The present invention relates in general to cylinder locks, and more particularly to cylinder locks having special provision for protecting the same against unauthorized entry by the usual lock picking procedures. One of the common types of cylinder locks which has come into wide use is the type known as a cylinder lock. Such cylinder locks comprise a lock body or casing having a cylindrical bore therein opening through the front surface of the lock body which rotatably houses a cylindrical plug having a keyway or key slot opening through the front surface of the plug and extending substantially the axial length of the plug. A series of parallel tumbler bores are formed in the plug and lock body along axes extending radially of the axis of rotation of the plug and lying in a common plane when the plug is in locked position, which house coil springs and sectioned locking pins each comprising a driving pin section and a tumbler pin section. The driving pin section normally lies partially in the body portion of the tumbler bores and partially in the plug portion of these bores, and the tumbler pin section is in axially aligned abutment with the driving pin sections and extends into the key slot to be engaged with the wards of the key bit. Since the driving pin sections normally extend across the shear line or boundary zone between the plug and the lock casing, the plug is restrained against rotation. However, a key of proper contour will elevate the pins proper distances to locate the line of separation between the driving pin sections and the tumbler pin sections in alignment with the shear line between the plug and body, permitting rotation of the plug and the bolt connected with the plug to unlock the closure protected by the lock.

Due to conditions which arise in the construction of the lock parts under customary manufacturing tolerances, it is possible to effect minute rotary displacement of the plug from its normal locked position and thereby produce a slight offset shoulder formation or ledge by the plug at the shear line between the plug and the wall of the plug accommodating bored, which will catch and support the edge of the lower end of the driving pin section of the locking pin when the latter are elevated. This property of the locks is taken advantage of in lock picking procedures by applying a special wrench to the plug to force or stress the plug in an angular direction about its axis of rotation and then manipulating the locking pins by a pick inserted into the key slot to individually lift them until the drive pin sections catch on the shoulder or ledge formed when the plug is thus stressed. When all of the drive pin sections have been thus caught in the elevated position, the plug can be turned through the appropriate arc to unlock the lock.

An effort has been made to prevent this type of unauthorized entry by the construction typified by U.S. Patent No. 2,491,337 granted to May Segal, wherein a radially slideable cover is provided for the key slot in the plug, which has a dove-tail formation slideable in a radial groove in the plug and extending into the lock body to prevent rotation of the plug whenever the slideable cover is disposed in non-covering relation to the entrance opening of the key slot. However, the construction of the slide cover and its relation to the key slot in the Segal construction is such that an opening of sufficient size to permit entry of a small picking wire into the key slot at the lower end of the slot entrance is still available when the slide cover is in lowered position, by which the tumbler pins could be manipulated with the plug in stressed condition. Further, wear on the sides of the dove-tail formation or on the slide groove due to raising and lowering of the slide cover over a period of use of the Segal lock would permit enough rotation of the plug even when the slide cover was raised to permit picking of the lock. Moreover, since some clearance would be provided between the dove-tail formation and groove to facilitate manual sliding of the cover, the Segal slide cover arrangement would permit accurate movement of the plug of varying degrees with variation in the position of the slide recover along the groove therefor.

An object of the present invention, therefore, is the provision of a cylinder key lock having novel means for protecting the lock against picking of the lock by unauthorized persons.

Another object of the present invention is the provision of a novel cylinder type key lock having a manually operable slide member which normally covers the key slot against access and which actuates interlocking means at the shear line between the rotatable plug and the lock body to positively lock the plug against such angular displacement as would facilitate catching of the locking pins upon manipulation thereof when the slide member is displaced sufficiently to expose any part of the key slot to access.

Other objects, advantages, and capabilities of the present invention will become apparent from the following description, taken in conjunction with the accompanying drawings illustrating 2 preferred embodiments of the invention.

