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[54] **COMBINATION LOCK CONSTRUCTION**
 32 Claims, 18 Drawing Figs.

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 292/169.22
 [51] Int. Cl..... **E05b 37/02,**
 E05b 65/02
 [50] Field of Search..... 70/78, 79,
 80, 81, 82, 83, 84, 129, 133, 285, 312, 314, 316,
 318, 446, 77

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ABSTRACT: A combination lock mechanism for locker doors and similar movable closures having a manually operable latching mechanism for the door, wherein the lock includes plural combination dial wheels spaced along a common axis and hubs which may be coupled with the dial wheels at different combination positions. A movable fence is normally restrained by the hubs in locking position to hold a locking bar against vertical movement and is released by gates in the hubs to permit the locking bar to be moved vertically to unlocking position when the correct combination is dialed. The locking bar is arranged to permit opening movement of the latching mechanism only when the fence is released upon dialing of the proper combination, or upon operation of a master key by a custodian which overrides the combination locking mechanism.

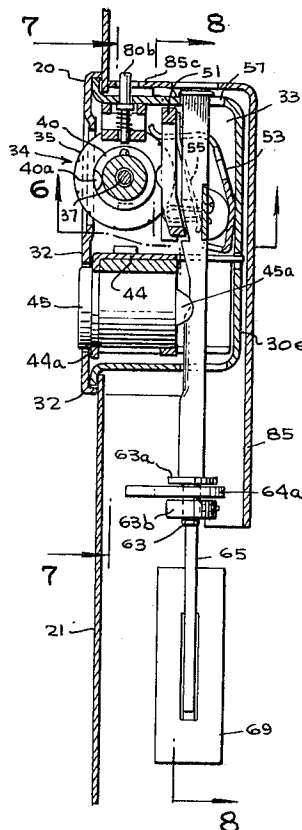


Fig-1

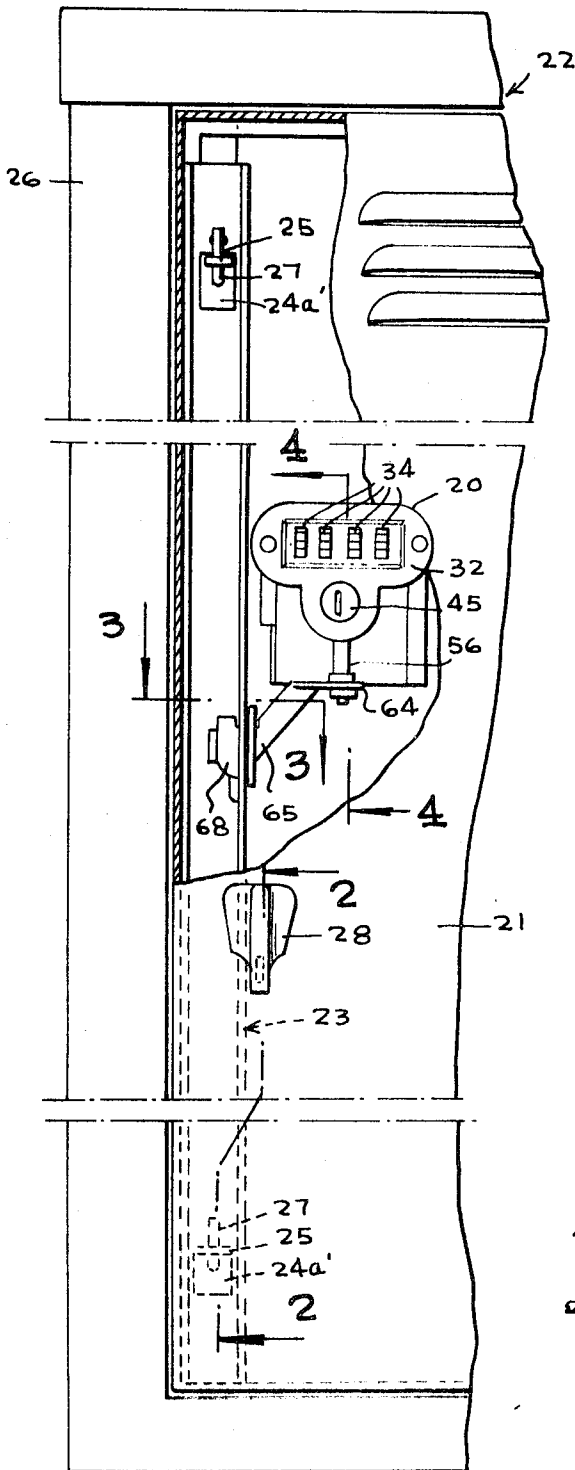
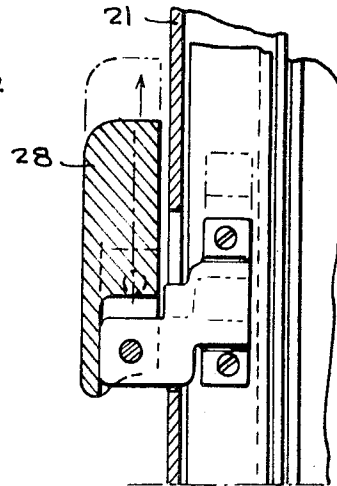


Fig-2

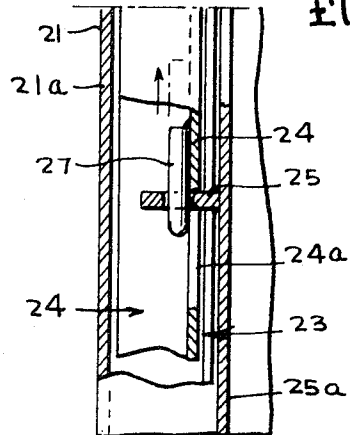
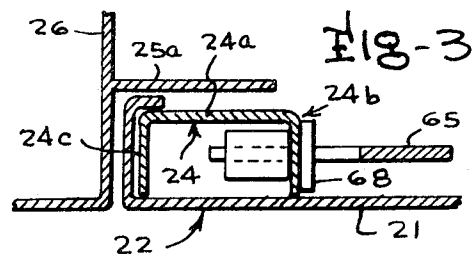
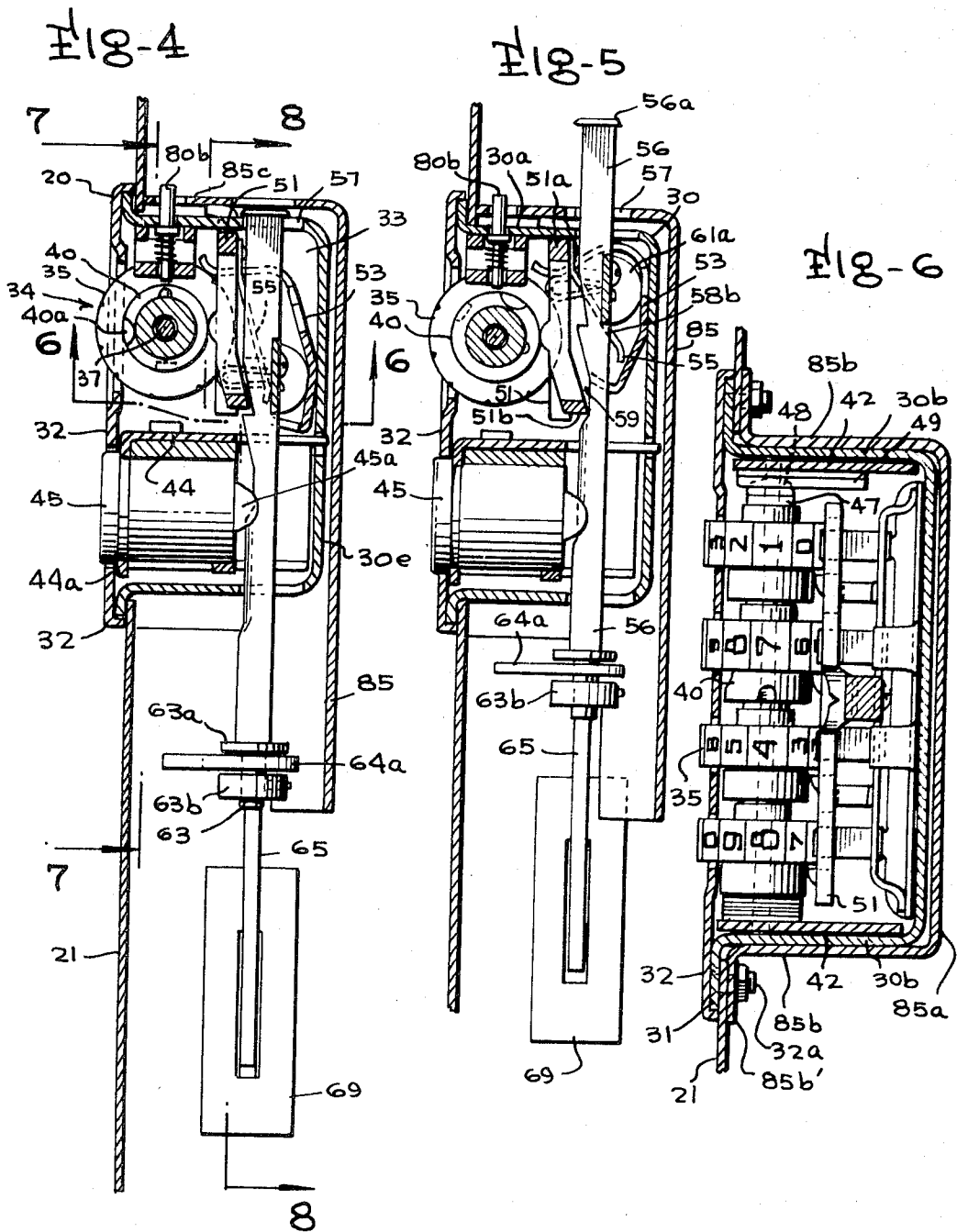


