opening **94**, thus releasing the barrel and handle unit **20** so that the spring **80** will project the same forwardly until the extension **100** of the detent plunger **96** engages the forward end of the elongated slot **102** in the sleeve **40**. The handle part **72** will thus be projected from the confining recess **34** and available for manual manipulation. Thereafter, by turning the handle part in a clockwise direction as viewed in FIGS. 2 and 3, the torque thus applied to the handle part will be transmitted through the interlocking spline recesses **76** and ribs **78** which function as a drive for the sleeve **40** so that the latter will be turned in unison with the barrel **70**. Since the lock shaft **42** is integrally formed on the sleeve **40**, it likewise will be turned and the locking cam **14** will be thus moved from its locking position to its position of release as determined by engagement of the shoulder **66** on the stop washer **56** with the stop pin **68** on the lock housing **16**.

The locking cam **14** may be moved to its locking position by a reversal of the procedure outlined above in connection with movement of the cam to its position of release. It will be understood, of course, that whereas upon release of the barrel and handle unit **20** by the latch bolt **90**, the spring **80** will automatically and forcibly propel the unit forwardly, to restore the handle part **72** to the recess **34**, it is necessary to push the handle part manually rearwardly against the yielding action of the spring **80** until such time as the latch bolt **90** moves into radial register with the opening **94** in the sleeve **40**.

It is to be noted at this point that normal binding action which is applied to the shaft **42** by reason of the eccentricity of the effective region of engagement between the locking cam **14** and the reaction shoulder **69** with which it cooperates will be transmitted to the sleeve **40** and not to the barrel **70**. Binding of the sleeve in the lock housing **16** is of no consequence since there is no axial movement of the sleeve and any tendency for the sleeve to bind in the lock housing will be immediately overcome with no noticeable effort on the part of the operator at the time he applies torque to the handle part **72**.

The invention is not to be limited to the exact arrangement of parts shown in the accompanying drawings or described in this specification as various changes in the details of construction may be resorted to without departing from the spirit or scope of the invention. For example, while the lock cylinder disclosed herein for locking the barrel and handle unit **20** in its retracted position within the sleeve **40** is of the axial pin-tumbler type, it is contemplated that other types of lock cylinders, for example cylinders of the radial pin-tumbler type, may be employed within the barrel **70**. Therefore, only insofar as the invention has particularly been pointed out in the accompanying claims is the same to be limited.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. In a lock assembly for a sealed cabinet door, in combination, a tubular open-ended cylindrical lock housing provided at its front end with a radial rim flange and at its rear end with an inturned bearing flange presenting a central bearing opening, said rim flange being provided with a shallow elongated recess in the forward end face thereof, a cylindrical sleeve coaxial with and rotatably disposed within said lock housing, means constraining said sleeve against axial shifting within the lock housing while allowing for free rotation thereof, a lock shaft on the rear end of said sleeve projecting through said bearing flange, an operating handle shaped conformably to the shape of the recess, positioned forwardly of the housing and having a tubular hub projecting rearwardly therefrom and constituting a lock barrel, said lock barrel being telescopically slidable in said sleeve between a retracted position wherein the operating handle is nested within the recess and a projected position wherein said handle is projected out of the recess, means establishing a driving connection between the barrel and sleeve, and a locking cam on said lock shaft exteriorly of the lock housing.

2. In a lock assembly for a sealed cabinet door, the combination set forth in claim **1**, and wherein said driving connection is in the form of a sliding spline connection.

3. In a lock assembly for a sealed cabinet door, the combination set for in claim **1**, and wherein said driving connection includes a series of circumferentially spaced axially extending ribs on the barrel and a cooperating series of circumferentially spaced axially extending grooves which are formed internally on the sleeve and slidably receive the ribs.

4. In a lock assembly for a sealed cabinet door, in combination, a tubular open-ended cylindrical lock housing provided at its front end with a radial rim flange and at its rear end with an inturned bearing flange presenting a central bearing opening, said rim flange being provided with a shallow elongated recess in the forward end face thereof, a cylindrical sleeve coaxial with and rotatably disposed within said lock housing, means constraining said sleeve against axial shifting within the lock housing while allowing for free rotation thereof, a lock shaft on the rear end of said sleeve projecting through said bearing flange, an operating handle shaped conformably to the shape of the recess, positioned forwardly of the housing and having a tubular hub projecting rearwardly therefrom and constituting a lock barrel, said lock barrel being telescopically slidable in said sleeve between a retracted position wherein the operating handle is nested within the recess and a projected position wherein said handle is projected out of the recess, spring means yieldingly urging said barrel toward its projected position, means establishing a driving connection between the barrel and sleeve, a locking cam on said lock shaft exteriorly of the lock housing, and key-actuated latch means for releasably maintaining said barrel in its retracted position.