In the drawings:

FIGURE 1 is a front elevation view of a cylinder lock embodying the present invention, with the manually operable slide member illustrated in raised position exposing the entrance end of the key slot to admission of a key;

FIGURE 2 is a vertical section view thereof taken along the line 2--2 of FIGURE 1;

FIGURE 3 is a vertical section view similar to FIGURE 2, but illustrating the slide member in lowered covering relation to the key lock;

FIGURE 4 is a vertical transverse section view taken along the line 4--4 of FIGURE 2;

FIGURE 5 is a section view taken along the line 5--5 of FIGURE 4;

FIGURE 6 is a vertical transverse section view taken along the line 6--6 of FIGURE 5; showing the configuration of the rear face of the slide member;

FIGURE 7 is an exploded perspective view of the cylinder lock and an exemplary key stem and key holder usable therewith;

FIGURES 8 and 9 are a rear elevation and a side elevation respectively of the interlocking pin employed in the cylinder lock; and

FIGURE 10 is a slide elevation view, with parts broken away, illustrating a modified version of the cylinder lock having a removable dust cap associated therewith.

Referring to the drawing, wherein reference characters designate corresponding parts throughout the several figures, the cylinder lock of the present invention, indi
A slide member 39 having a disk-like body 40 of generally cylindrical configuration slightly larger in diameter than the plug 16 and a forwardly projecting rectangular knob portion 41 is held against the front surface 17 of the plug 16 and the front surface 13 of the lock body 11 by a retainer cap 42 having a circular front wall 43 and an annular rearwardly projecting flange 44 which encircles and is secured to a suitable mounting formation, such as head 11', at the front of the lock body 11. The front wall 43 of the retainer cap 42 has a rearwardly opening, vertically elongated guide channel 45 to slidably receive the disk portion 40 of the slide member, interrupted by a circular aperture 46 opening forwardly through the front wall 43 in axial alignment with the axis of rotation of the plug 16 and of slightly smaller diameter than the plug 16, and a connecting vertical excursion 47 of sufficient width to receive the knob portion 41 of the slide member 39.

The knob portion 41 has a slot 48 extending from the upper edge thereof adjacent its juncture with the disk portion 40 to a point near the lower edge of the knob portion 41, which slot 48 is of slightly greater thickness than the front wall 43 of the cap 42 in the region of the guide channel 45 to the upper limit or open position illustrated in FIGURES 2 and 6. The inner or rear face of the disk portion 40 of slide member 39 is provided with a specially shaped cam surface 49 and a pin accommodating bore 50, forming a receptacle for a biased headless screw 51 thereof with the apex of the conical front surface 32 of the interlocking pin head 30 when the slide member 39 is in fully lowered or closed position completely covering the front face of the plug 16. The cam socket 50 covers a sufficiently limited zone so that it is disposed completely out of framed recess 29 when the slide member 39 is slidably moved to the rearwardly projecting flange 44 and the front face 13 of the lock body 11. However, the configuration of the cam socket 50 is such that upward movement of the slide member 39 from its lower limit position over a range less than that which would bring the lower edge of the disk portion 40 in line with the lowermost part of the key slot entrance 20 will cam the interlocking pin 28 rearwardly to a sufficient extent to dispose at least a portion of the cylindrical head portion 31 of head 30 in the recess portion 37 of the plug 16 and in a locking recess 52 in the lock body 11 which conforms precisely to the shape of the cylindrical head portion 31 which lies forwardly of cutout 36. The beveled rear edge 32' of the head facilitates insertion of the head 30 into the recess 52. A shallow detent socket 53 is also provided in the rear face of the slide member disk portion 40 to register with the apex of the conical front surface 52 of interlocking pin head 30 when the slide member 39 is projected fully to its uppermost limit or open position to resiliently engage the slide member at this upper limit position.