Fig-3

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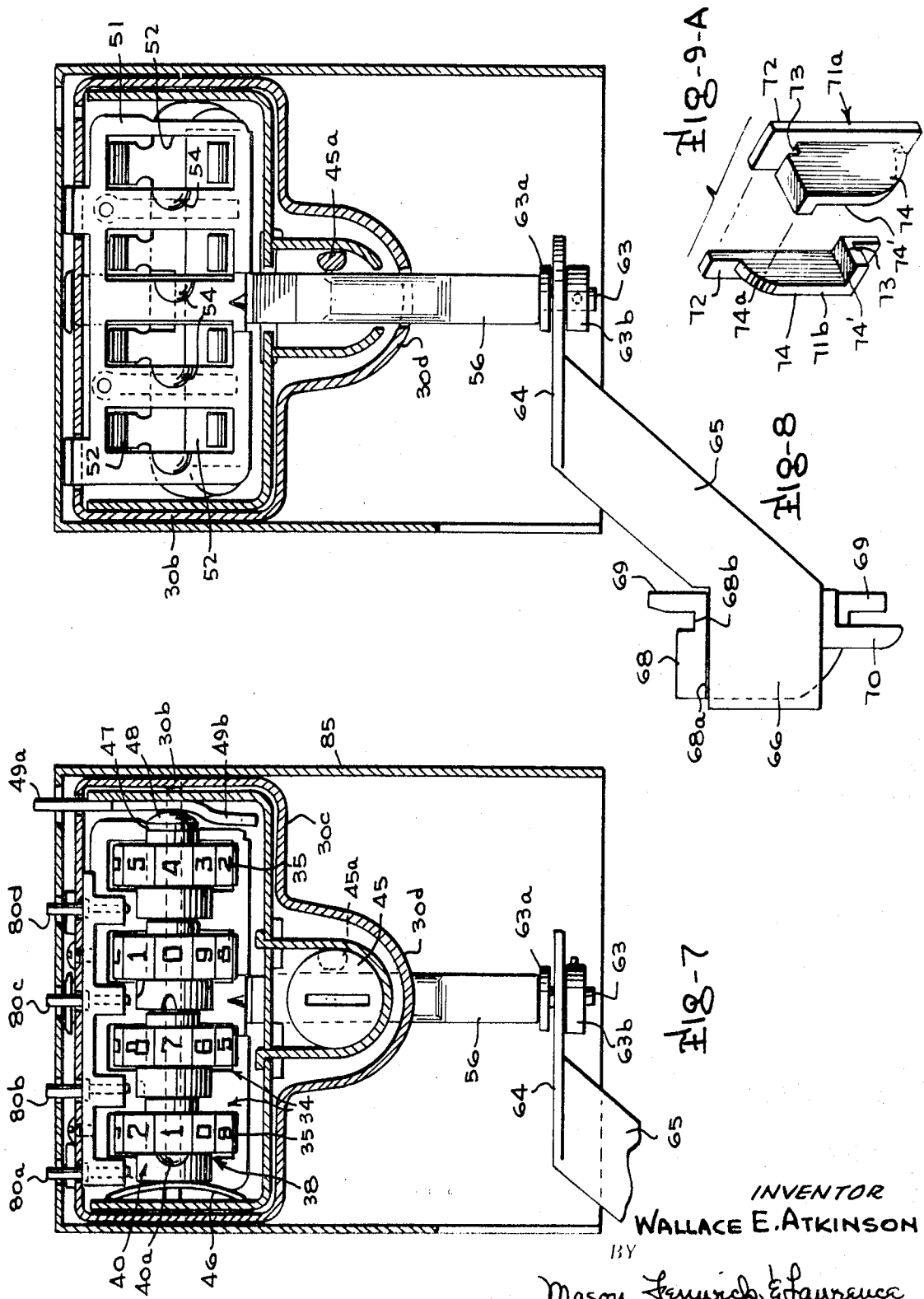
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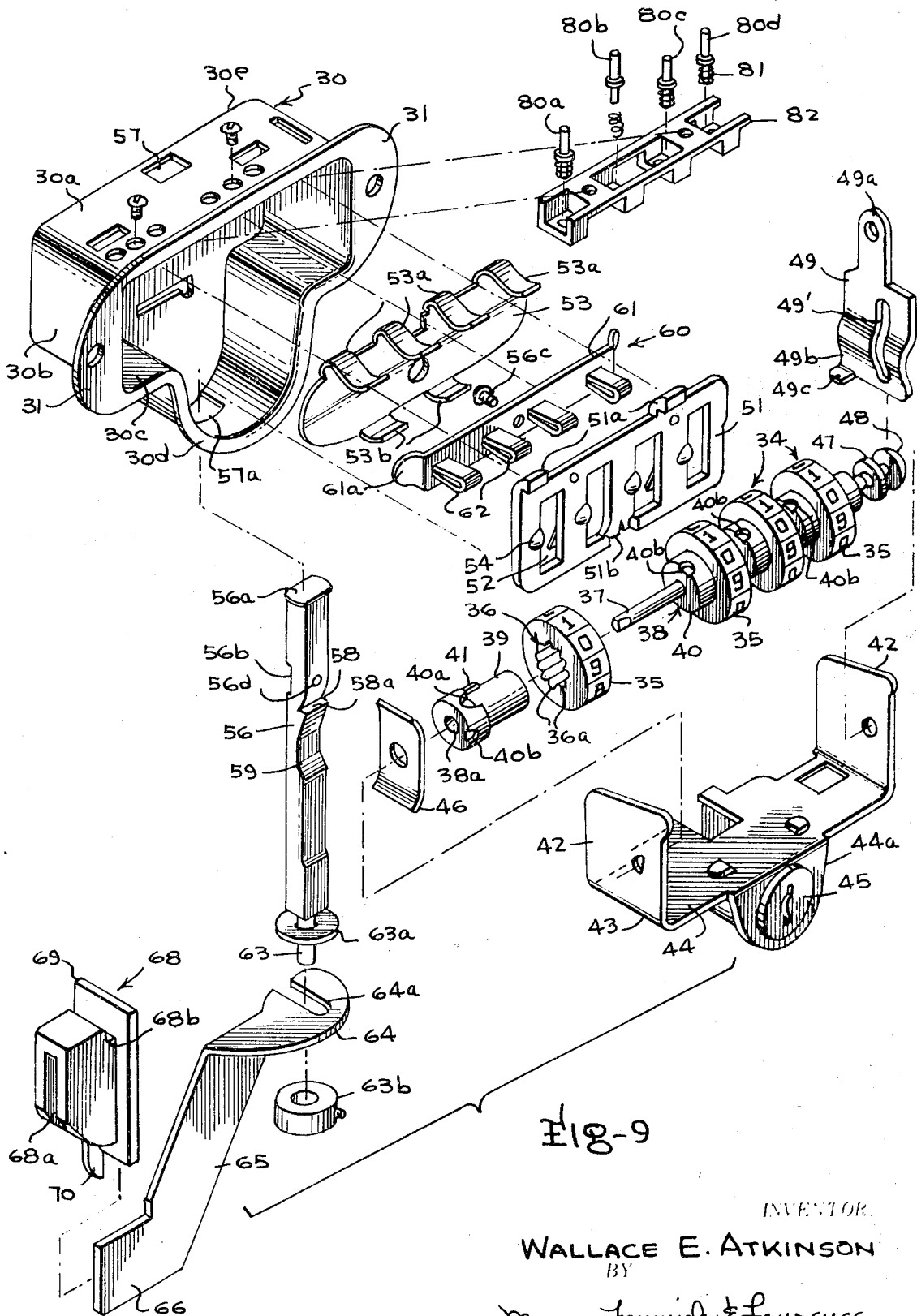
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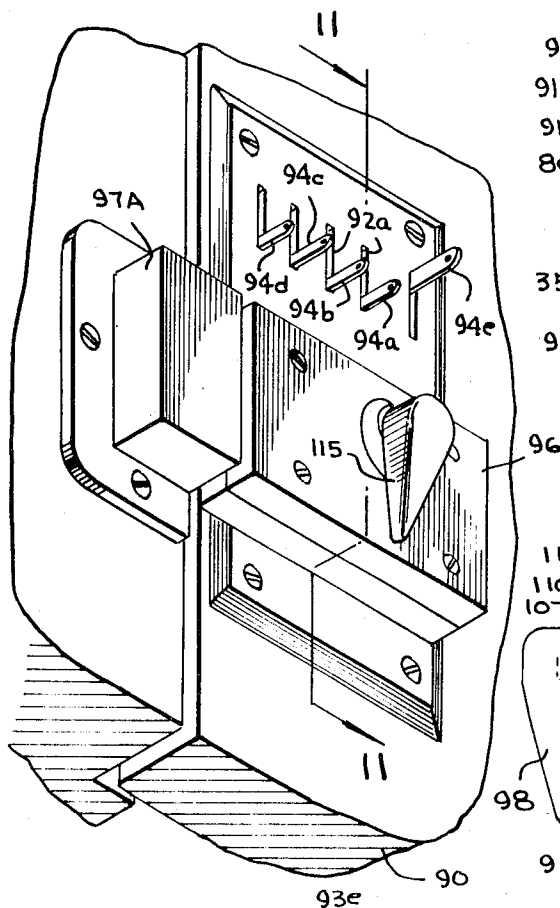
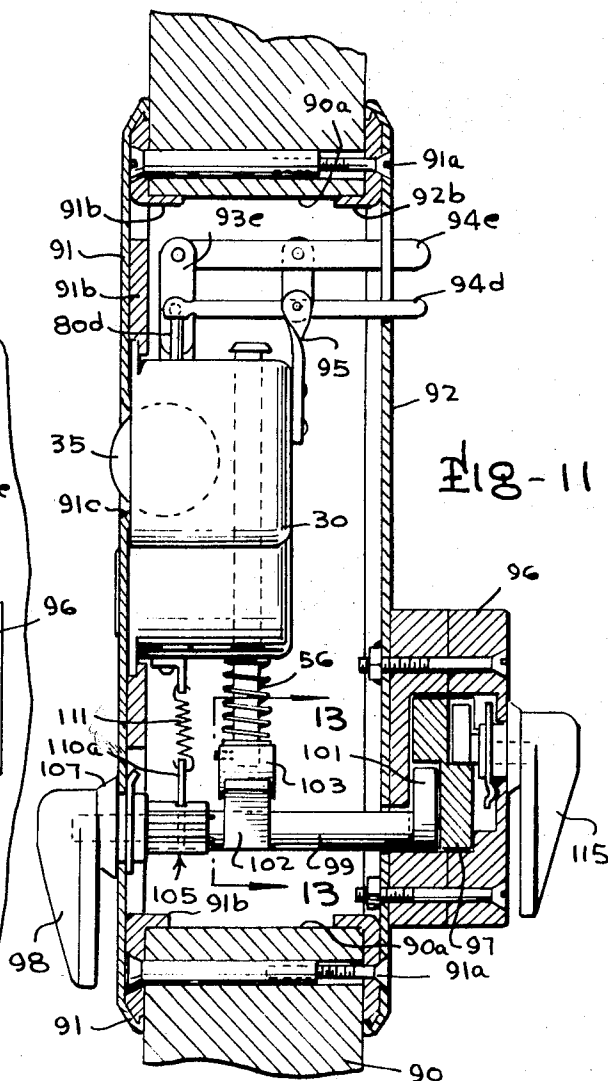