5. In a lock assembly for a sealed cabinet door, the combination set forth in claim **4**, and wherein said driving connection includes a series of circumferentially spaced axially extending ribs on the barrel and a cooperating series of circumferentially spaced axially extending grooves which are formed internally on the sleeve and slidably receive the ribs.

6. In a lock assembly for a sealed cabinet door, in combination, a tubular open-ended cylindrical lock housing provided at its front end with a radial rim flange and at its rear end with an inturned bearing flange presenting a central bearing opening, said rim flange being provided with a shallow elongated recess in the forward end face thereof, a cylindrical sleeve coaxial with and rotatably disposed within said lock housing, means constraining said sleeve against axial shifting within the lock housing while allowing for free rotation thereof, a lock shaft on the rear end of said sleeve projecting through said bearing flange, an operating handle shaped conformably to the shape of the recess, positioned forwardly of the housing and having a tubular hub projecting rearwardly therefrom and constituting a lock barrel, said lock barrel being telescopically slidable in said sleeve between a retracted position wherein the operating handle is nested within the recess and a projected position wherein said handle is projected out of the recess, spring means yieldingly urging said barrel toward its projected position, means establishing a driving connection between the barrel and sleeve, there being a small opening in the cylindrical wall of said barrel and a similar opening in the wall of said sleeve, said openings being in radial register with each other when the barrel is in its retracted position, a latch bolt

slidable in the barrel opening between an advanced position wherein it projects into the sleeve opening and a retracted position wherein it is withdrawn from said sleeve opening, key-actuated means for effecting sliding movement of the latch bolt, and a locking cam on said lock shaft exteriorly of the lock housing.

7. In a lock assembly for a sealed cabinet door, in combination, a tubular open-ended cylindrical lock housing provided at its front end with a radial rim flange and at its rear end with an inturned bearing flange presenting a central bearing opening, said rim flange being provided with a shallow elongated recess in the forward end face thereof, a cylindrical sleeve coaxial with and rotatably disposed within said lock housing, means constraining said sleeve against axial shifting within the lock housing while allowing for free rotation thereof, a lock shaft on the rear end of said sleeve projecting through said bearing flange, an operating handle shaped conformably to the shape of the recess, positioned forwardly of the housing and having a tubular hub projecting rearwardly therefrom and constituting a lock barrel, said lock barrel being telescopically slidable in said sleeve between a retracted position wherein the operating handle is nested within the recess and a projected position wherein said handle is projected out of the recess, spring means yieldingly urging said barrel toward its projected position, means establishing a driving connection between the barrel and sleeve, there being a small opening in the cylindrical wall of said barrel and a similar opening in the wall of said sleeve, said openings being in radial register with each other when the barrel is in its retracted position, a latch bolt slidable in the barrel opening between an advanced position wherein it projects into the sleeve opening and a retracted position wherein it is withdrawn from said sleeve opening, spring means yieldingly urging said latch bolt to its advanced position, and key-actuated means for withdrawing said latch bolt from said sleeve opening against the yielding action of said latter spring means.

8. In a lock assembly for a sealed cabinet door, in combination, a tubular open-ended cylindrical lock housing provided at its front end with a radial rim flange and at its rear end with an inturned bearing flange presenting a central bearing opening, said rim flange being provided with a shallow elongated recess in the forward end face thereof, a cylindrical sleeve coaxial with and rotatably disposed within said lock housing, means constraining said sleeve against axial shifting within the lock housing while allowing for free rotation thereof, a lock shaft on the rear end of said sleeve projecting through said bearing flange, an operating handle shaped conformably to the shape of the recess, positioned forwardly of the housing and having a tubular hub projecting rearwardly therefrom and constituting a lock barrel, said lock barrel being telescopically slidable in said sleeve between a retracted position wherein the operating handle is nested within the recess and a projected position wherein said handle is projected out of the recess, spring means yieldingly urging said barrel toward its projected position, means establishing a driving connection between the barrel and sleeve, there being a small opening in the cylindrical wall of said barrel and a similar opening in the wall of said sleeve, said openings being in radial register with each other when the barrel is in its retracted position, a latch bolt slidable in the barrel opening between an advanced position wherein it projects into the sleeve opening and a retracted position wherein it is withdrawn from said sleeve opening, there being a second small opening in the wall of said sleeve at a region diametrically disposed from the other opening therein and in the same transverse plane of the sleeve, there being an elongated slot in the wall of the barrel in register with said second opening in any axial position of the barrel, a detent plunger slidable in said second opening and movable between an advanced position wherein it is projected into said slot and a retracted position wherein it is withdrawn radially inwardly from said slot, a compression spring extending diametrically across the barrel internally thereof and bearing at one end against the latch bolt and at the other end against said detent plunger, said compression spring serving to yieldingly urge said latch bolt and detent plunger toward their advanced positions, key-actuated means for withdrawing said latch bolt from the sleeve opening against the yielding action of said compression spring, and a locking cam on said lock shaft exteriorly of the lock housing.

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