The cylinder lock of the construction hereinafter described is preferably unlocked by a special key having a key bit which is separable from a key holder for example of the construction illustrated in FIGURES 5 and 7. The key bit 55 has the usual longitudinal elongated rectangular grooves 56 to conform the transverse profile of the key bit to the transverse sectional configuration of the key slot 19 and a working edge with profiled wards 57 formed of crests and troughs of appropriate depth. The key bit
terminates in a front end 58 at a point corresponding to the juncture between the key bit and key head of conventional keys so that only a short portion of the key bit will project outwardly from the front face 17 of the plug 16 when the key bit 55 is fully inserted in the keyway 19. The key holder 59 has a handle portion 60 resembling the usual key handle from which an aligned spring metal gripping jaws 61, 61' project and terminate at their free ends in inturnd teeth 62, 62' adapted to interfit in apertures 63 in the end portion 58 of the key bit 55. A slide band or ring 64 surrounds the jaws 61, 61' and is adjustable longitudinally of the jaws to an inner limit position near the teeth 62, 62' to retain the jaws in close-together, key bit holding condition, or to an outer limit position near the handle 60 wherein the jaws flex away from each other sufficiently to release the key bit 55.

In the operation of the above-described cylindrical key lock, the lock normally assumes the condition illustrated in FIGURE 3 with no key inserted in the key slot 19, and with the slide member 39 in the lower limit or closed position. In such condition, the locking pins 23 are in the position illustrated in FIGURE 2, being biased to bottomed condition in the pin accommodating bores 21, 22, 26 and rings 25. When it is desired to insert the cylindrical lock 10 with an appropriate key, the slide member 39 is elevated to the upper limit or open position shown in FIGURES 1, 2, 5 and 6, so that the disk portion 40 of the slide member is raised sufficiently to expose the entrance end 20 of the key slot 19 to insertion of a key bit therein through the aperture 46 in the retainer cap 42. The key bit 55 may either be inserted into the key slot 19 by direct manual grasping of the key bit, or it may be inserted by means of the key holder 59. In the latter case, upon full insertion of the key bit 55 in the key slot 19, the slide member 39 is rotated to a position which maintains the key bit by withdrawing the slide band 64 outwardly to a position adjacent the holder portion 60, releasing the jaws 61, 61' to spring away from each other and withdraw the teeth 62, 62' from the apertures 63. It will be observed that in the elevated position of the slide member 39, the conically shaped rear surface 32 of the interlocking pin 28 is engaged by portions of the slide member 39 that lie rearwardly of the cam socket 50 therein and thus force the interlocking pin 28 rearwardly against the action of the spring 38 to lodge the cylindrical body portion 31 thereof in nested relation within the excursion 37 of the plug 16 and within the locking recess 52 in the lock body 11. Since the configuration of the cylindrical body portion 31 of the interlocking pin head and the recesses 37 and 52 can be formed to vary close tolerances, such an arrangement provides a cylinder lock which is adaptable to mass production methods and which will still positively interlock the plug 16 against any angular rotation or stressing in an angular direction when the slide member 39 is in raised position, such as would be necessary for effective picking of the lock.

When the key bit 55 is inserted fully in the key slot 19 and the key holder 59 is removed from the aperture 46 in the retainer cap 42, the slide member 39 is then turned to the lower limit or closed position illustrated in FIGURE 3. During this downward movement of the slide member 39, the vertically elongated groove 65 in the inner or rear surface thereof receives the front end portion 58 of the key bit 55 and provides an effective connection between plug 16 and key bit 55 whereby the key bit can then be rotated about the axis of rotation of the plug 16 by appropriate rotation of the slide member 39. Since the wards 57 of the key bit 55 appropriate elevating the locking pins 23 so as to dispose the lines of separation between the tumbler pin sections 25 and the driving section 24 of the pin at the shear line between the plug 16 and the wall of the bore 12, the plug 16 is free to be rotated whenever the appropriate key bit is inserted in the key slot 19. In accordance with the usual procedure, the plug 16 may be rotated through about 90° by manual rotation of the slide member 39 to effect rotation or withdrawal of a suitable bolt from a keeper of conventional construction.