Fig-11



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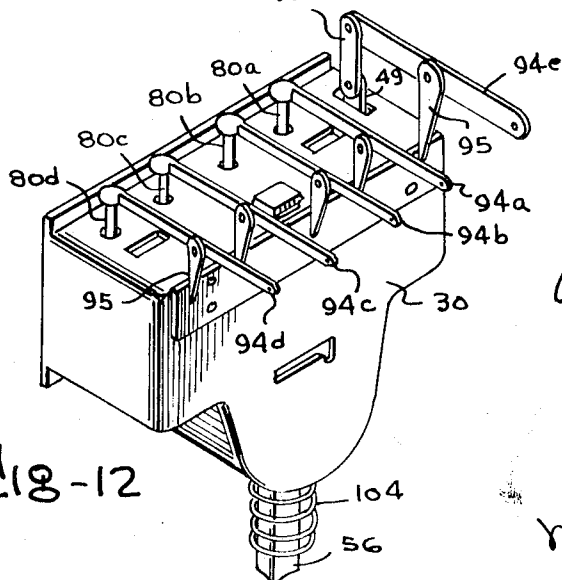
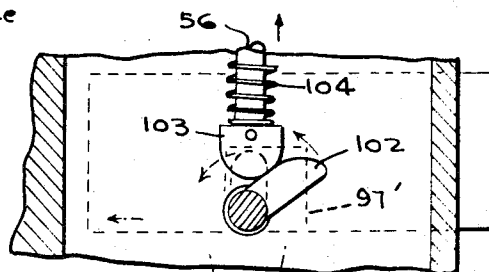


Fig-13



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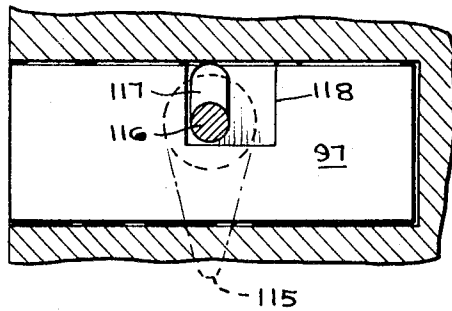


Fig-14-B

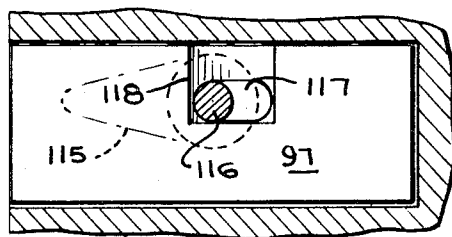


Fig-14-A

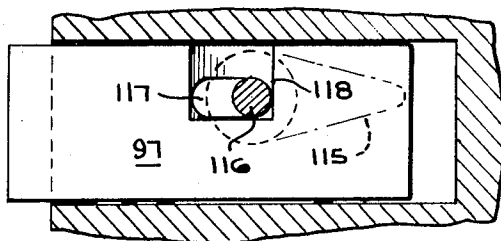


Fig-14.C

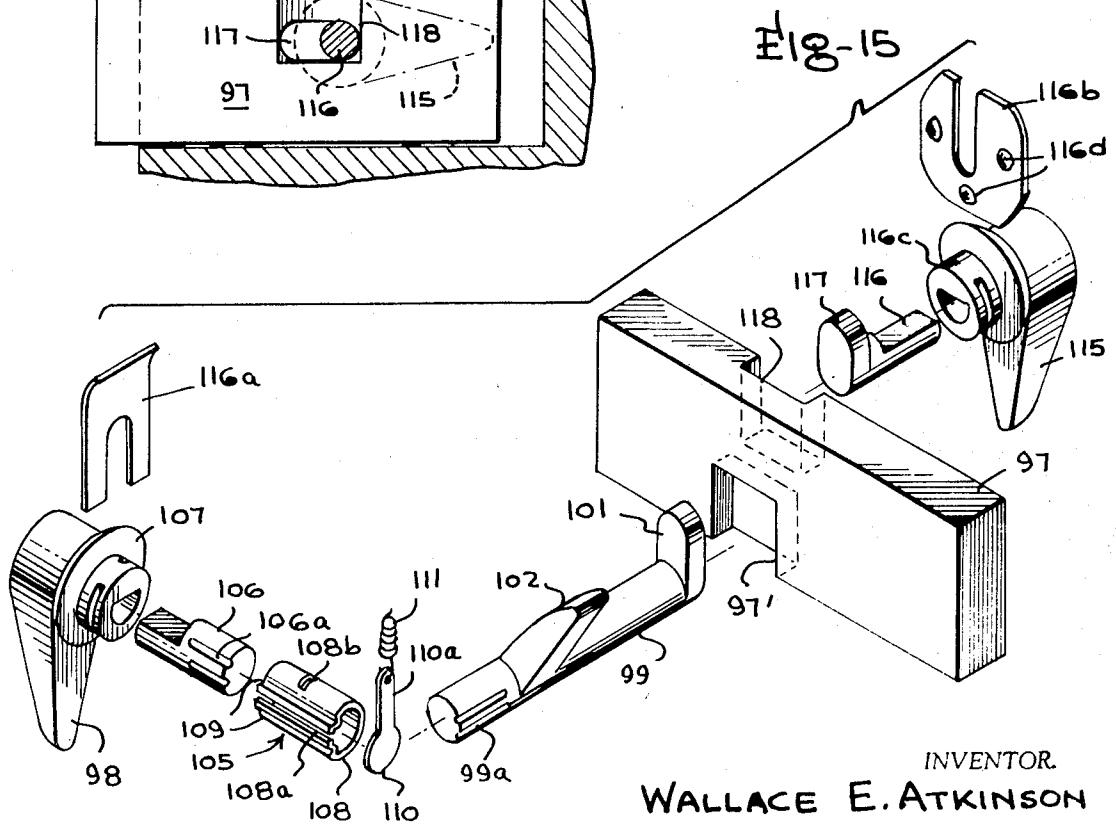


Fig-15

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COMBINATION LOCK CONSTRUCTION

BACKGROUND AND OBJECTS OF THE INVENTION

The present invention relates in general to combination locks, and more particularly to combination locks designed for use on doors to lock and unlock the normal door-latching mechanism, the combination locks embodying the present invention being especially useful on the doors of lockers, cabinets and similar storage receptacles such as those employed in educational institutions, factories and the like.

Heretofore, it has been the custom to provide locks for securing lockers or cabinets assigned to students or workmen in large installations such as schools, laboratories, work shops and the like, and in factories, where each student or workman has a locker or cabinet in which his books, clothing, tools and the like are kept. Because of the difficulty in keeping up with keys associated with key locks, and because key locks are generally easier to pick, combination locks have come into wide use for such applications. When such combination locks are used, the combinations for each of the locks are different, and each student or workman normally knows only the combination giving access to his particular locker. As the lockers or cabinets in these cases are usually periodically reassigned to different students or different workmen it is highly desirable that the combination of the locks should be readily subject to change or resetting upon such reassignment so that the former tenant of the locker who has memorized the combination would not have further access to the locker.