When it is desired to remove the key bit 55 from the key slot 19, the slide member 39 is rotated back to the position illustrated in FIGURE 3 and is then elevated to the upper limit or open position of FIGURE 2, after which the teeth 62, 62' on the jaws of the key holder 59 may be inserted in the apertures 63 of the key bit, the slide band 64 can be shifted forwardly to retain the jaws 61, 61' close together to maintain the teeth 62, 62' in the key bit apertures 63, and the key holder and key bit withdrawn from the lock.

A slight modification is illustrated in FIGURE 10 to provide additional dust protection for the portions of the cylinder key lock which are normally exposed to atmosphere. In the modification illustrated in FIGURE 10, all components other than the retaining cap of the previously described embodiment are the same as in the foregoing embodiment, and where visible in FIGURE 10 are indicated by the same reference characters as those employed in the description of the preceding embodiment. The retaining cap 42 of the FIGURE 10 embodiment is similar to the retaining cap 42 of the former embodiment, except that the exterior surface of the annular flange 44 is provided with helical threads 70. A cup-shaped dust cap or cover 71 having a disk-like front wall 72 and a rearwardly projecting continuous annular flange 73 is adapted to be mounted on the flange 44 of the retaining cap 42 in covering relation to the lock components which would otherwise exposed at the front of the lock, the annular flange 73 having helical threads 74 along the inner surface thereof adapted to be intercoupled with the threads 70 on the retainer cap 42.

While the preferred embodiments of the present invention have been particularly shown and described, it is apparent that various modifications may be made therein within the spirit and scope of the invention, and it is desired, therefore, that only such limitations be placed on the invention as are imposed by the prior art and set forth in the appended claims.

What is claimed is:

1. A cylinder lock adapted to be unlocked by a key comprising a lock body having a front wall portion and a cylindrical bore extending along an axis perpendicular to said front wall portion and opening therethrough, a cylindrical plug rotatably seated in said bore for rotation about the bore axis having a cylindrical surface closely conforming to and located immediately adjacent the bounding surface of said bore, said plug having a key slot therein for receiving said key, adjacent portions of said plug and lock body having complementary recess portions therein opening through said front wall portion collectively defining an interlock recess, interlock pin means having a head closely conforming to the configuration of said interlock recess supported for axial movement in said plug along an axis parallel to and rotatably spaced from said bore axis from a retracted position disposing said head in said interlock recess to a projected position disposing said head wholly forward of said front wall portion free of said recess, biasing means continuously urging said interlock pin means to said projected position, and a manually operable slide member supported for radial movement relative to said bore axis at said front wall portion from a first position completely covering said key slot against access thereto to a second position exposing said key slot to admission of a key, said slide member having pin control means permitting movement of said interlock pin head to said projected position only when said slide member occupies said first position and for driving said interlock pin head to said retracted position when said slide member is displaced from said first position.

2. A cylinder lock adapted to be unlocked by a key com-
prising a lock body having a front wall portion and a cylindrical bore extending along an axis perpendicular to said front wall portion and opening therethrough, a cylindrical plug rotatably seated in said bore for rotation about the bore axis having a cylindrical surface closely conforming to said bore axis and located immediately adjacent the bounding surface of said bore, said plug having a key slot therein for receiving said key, adjacent portions of said plug and lock body having complementary recess portions therein opening there through said front wall portion collectively defining an interlock recess of cylindrical configuration axially paralleling said bore axis, said interlock recess spanning the shear zone defined between the cylindrical surface of said plug and the bounding surface of said bore, an interlock pin including an integral head having a cylindrical portion closely conforming to the configuration of said interlock recess, said pin supported for axial movement in said plug along an axis paralleling and rotatably spaced from said bore axis from a retracted position disposed said head in said interlock recess to a projected position disposed said head wholly forward of said front wall portion free of said recess, biasing means continuously urging said interlock pin to said projected position, and a manually operable slide member supported for radial movement relative to said bore axis at said front wall portion from a first position completely covering said key slot against access to a second position exposing said key slot to admission of a key, said slide member having pin control means permitting movement of said interlock pin head to said projected position only when said slide member occupies said first position and for driving said interlock pin head to said retracted position when said slide member is displaced from said first position.