Present combination locks for such installations are preset at the factory, and each lock is coded and the preset combination number is related to the individually coded lock. A control book is issued to the institutional purchaser. The lockers must be numbered, and each coded lock with its separate combination must be assigned to a particular locker and a record kept of all of this. Afterwards, to provide access to a locker by a single person, the combination numbers for each lock must be issued to him, with this recorded in a separate file card system, or by other means. Also, combination locks in present use are frequently such that once a given lock is set by factory assembly, only a few more combinations are available to custodians who must then follow a prearranged sequence of different combination numbers. This sequence becomes a cycle after the sequence is completed. The custodian must change the combination number in present locks, not the user, and he must refer to the control book for each lock and has no choice other than the prearranged sequence. The changing of the combination number by custodians is slow and tedious work, and mistakes frequently occur. Although the control book and the index file cards are reserved to the custodian, the combination numbers can be, and sometimes are, pilfered and security is lost.

It is therefore important in combination locks for such applications that mechanism be incorporated to permit a custodian or person with a master key to override the combination mechanism and open the lock, to alleviate many of the above discussed inconveniences and problems. This capacity would also be highly desirable when the locks are used for doors such as the doors to apartment house installations. Thus if an apartment tenant moves without advising the custodian of the combination permitting access to the apartment, the custodian should have the capacity to override the unknown combination by means of an appropriate key. Further, in order to avoid having to destroy the lock in any of such circumstances where it must be operated by a key, means should be provided to permit the custodian to detect, from the inside of the locker or other door on which the combination lock is mounted, the combination of which the lock is already set, as combination locks customarily must be dialed to open condition before the combination can be changed by whatever combination change mechanism is incorporated in the lock.

An object of the present invention, therefore, is the provision of a novel combination lock mechanism of durable and reliable construction, which is adaptable to mass production

techniques and provides a relatively simplified construction for locks having plural dial wheels on a common axis parallel to the front plane of the door.

Another object of the present invention is the provision of a novel combination lock mechanism, especially suitable for lockers, cabinets and the like, wherein the lock construction is such that the lock can be operated by a custodian with a master key which overrides the combination locking mechanism and permits opening of the lock, and wherein means are provided to facilitate determination of the combination on which the lock is set, to avoid the necessity of destroying a lock having a lost combination.

Another object of the present invention is the provision of a novel combination lock mechanism, suitable for residential doors, wherein the lock construction is such that the lock cannot be picked or forced open once it has been locked from the inside of the residence.

Another object of the present invention is the provision of a novel combination lock mechanism as described in the immediately preceding paragraph, which incorporates overriding master key means to permit access to the lock when the lock has been locked from the outside of the residence.

Yet another object of the present invention is the provision of a novel combination lock mechanism having the properties described in the preceding objects, and which is so constructed as to facilitate production of the lock more economically than present combination locks designed for similar applications.

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

BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 is a fragmentary front elevation view of a locker having the combination lock construction of the present invention installed thereon, parts being broken away to reveal features of the construction;

FIG. 2 is a vertical section view taken along the line 2—2 of FIG. 1 illustrating features of the latch bar and operating handle construction provided on a conventional locker on which the combination lock may be mounted;

FIG. 3 is a horizontal transverse section view taken along the line 3—3 of FIG. 1;

FIG. 4 is a vertical section view through the combination lock mechanism, taken along the line 4—4 of FIG. 1, and illustrating the combination lock in locked condition;

FIG. 5 is a vertical section view taken from a plane corresponding to that of FIG. 4, but illustrating the combination lock in unlocked condition;

FIG. 6 is horizontal transverse section view through the combination lock construction, taken along the line 6—6 of FIG. 4;

FIGS. 7 and 8 are vertical transverse section views through the combination lock construction, taken along the lines 7—7 and 8—8, respectively, of FIG. 4;

FIG. 9 is an exploded perspective view of the combination lock mechanism;

FIG. 9a is an exploded perspective view of a modified type of coupling fitting which may be used to couple the lock with the locker latch bar;

FIG. 10 is a fragmentary perspective view of a modified form of the combination lock mechanism adapted for use on an apartment door or the like, shown installed on the door and viewed from the interior side of the door;

FIG. 11 is a vertical section view taken along the line 11—11 of FIG. 10;

FIG. 12 is a fragmentary perspective view of the combination lock casing and the actuating levers and linkages on the top thereof for actuating the combination resetting mechanism and the combination detecting pins;

FIG. 13 is a fragmentary section view taken along the lines 13—13 of FIG. 11;

FIGS. 14A, 14B and 14C are fragmentary, and somewhat diagrammatic, section views showing the operation of the bolt by the cam controlled by the interior control knob; and

FIG. 15 is an exploded perspective view of the bolt and the associated shaft and cam assemblies.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to the drawings, wherein like reference characters designate corresponding parts throughout the several figures, and particularly to the embodiment illustrated in FIGS. 1 to 9 inclusive, the combination lock is generally indicated by the reference character 20 and is adapted to be mounted on a door, such as the door 21 of the locker 22 to lock and unlock the usual latch mechanism, indicated generally at 23, of the locker door 21. In the example illustrated in FIGS. 1 to 3, the latch mechanism 23 comprises a vertically elongated latch bar 24 of generally channel configuration having openings 24a' in the rear web portion 24a through which apertured keepers 25 may project from a stationary portion, such as flange 25a, of the jamb or sidewall 26 of the locker. In the embodiment illustrated, the latch bar also has latch tongues or rods 27 secured, as by welding, onto the web portion 24a of the latch bar 24 positioned to project downwardly into the openings of the keepers 25 when the latch bar is in the lower or locking position shown in solid lines. One of the side flanges 24b of the latch bar 24 has a handle 28 fixed thereto, as illustrated particularly in FIG. 2, which projects through a slot in the front panel 21a of the door 21 to an accessible position for manual operation of the latch bar in a vertical direction.

The combination lock unit 20, more clearly shown in FIGS. 4 to 9 inclusive, comprises a casing 30 having laterally projecting mounting flanges 31 apertured to receive fastening members, as indicated at 32a projecting rearwardly from corresponding parts of a front cover plate 32. The casing has a top wall 30a, sidewalls 30b, and a curved bottom wall 30c having downwardly directed convex projection 30d in the center portion thereof, and a rear wall 30e collectively defining a forwardly opening chamber 33 for housing the lock mechanism. Within the chamber 33 is a transversely aligned group of four dial assemblies 34, aligned in side-by-side concentric relation along a horizontal axis paralleling the plane of the locker door 21. Each of the dial assemblies comprises a dial wheel 35 in the form of a thin annular cylindrical member having dial marking lines and dial numerals on the periphery thereof so as to be visible to the operator from the front of the combination lock unit, and each having an axial bore 36 extending therethrough, provided with a plurality of concave notches in the inwardly facing surface thereof, for example 10 notches, indicated at 36a. Cylindrical segment portions of the dial wheels 35 project through accommodating slots in the front cover plate 32, as more clearly shown in FIGS. 4, 5 and 6, so as to be visible from externally of the lock unit and be manually operable to different angular positions.

The dial wheels 35 are journaled within the chamber 33 in coaxial relation along a common axis defined by an axle pin 37 by spindle members 38, each having a relatively smaller diameter hub portion 39 which is of sufficient axial extent to project entirely through the axial bore 36 of the dial wheel 35 and a selected distance there beyond. The hub portion 39 of each spindle member adjoins an enlarged collar formation 40 integrally formed with the hub portion 39 and of a sufficiently larger diameter than the minimum diameter of the bore 36 so as to abut against a confronting face of the adjacent dial member 35. A plurality of eccentrically located, axially elongated interlocking formations, shown in the illustrated example as a diametrically opposed pair of pins 41, are also formed integrally on the spindle members and project axially from the collar formation 40 to be received in the notches 36a in the inwardly facing surface of the axial bore 36 of the associated dial wheel 35 to interlock the dial wheel and its respective associated spindle member against relative angular movement at any of 10 selected angular positions corresponding to the 10 dial numbers on the periphery of the dial wheel.

The spindle members 38 are each provided with a central bore extending therethrough, indicated at 38a, so that the spindle members of the dial assemblies can be arranged in stacked or side by side coaxial relation on the axle pin 37 and the ends of the axle pin journaled in flanges 42 of a dial assembly supporting frame 43 having a web portion 44 with a turned down extension 44a through which projects the key cylinder of a cylinder key lock unit 45. Between the left-hand end of the stack of spindle members 38 and the adjacent flange 42 is a bowed leaf spring 46 which biases the stack of spindle members 38 to the right as viewed in FIGS. 7 and 9, while a flat annular spacer washer 47 and a dome- or cylindrical-segment-shaped washer 48 are provided on the opposite or right-hand end portion of the axle pin 37, as viewed in FIG. 9. The pin 37 then passes through the slot 49' in a combination change actuator 49 in the form of a slide member disposed between the dome-shaped washer 48 and the right-hand flange 42 of the frame 43. The combination change actuator 49 has an extension handle 49a projecting upwardly through an accommodating slot in the top wall 30a of the casing 30, and has a bowed cam portion 49b which is normally located below and out of registration with the dome-shaped washer 48, as shown in FIG. 7, allowing the spring 46 to bias the stack of spindle members to the right as viewed in FIGS. 7 and 9 and thereby maintain their pins 41 interlocked with the notches 36a of their associated dial wheels 35. However, after setting the numbered wheels to the correct combination, and upon raising the combination change actuator 49 to bring the bowed cam portion 49b into engagement with the center portion of the dome-shaped washer 48, the washer 48 forces the spindle members 38 to the left against the resilient biasing action of the spring 46 a sufficient distance to release the interlocking pins 41 from engagement with the notches 36a of the associated dial wheels 35. The dial wheels are restrained against movement to the left of FIG. 7, by reason of portions of the dial wheels being interfitted in the slots therefor in the front cover plate 32 and in openings in the fence as hereinafter explained. In this condition, wherein the spindle members are released from their respective dial wheels, the dial wheels can then be manually rotated to new combination positions and, upon return of the actuator slide 49 to the lower or normal position, the pins 41 will interlock with different notches 36a and establish new combinations for the dial assemblies.

A fence 51 is pivotally hung from the top wall 30a, as is more apparent from FIG. 4, by means of curved lugs 51a projecting through slots in the top wall 30a of the casing, and is in the general form of a rectangular frame having four rectangular openings 52 therein located to accommodate rearwardly projecting segments or portions of the dial wheels 35 to extend therein, and having sufficient vertical size to permit detent fingers 53a of spring 53 to normally project therethrough into detenting contact with the peripheries of the dial wheels 35. The fence 51 also has forwardly projecting contact or nose formations 54 thereon located to the left of and along side each of the openings 52 as viewed in FIGS. 8 and 9, aligned fore and aft to bear on the peripheries of the collar formations 40 of the spindle members 38. As will be more evident from FIGS. 4 and 9, each of the spindle member collar formations 40 has a first gating recess 40a, which is of semicylindrical configuration in this embodiment, adjoining the transition shoulder between the collar formation 40 and the hub portion 39 of each spindle member, which at a proper angular position of the spindle member will confront and receive the fence nose formation therein. When all of the gates 40a of the spindle members are in proper alignment with the nose formations 54, as will be the case when the proper combination has been dialed, the fence 51 is then free to pivot from the normal locking or rearmost position illustrated in FIG. 4 to the forward or release position illustrated in FIG. 5. Leaf springs 55 secured at their upper ends to the fence 51 and projecting in rearwardly and downwardly inclined relation therefrom normally bias the fence 51 toward the dial assemblies, or in a clockwise direction as viewed in FIG. 4. The leaf springs 55 obtain their tension from pushing at their lower ends against the body portion of scrambler spring unit 60, later described.

A vertically reciprocative control bar 56 is guided for generally vertical movement by an aperture 57 in the top wall 30a of the casing corresponding substantially to the cross section of the control bar 56, and by a slot 57a in the curved bottom wall 30b which may be somewhat elongated fore and aft relative to the aperture 57. The control bar 56 has an enlarged head 56a at its upper end engageable with the top wall 30a to restrain the control bar against further downward movement from the lower limit position illustrated in FIG. 4 and has a triangular or sawtooth-shaped forwardly facing locking recess 58 therein bounded by horizontal lower shoulder 58a designed to receive the rearwardly inclined locking shoulder 51b of the fence 51 in the normal condition illustrated in FIG. 4. In this normal locked condition, the shoulder 58a of the control bar 56 confronts the locking shoulder 51b of the fence 51 and is restrained by the fence in the normal locking position from being raised from the lower limit position of the control bar 56. An elongated notch 59 is also provided on the control bar 56 below the locking recess 58 to receive the locking shoulder 51b and to coact with an actuating nose 45a of the key cylinder unit 45 in a manner later to be described.

A scrambler spring unit 60 has a transversely extending body portion 61 attached to the locking control bar 56 by a pin, rivet or other fastener 56c extending through a hole 56d in bar 56, and is held against movement by a slot or recess 56b in the bar 56. The body portion 61 terminates at opposite ends in rearwardly projecting ear formations 61a and has substantially U-shaped scrambler spring projections 62 projecting forwardly through the apertures 52 in the fence 51 which are normally lightly engaging or spaced slightly out of contact with the peripheries of the dial wheels when the control bar 56 occupies the lower limit or locked position of FIG. 4. The detenting spring 53 is of somewhat bowed configuration as shown in FIGS. 4 and 5, defining upper and lower relatively inclined sections, and is normally restrained in the position illustrated in FIG. 4 by the ear formations 61a of the scrambler spring unit 60 urging the lower inclined section of the body portion 53 of the detenting spring against the rear wall of the case 30 and thereby disposing the detent fingers 53a in detenting engagement with the peripheries of the dial wheels 35.

The relationship of the detenting spring 53 and the scrambler spring unit 60 and the leaf springs 55 is such that when the leaf springs 55 push against the body portion 61 of spring units 60, the fence is pushed forward and the noses 54 on the fence are waiting for the gates 40a on the hubs 39 to come into alignment when the right combination is reached. The springs 55 then force the fence 51 past center (its hanging center, so to speak, as suspended by lugs 51a) and the locking shoulder 51b of the fence is disengaged from the shoulder 58a of the control bar, whereupon the control bar is able to be lifted. Lifting the control bar 56 lifts the scrambler spring unit 60 attached thereto and this frees the loose ends of springs 55 so that the fence 51 drops back, pendulum fashion, and disengages noses 54 from the gates 40a in the hubs 39. This frees the hubs 39 and wheels 35 for scrambling action, which occurs both on the upstroke and downstroke of the locking bar.

The detenting spring 53 also slides up and down a short distance, and has lower forwardly projecting ears or tabs 53b which serve to help return the detent fingers 53a into contact with the dial wheels 35 when the spring unit 60, attached to the control bar 56, drops down and pushes on the two ears 53b. Also the edge of the spring unit 60 bearing against the ears 53b helps to hold the lower section of the spring 53 flat against the back of the housing as viewed in FIG. 4.

The scrambler spring unit 60 also gives tension to the control bar 56, to return the bar to its locking position after the wheels 35 spin and place the fence 51 in its locking position and the bar 56 has dropped, as later described.

The lower end portion of the control bar 56, in the illustrated embodiment, is provided with a constricted cylindrical end portion 63 adapted to be fitted into a slot 64a in the hooked shape flange formation 64 of a rigid linkage member 65, whose other end 66 is designed to be inserted into a slot in the side flange 24b of the locker latch bar 24. A washer 63a

may be fitted on the portion 63 above the flange formation 64. The control bar is coupled for coordinated vertical movement with the linkage member 65 by an annular locking collar 63b adapted to be fitted on the cylindrical lower end portion 63 of the control bar 56 and secured thereto by a setscrew or similar fastening means.

To facilitate installation, a coupling fitting, one form of which is illustrated particularly in FIGS. 8 and 9, is provided, which is indicated generally by the reference character 68. The coupling fitting 68 has a recess extending therethrough, indicated at 68a, sized to receive the end 66 of the linkage member 65, and has an enlarged flange portion 69 surrounding the entrance end of the recess 68a to bear against the surface of the channel 24b confronting the combination lock unit. A notch 68b is provided in the upper surface of the fitting 68 immediately inwardly of the flange portion 69 to receive in interfitting relation an edge of the channel side 24b at the upper boundary of the recess for the fitting 68, and a key member 70 of right-angular configuration is provided having a vertical leg to depend behind a portion of the channel side flange 24b adjacent the lower boundary of the opening therein for the fitting 68, and having a horizontal leg which forms a tight fit between the lower edge of the end 66 of the linkage member 65 and the bottom edge of the entrance portion of the recess therefor in the fitting 68.

Another form of coupling fitting or adapter for the end 66 of the linkage member 65 is illustrated in FIG. 9a and comprises a pair of identical members 71a and 71b, each forming half of the fitting. Each of the members 71a and 71b include an enlarged flange portion 72, a notch 73 sized to receive an edge of one of the channel sidewalls 24b, and a rearwardly extending body portion 74 having a large right-angle recess 74' formed therein over most of its height whereby the recess 74' of the two fitting halves 71a, 71b when the two pieces are relatively inverted with respect to each other as shown in FIG. 9a mate to collectively define the recess for the linkage member end 66. The edge of the body portion opposite the edge having the notch 73 is of a curved configuration as indicated at 74a whereby each half of the fitting 71a, 71b can be independently interfitted in the opening in the channel sidewall 24b by fitting the notch portion 73 onto the upper or lower edge of the channel sidewall 24b bounding the opening and then shifting the flange half in a curved path to progress the body portion 74 inwardly of the channel until the enlarged flange portion 72 butts the channel sidewall 24b. The two fitting sections 71a, 71b mutually support each other for permanent retention in the channel bar 24.

In the operation of the combination lock construction thus far described, the tenant of the locker engages the outwardly exposed peripheral portions of the dial wheels 35 to manually adjust them angularly to the combination positions corresponding to the combination on which the lock is set. The rotation of the dial wheels 35 similarly rotates the spindle members 38 interconnected therewith to dispose the gates 40a in confronting relationship to the nose formations 54 on the fence 51 to receive the latter. When all of the gates 40a are aligned with the fence noses 54, the springs 55 cause the fence 51 to swing from the normal locking position shown in FIG. 4 to the release position shown in FIG. 5, withdrawing the locking shoulder 51b of the fence from the locking recess 58 of the control bar 56. The operator then raises the handle 28 of the latch bar 24, which is interlinked with the control bar 56 by the linkage member 65, such attempted upward movement of the latch bar 24 causing the control bar 56 to also be raised, as it is free to do when the locking shoulder 51a of the fence is thus withdrawn from the locking recess 58. Full raising of the latching bar 24 through the normal opening range thereof, which withdraws the latch tongues 27 from the keepers 25, raises the control bar 56 to the position illustrated in FIG. 5.