3. In a cylinder lock, as defined in claim 2, said plug having a recessed extension communicative with said interlock recess and conforming to the portion thereof occurring in said plug, and pin means including an elongated cylindrical shank portion extending integrally from said head along an axis paralleling and offset radically from the axis of said cylindrical head portion and a segmental head portion at the juncture of said head and shank portion conforming to the configuration of said recess extension in said plug to be continuously received therein at all positions of said interlock pin.

4. In a cylinder lock, the combination defined in claim 3, wherein said slide member pin control means comprises cam surfaces opening toward said interlock pin head co active with a portion of said head to cam said pin to said retracted position whenever said slide member is displaced from said first position including a socket to be aligned with said head when said slide member occupies said first position and accommodated movement of said pin head to said projected position responsive to said biasing means.

5. In a cylinder lock, the combination defined in claim 1, wherein said slide member pin control means comprises cam surfaces opening toward said interlock pin head co active with a portion of said head to cam said pin to said retracted position whenever said slide member is displaced from said first position including a socket to be aligned with said head when said slide member occupies said first position and accommodated movement of said pin head to said projected position responsive to said biasing means.

6. In a cylinder lock, the combination defined in claim 1, including a retainer cap member mounted on said lock body in covering relation to said front wall portion having a guide channel therein receiving a portion of said slide member and guiding the same for rectilinear movement radially of said bore axis between said first and second positions, said retainer cap member having a key access aperture therein aligned with said plug, and said slide member having a portion covering said aperture at said first position and a knob-like extension projecting through said aperture to a manually accessible position.

7. In a cylinder lock, the combination defined in claim 2, including a retainer cap member mounted on said lock body in covering relation to said front wall portion having a guide channel therein receiving a portion of said slide member and guiding the same for rectilinear movement radially of said bore axis between said first and second positions, said retainer cap member having a key access aperture therein aligned with said plug, and said slide member having a portion covering said aperture at said first position and a knob-like extension projecting through said aperture to a manually accessible position.

8. A cylinder lock adapted to be unlocked by a key comprising a lock body having a front wall portion and a cylindrical bore extending along an axis perpendicular to said front wall portion and opening therethrough, a cylindrical plug rotatably seated in said bore for rotation about the bore axis having a cylindrical surface closely conforming to and located immediately adjacent the bounding surface of said bore, said plug having a key slot therein for receiving said key, adjacent portions of said plug and lock body having complementary recess portions therein opening there through said front wall portion collectively defining an interlock recess of cylindrical configuration axially paralleling said bore axis, said interlock recess spanning the shear zone defined between the cylindrical surface of said plug and the bounding surface of said bore, an interlock pin including an integral head having a cylindrical portion closely conforming to the configuration of said interlock recess, said pin supported for axial movement in said plug along an axis paralleling and rotatably spaced from said bore axis from a retracted position disposed said head in said interlock recess to a projected position disposed said head wholly forward of said front wall portion free of said recess, biasing means continuously urging said interlock pin to said projected position, and a manually operable slide member supported for radial movement relative to said bore axis at said front wall portion from a first position completely covering said key slot against access to a second position exposing said key slot to admission of a key, said slide member having pin control means permitting movement of said interlock pin head to said projected position only when said slide member occupies said first position and for driving said interlock pin head to said retracted position when said slide member is displaced from said first position.

9. In a cylinder lock, the combination defined in claim 2, including a retainer cap member mounted on said lock body in covering relation to said front wall portion having a guide channel therein receiving a portion of said slide member and guiding the same for rectilinear movement radially of said bore axis between said first and second positions, said retainer cap member having a key access aperture therein aligned with said plug, and said slide member having a portion covering said aperture at said first position and a knob-like extension projecting through said aperture to a manually accessible position.
having only a key bit which terminates in a stub bit portion of substantially rectangular section projecting a short distance to the front of said plug, said slide member having a groove of similar configuration to said stub bit portion opening in a direction to receive the same upon movement of said slide member from said second position to said first position and intercouple the slide member and key for corresponding rotation.