It will be noted that during this lifting or raising movement of the control bar 56, the body portion 61 of the scrambler spring unit 60 on which the fence-biasing springs 55 normally bear, is raised to a position whereby the biasing springs 55 no

longer bias the fence 51 to the release position, the fence being then gravitationally returned approximately to the locking position illustrated in FIG. 4. The upward movement of the control bar 56, and therefore of the ear formations 61a on the spring 60, also shifted the points of engagement of the latter with the spring 53 to the upper inclined section thereof, lifting the spring 53 and also rotating it somewhat clockwise to the position illustrated in FIG. 5 wherein the detent fingers 53a no longer engage and restrain the peripheries of the dial wheels 35. During a portion of the downstroke or return of the latch bar 24, and of the control bar 56 linked therewith to the lower or normal position, as well as during a portion of the upstroke of bar 56 after the detent fingers 53a have been released from restraining engagement with the dial wheels, the scrambler spring projections 62 engage the peripheries of the dial wheels 35 and rotate the dial wheels and the spindle members 38 intercoupled therewith to scrambled positions no longer corresponding to the combination of the lock. Thus the scrambling action occurs both on the upstroke and downstroke of the control bar 56, and shifts the gates 40a out of registry with the fence noses 54 so that the fence is held in the locking position illustrated in FIG. 4.

In order for the triangular nose portion 58b of the control bar 56 immediately below the locking recess 58 to pass by the fence shoulder 51a, the control bar 56 is permitted a limited amount of rearward movement, by the fore-and-aft elongation of the slot 57a in the lower curved wall portion 30d of the casing 30 and, if desired, by accommodation of some rearward movement of the upper end portion of the control bar 56 in the upper slot 57. Thus lock the downward stroke of the control bar 56, the nose portion 58b passes rearwardly of the fence shoulder 51a by rearward displacement of the control bar 56 against the forward biasing force of the spring 60, and when the control bar 56 reaches its lower limit position, the control bar is resiliently returned to its forwardmost position illustrated in FIG. 4 with the fence shoulder 51b projecting into the locking recess 58 and restraining the control bar 56 and the locker latch bar 24 interlinked therewith again in the locked position.

To permit a custodian with a master key to override the combination lock mechanism in the event the tenant of the locker has forgotten the combination or the combination has for some other reason become lost, the custodian merely inserts the appropriate key in the cylinder lock 45 and rotates the conventional cylinder therein through, for example, 90° in the illustrated embodiment, to shift the rearwardly projecting nose portion 45a into engagement with the control bar 56 and force the lower portion thereof engaged by the nose 45a rearwardly against the bias of the spring 60 through a sufficient distance to position the shoulder 58a of the locking recess 58 slightly rearwardly of the locking shoulder 51a of the fence 51, whereupon the control bar 56 is free to be moved upwardly by manual raising of the handle 28 and latch bar 24 to permit unlocking of the locker.

When the locker door is open, the custodian can then determine the lost combination of the lock due to the provision of the combination detection pins 80a, 80b, 80c, 80d provided in the lock. These combination detection pins have upper end portions extending through apertures provided therefor in the top wall 30a of the casing, and are resiliently biased to the raised positions illustrated in FIGS. 4 and 5 by springs 81 compressed between shoulder formations on the pins 80a-d and surfaces of the pin supporting block 82 which is fixed to the top casing wall 30a and is also suitably apertured to permit passage of the lower portions of the pins therethrough to a position adjacent but normally not contacting the peripheries of the collar formations 40 on the spindle members 38. These collar formations 40 also have additional small recesses 40b therein, spaced circumferentially from the gates 40a and preferably located so as to not engage the fence noses 54. In the illustrated embodiment, these recesses 40b are provided adjacent the opposite edges of the collar formations 40 from the gates 40a, and are located at an angle of about 90° from

the gates 40a. When the custodian desires to detect the lock combination, after opening the locker door as previously described, each of the pins 80a to 80d are manually depressed in succession to cause their lower edges to contact the peripheral surface of the associated collar formation 40, and the associated dial wheel 35 is manually rotated until the recess 40b registers with the combination detecting pin, at which point the operator can feel that the pin is allowed to move to a lower position and restrain the dial wheel against further rotation. By repeating this procedure for each of the dial assemblies 34, until each are latched by engagement of their associated combination detection pins 80a-80d in the gates 40b, the existing combination of the lock can be read.

The combination can, of course, be reset at any time the locker door is open, and the correct combination has been dialed, by raising the combination change actuator slide 49 until the cam portion 49b thereof engages the dome-shaped washer 48 and forces the set of spindle members 38 to the left, as viewed in FIG. 7, to released condition relative to dial members 35, whereupon the dial members can be adjusted to new combination positions and the spindle members 38 returned into interlocked relation therewith by return of the combination change actuator 49 to the lowered position. The lug 49c on the actuator 49 underlies the adjacent edge of the fence 51 at the normal locked position of the fence, thus restraining the actuator 49 from being raised. When the correct combination has been dialed, the gates 40a permit the fence 51 to rock forwardly out of the path of the lug 49c, freeing the actuator 49 to be raised to combination change position.

An outer housing 85 enclosing the top and rear of the lock assembly can be provided if desired. In the form illustrated in the drawings, the outer housing 85 may simply take the form of an open bottom casing having a backwall 85a and sidewalls 85b defining a forwardly facing channel, joined integrally by a top wall 85c extending forwardly from the backwall 85a to the door 21, and having apertures for the control bar 56 and the combination detecting pins 80a, 80b, 80c, and 80d. As shown more clearly in FIG. 6, the sidewall portions 85b of the outer housing 85 may have outwardly projecting mounting flanges 85b' suitably apertured to receive the fastening members 32a projecting from the front cover plate.

This same basic combination lock mechanism as provided in the casing 30 may also be employed as the combination lock for other doors, such as entrance doors to apartments and the like, by provision of certain additional linkages and modifications of the lower end portion of control bar 56, as illustrated in FIGS. 10-14C. Referring to these figures, and particularly to FIGS. 10 and 11, the combination lock unit previously described contained in the casing 30 is mounted in a suitable opening 90a in a door 90, such as an apartment entrance door, for example by a front escutcheon plate 91 which may be of generally rectangular configuration having larger vertical and horizontal dimensions than the opening 90a and being secured to the door 90 for example by inwardly projecting peripheral lips which interfit in grooves in the edge of a mounting plate 91b fixed to the door by screws 91a. Locator lugs 91b may be sheared from an inner layer portion of the escutcheon plate 91 and the plate 91b omitted, or may be lug formations formed on the plate 91b, to provide inwardly directed lug portions to engage the edges of the door opening 90a and properly locate the escutcheon plate relative thereto. The escutcheon plate 91 will preferably have openings or slots 91c therein similar to the corresponding slots in the front cover plate 32 through which cylindrical segment portions of the dial wheels 35 may project to visible and manually operable positions, and may have rearwardly projecting lugs bent about the front flanges of the lock casing 30, or as shown in the illustrative example the mounting plate 91b may have a rabbet bounding the opening for the front of the casing 30 to receive the top and bottom flanges at the front edges of the top wall 30a and bottom wall 30c, 30d to securely mount the combination lock unit casing 30 to the front escutcheon plate.

A similar rear escutcheon plate or plate assembly 92 fastened in a similar manner to the door and having similar locator lugs 92b is also provided to cover the rear of the door opening 90a.

To gain access from the inside of the apartment or the inner side of the door to the combination change actuator 49 and the combination detecting pins 80a-80d, link member 93e is coupled to the combination change actuator 49 and is pivoted to lever 94e, and levers 94a to 94d are respectively pivoted at their inner ends to the tops of detecting pins 80a-80d, and the levers 94a to 94e are pivoted near their center by pivot mounts 95 with the outer end portions of the levers extending through slots 92a in the rear escutcheon plate 92.

Supported externally on the rear of the rear escutcheon plate 92 is a slide bolt housing 96 having a bolt 97 therein reciprocative on a horizontal axis between a retracted position, and a projected position extending into a keeper, indicated at 97A. The bolt is operated between retracted and projected positions from externally of the door by an outside door latch knob 98 coupled to a shaft 99 having a cam 101 on the inner end thereof located in a cam recess 97' of bolt 97 and having a second cam 102 disposed beneath the control bar 56. The lower end of the control bar in this embodiment is provided with a cam follower formation 103 on the lower end thereof and is resiliently biased by spring 104 downwardly into following contact with the cam 102. As will be apparent from FIG. 11, the relationship of the cam 102 and door latch knob 98 is such that when the combination lock mechanism in the casing 30 is in the locked condition, wherein the fence prevents raising of the control bar 56 from its lower limit position, the door latch knob 98 is prevented from being rotated between locked and open positions. However, when the combination is dialed on the dial wheels 35, and the fence 51 shifts forwardly to the release position, the outside door latch knob 98 can then be rotated to the open position, during which the cam 102 engaging the follower 103 lifts the control bar 56 in the same manner as during opening operation of the latch bar of the locker in the first described embodiment, and the control bar 56 is returned to the lower limit position by the spring 104.

In the embodiment herein illustrated, an overload clutch coupling, indicated generally by the reference character 105 is provided to couple the shaft portion 106 immediately connected to the door latch knob 98 and extending through the bushing 107 therefor in the front escutcheon plate 91 and the shaft 99 carrying the cam 102. The adjacent end portions of the shaft portion 106 and the shaft 99 are provided with a pair of concave slots 99a and 106a and the coupling 105 comprises an axially split generally cylindrical spring steel sleeve 108 having a slit 108a therein and having a pair of inwardly deformed convex beads 109 extending along axes paralleling the axis of the sleeve 108, to resiliently interfit into the slots 99a and 106a and retain the two shafts in releasably intercoupled relation. It will be apparent that if the load is too severe when one attempts to manually turn the outside door latch knob 98, the portions of the spring steel sleeve 108 surrounding the shaft portion 106 will spring outwardly withdrawing the beads 109 from the slots 106a.

In the illustrated construction, the sleeve 108 also has a slot 108b extending in an arcuate path transversely of the axis of the sleeve, and located in alignment with the space between the two adjacent ends of the shafts 99 and 106, to receive the tab or arm 110a of shaft return member 110 having a circular enlargement at one end corresponding to the cross section of the shafts and interfitted therebetween. The upper end of the tab or arm 110a is connected by a coil spring 111 with a stationary member, such as the lower portion of the casing 30, to resiliently return the outside door latch knob 98 to the normal closed position.

An inside latch knob 115 having a shaft 116 and controlling a cam 117 is also provided to control the bolt 97. The shaft 116 is journaled in a suitable bore in the bolt housing 96, and the cam 117 works in a recess 118 in the bolt 97 to operate the

bolt in the manner indicated diagrammatically in FIGS. 14A, 14B, and 14C. In the position of FIG. 14A, wherein the inside latch knob 115 is turned to the left toward the door edge, as viewed in the Figures, the cam 117 is so disposed in the recess 118 as to jam the bolt 96 in open position, operating in a manner similar to that of a dead latch lock in open position, and thus preventing throwing of the bolt to locking position by mischievous use of the outside knob 98. In the downwardly depending position of the knob 115 as illustrated in FIG. 14B, the cam 117 is in a neutral position relative to the recess 118 and the bolt 97, whereby the outside knob 98 can be turned clockwise from the downwardly extending normal position to throw the bolt 97 to the locking position as the occupant leaves. In the position of FIG. 14C, the cam 117 engages the surfaces of the bolt recess 118 in such a manner as to jam the bolt in locked position so that, in cooperation with the overload clutch previously described, the bolt cannot be unlocked from the outside by any means. The outside knob 107 may be conveniently assembled with its hub in the hole therefor in the escutcheon plate 91 by a slotted spring clip member 116a interfitted into grooves in the hub of knob 107, illustrated in FIG. 15. The inside latch knob 115 is resiliently held in either of the three positions indicated in FIGS. 14A, 14B, and 14C by suitable means, such as a flat spring clip of the washer type, indicated at 116b in FIG. 15, suitably retained as by being snapped in slots on the hub 116c on the shaft 116. The flat spring clip 116b has noses or bosses 116d projecting toward and bearing against the inside surface of the wall of the slide bolt housing 96, and the latter has detent sockets, for example at four 90° positions, to receive the bosses 116d and resiliently restrain the knob 115 at any of the three positions.

What is claimed is:

1. A combination lock mechanism for a movable closure member securing an interior space and having a manually operable latching mechanism for latching the closure member in closed condition, comprising a lock casing, a horizontal shaft disposed in said casing, a set of plural rotatable combination dial wheel assemblies disposed in axially spaced coaxial relation along said shaft, said wheel assemblies each comprising an outer annular dial wheel and an inner hub extending therethrough selectively intercoupled at plural relative angular positions with respect to the associated dial wheel, each of the dial wheels having a cylindrical segment portion projecting forwardly of the front surface of the closure member to manually operable positions, a movable fence adjacent said dial assemblies having locking and unlocking positions, means on said hubs coactive with said fence for restraining the latter at said locking position and releasing the fence to unlocking position when the dial wheel assemblies occupy a selected combination of angular positions, and a vertically elongated control bar for restraining the latching mechanism in latched condition and for releasing the same for unlatching movement, said control bar being supported for vertical movement adjacent and relative to said fence, the control bar and the fence having confronting surface formations disposed when the fence is in said locking position to restrain the control bar against upward movement from a lower position maintaining the latching mechanism in latching condition, and said fence being shifted to said unlocking position upon preselected alignment of said hubs in a set of angular positions corresponding to the combination of the lock mechanism to locate said surface formations at positions releasing the control bar for upward movement to a raised position freeing said latching mechanism to be opened.

2. A combination lock mechanism as defined in claim 1, including scrambling means operable upon raising of said control bar to said raised position to rotate said hubs to positions returning the fence to said locking position, and said control bar being supported for a selected range of rearward tilting movement about a horizontal axis to permit downward movement of the surface formation on the control bar rearwardly past the confronting surface formation on the fence.

3. A combination lock mechanism as defined in claim 1, wherein each of said dial wheels has a central bore and an indicia bearing periphery and each of said hubs is slidably and rotatably journaled on said shaft and extends entirely through the bore of the associated wheel, said hubs being disposed in endwise abutting stacked relation on said shaft and each having a circumferential portion coacting with the fence to restrain the latter in locking position and gating means at a selected angular position for admitting unlocking movement of the fence.

4. A combination lock mechanism as defined in claim 2, wherein each of said dial wheels has a central bore and an indicia-bearing periphery and each of said hubs is slidably and rotatably journaled on said shaft and extends entirely through the bore of the associated wheel, said hubs being disposed in endwise abutting stacked relation on said shaft and each having a circumferential portion coacting with the fence to restrain the latter in locking position and gating means at a selected angular position for admitting unlocking movement of the fence.

5. A combination lock mechanism as defined in claim 3, including means intercoupling said hubs with their respective dial wheels in any of a plurality of relative angular positions at a first relative axial position of the latter and releasing the hubs for relative angular movement at a second relative axial position, resilient means continuously biasing the stack of hubs to said first relative axial position, and a combination change lever supported for radial movement relative to said shaft bearing against an end of the stack of hubs normally disposing the hubs at said first axial position and shiftable to a release position to position the hubs at said second position and decouple the hubs from the dial wheels for permitting adjustment of the dial wheels to a different combination of angular positions.

6. A combination lock mechanism as defined in claim 4, including means intercoupling said hubs with their respective dial wheels in any of a plurality of relative angular positions at a first relative axial position of the latter and releasing the hubs for relative angular movement at a second relative axial position, resilient means continuously biasing the stack of hubs to said first relative axial position, and a combination change lever supported for radial movement relative to said shaft bearing against an end of the stack of hubs normally disposing the hubs at said first axial position and shiftable to a release position to position the hubs at said second position and decouple the hubs from the dial wheels for permitting adjustment of the dial wheels to a different combination of angular positions.

7. A combination lock mechanism as defined in claim 1, wherein said hubs include fence-controlling portions in intervening spaces between said dial wheels and defining a circumferential cylindrical surface interrupted by a gating formation, said fence being supported adjacent the dial wheels spanning the whole group of dial wheel assemblies for angular movement about a pivot axis paralleling the axis of said shaft, said fence having plural nose formations extending into said intervening spaces into engagement with said fence-controlling portions of said hubs to be positioned at a locking position by said cylindrical surfaces and at an unlocking position when abutting said gating formations.

8. A combination lock mechanism as defined in claim 2, wherein said hubs include fence-controlling portions in intervening spaces between said dial wheels and defining a circumferential cylindrical surface interrupted by a gating formation, said fence being supported adjacent the dial wheels spanning the whole group of dial wheel assemblies for angular movement about a pivot axis paralleling the axis of said shaft, said fence having plural nose formations extending into said intervening spaces into engagement with said fence-controlling portions of said hubs to be positioned at a locking position by said cylindrical surfaces and at an unlocking position when abutting said gating formations.

9. A combination lock mechanism as defined in claim 3, wherein said hubs include fence-controlling portions in intervening spaces between said dial wheels and defining a circumferential cylindrical surface interrupted by a gating formation, said fence being supported adjacent the dial wheels spanning the whole group of dial wheel assemblies for angular movement about a pivot axis paralleling the axis of said shaft, said fence having plural nose formations extending into said intervening spaces into engagement with said fence-controlling portions of said hubs to be positioned at a locking position by said cylindrical surfaces and at an unlocking position when abutting said gating formations.

10. A combination lock mechanism as defined in claim 4, wherein said hubs include fence-controlling portions in intervening spaces between said dial wheels and defining a circumferential cylindrical surface interrupted by a gating formation, said fence being supported adjacent the dial wheels spanning the whole group of dial wheel assemblies for angular movement about a pivot axis paralleling the axis of said shaft, said fence having plural nose formations extending into said intervening spaces into engagement with said fence-controlling portions of said hubs to be positioned at a locking position by said cylindrical surfaces and at an unlocking position when abutting said gating formations.

11. A combination lock mechanism as defined in claim 5, wherein said hubs include fence-controlling portions in intervening spaces between said dial wheels and defining a circumferential cylindrical surface interrupted by a gating formation, said fence being supported adjacent the dial wheels spanning the whole group of dial wheel assemblies for angular movement about a pivot axis paralleling the axis of said shaft, said fence having plural nose formations extending into said intervening spaces into engagement with said fence-controlling portions of said hubs to be positioned at a locking position by said cylindrical surfaces and at an unlocking position when abutting said gating formations.

12. A combination lock mechanism as defined in claim 1, wherein said hubs include fence-controlling portions having a gating formation for permitting movement of the fence to the unlocking position and having a recess located in selected angular relation to said gating formation, and the lock mechanism including a plurality of combination detector pins operable from the side of said closure member facing said interior space, said pins being each respectively associated with one of said fence-controlling portions and being supported for movement along axes extending radially of said shaft from a normal raised position locating the inner ends of the pins in spaced relation to said fence-controlling portions, the inner ends of said pins being received in the recesses of the associated fence-controlling portions when the pin is manually lowered and the dial wheel assembly is manually rotated to restrain the associated hub and dial wheel at a combination-indicating position.

13. A combination lock mechanism as defined in claim 2, wherein said hubs include fence-controlling portions having a gating formation for permitting movement of the fence to the unlocking position and having a recess located in selected angular relation to said gating formation, and the lock mechanism including a plurality of combination detector pins operable from the side of said closure member facing said interior space, said pins being each respectively associated with one of said fence-controlling portions and being supported for movement along axes extending radially of said shaft from a normal raised position locating the inner ends of the pins in spaced relation to said fence-controlling portions, the inner ends of said pins being received in the recesses of the associated fence-controlling portions when the pin is manually lowered and the dial wheel assembly is manually rotated to restrain the associated hub and dial wheel at a combination-indicating position.

14. A combination lock mechanism as defined in claim 3, wherein the circumferential portions of said hubs each have a recess located in selected angular relation to said gating

means, and the lock mechanism including a plurality of combination detector pins operable from the side of said closure member facing said space each respectively associated with one of said hubs, said pins being supported for movement along axes extending radially of said shaft and having an inner end normally spaced from the associated circumferential portion of the hub to be received in the recess thereof when the pin is manually lowered and restrain the latter at a combination-indicating position upon manual rotation of the dial wheel assembly.

15. A combination lock mechanism as defined in claim 4, wherein the circumferential portions of said hubs each have a recess located in selected angular relation to said gating means, and the lock mechanism including a plurality of combination detector pins operable from the side of said closure member facing said space each respectively associated with one of said hubs, said pins being supported for movement along axes extending radially of said shaft and having an inner end normally spaced from the associated circumferential portion of the hub to be received in the recess thereof when the pin is manually lowered and restrain the latter at a combination-indicating position upon manual rotation of the dial wheel assembly.

16. A combination lock mechanism as defined in claim 5, wherein the circumferential portions of said hubs each have a recess located in selected angular relation to said gating means, and the lock mechanism including a plurality of combination detector pins operable from the side of said closure member facing said space each respectively associated with one of said hubs, said pins being supported for movement along axes extending radially of said shaft and having an inner end normally spaced from the associated circumferential portion of the hub to be received in the recess thereof when the pin is manually lowered and restrain the latter at a combination-indicating position upon manual rotation of the dial wheel assembly.

17. A combination lock mechanism as defined in claim 9, wherein the circumferential portions of said hubs each have a recess located in selected angular relation to said gating means, and the lock mechanism including a plurality of combination detector pins operable from the side of said closure member facing said space each respectively associated with one of said hubs, said pins being supported for movement along axes extending radially of said shaft and having an inner end normally spaced from the associated circumferential portion of the hub to be received in the recess thereof when the pin is manually lowered and restrain the latter at a combination-indicating position upon manual rotation of the dial wheel assembly.

18. A combination lock mechanism as defined in claim 1, including a cylinder-type key lock located in said housing below said plurality of dial wheel assemblies, said key lock including a rotatable cylinder movable arcuately about an axis intercepting the path of movement of said control bar and having a projection located to engage said control bar and move the same rearwardly to a position freeing the control bar for upward movement to said raised position while said fence remained at its locking position.

19. A combination lock mechanism as defined in claim 2, including a cylinder-type key lock located in said housing below said plurality of dial wheel assemblies, said key lock including a rotatable cylinder movable arcuately about an axis intercepting the path of movement of said control bar and having a projection located to engage said control bar and move the same rearwardly to a position freeing the control bar for upward movement to said raised position while said fence remained at its locking position.

20. A combination lock mechanism as defined in claim 3, including a cylinder-type key lock located in said housing below said plurality of dial wheel assemblies, said key lock including a rotatable cylinder movable arcuately about an axis intercepting the path of movement of said control bar and having a projection located to engage said control bar and move

the same rearwardly to a position freeing the control bar for upward movement to said raised position while said fence remained at its locking position.

21. A combination lock mechanism as defined in claim 5, including a cylinder-type key lock located in said housing below said plurality of dial wheel assemblies, said key lock including a rotatable cylinder movable arcuately about an axis intercepting the path of movement of said control bar and having a projection located to engage said control bar and move the same rearwardly to a position freeing the control bar for upward movement to said raised position while said fence remained at its locking position.

22. A combination lock mechanism as defined in claim 1, wherein said closure member is a hinged locker door having a vertically reciprocative latch bar mounted adjacent the free edge thereof coactive with stationary keeper means for latching the locker door in closed position, and linkage means interconnecting said latch bar with said control bar to restrain said latch bar in latching position when said control bar occupies said lower position and to permit movement of said latch bar to unlatching position when said control bar is released for upward movement to said raised position.

23. A combination lock mechanism as defined in claim 2, wherein said closure member is a hinged locker door having a vertically reciprocative latch bar mounted adjacent the free edge thereof coactive with stationary keeper means for latching the locker door in closed position, and linkage means interconnecting said latch bar with said control bar to restrain said latch bar in latching position when said control bar occupies said lower position and to permit movement of said latch bar to unlatching position when said control bar is released for upward movement to said raised position.

24. A combination lock mechanism as defined in claim 3, wherein said closure member is a hinged locker door having a vertically reciprocative latch bar mounted adjacent the free edge thereof coactive with stationary keeper means for latching the locker door in closed position, and linkage means interconnecting said latch bar with said control bar to restrain said latch bar in latching position when said control bar occupies said lower position and to permit movement of said latch bar to unlatching position when said control bar is released for upward movement to said raised position.

25. A combination lock mechanism as defined in claim 12, wherein said closure member is a hinged locker door having a vertically reciprocative latch bar mounted adjacent the free edge thereof coactive with stationary keeper means for latching the locker door in closed position, and linkage means interconnecting said latch bar with said control bar to restrain said latch bar in latching position when said control bar occupies said lower position and to permit movement of said latch bar to unlatching position when said control bar is released for upward movement to said raised position.

26. A combination lock mechanism as defined in claim 18, wherein said closure member is a hinged locker door having a vertically reciprocative latch bar mounted adjacent the free edge thereof coactive with stationary keeper means for latching the locker door in closed position, and linkage means interconnecting said latch bar with said control bar to restrain said latch bar in latching position when said control bar occupies said lower position and to permit movement of said latch bar to unlatching position when said control bar is released for upward movement to said raised position.

27. A combination lock as defined in claim 1, including a cam follower carried on said control bar below said casing, a horizontally reciprocative bolt supported on said closure member rearwardly of said cam follower for movement between retracted and projected positions and having a cam recess therein, a cam shaft journaled in said closure member for rotary movement about its axis having a control knob fixed thereon externally of the closure member for manual rotation between opening and closing angular positions, the camshaft having first cam means thereon working in said cam recess for shifting said bolt to retracted and projected positions respec-

tively when said shaft is rotated to said opening and closing positions, and means on said camshaft coactive with said cam follower for restraining the camshaft against opening movement when said control bar is restrained in lower position.

28. A combination lock as defined in claim 2, including a cam follower carried on said control bar below said casing, a horizontally reciprocative bolt supported on said closure member rearwardly of said cam follower for movement between retracted and projected positions and having a cam recess therein, a camshaft journaled in said closure member for rotary movement about its axis having a control knob fixed thereon externally of the closure member for manual rotation between opening and closing angular positions, the camshaft having first cam means thereon working in said cam recess for shifting said bolt to retracted and projected positions respectively when said shaft is rotated to said opening and closing positions, and means on said camshaft coactive with said cam follower for restraining the camshaft against opening movement when said control bar is restrained in lower position.

29. A combination lock as defined in claim 5, including a cam follower carried on said control bar below said casing, a horizontally reciprocative bolt supported on said closure member rearwardly of said cam follower for movement between retracted and projected positions and having a cam recess therein, a camshaft journaled in said closure member for rotary movement about its axis having a control knob fixed thereon externally of the closure member for manual rotation between opening and closing angular positions, the camshaft having first cam means thereon working in said cam recess for shifting said bolt to retracted and projected positions respectively when said shaft is rotated to said opening and closing positions, and means on said camshaft coactive with said cam follower for restraining the camshaft against opening movement when said control bar is restrained in lower position.

30. A combination lock as defined in claim 12, including a cam follower carried on said control bar below said casing, a horizontally reciprocative bolt supported on said closure member rearwardly of said cam follower for movement between retracted and projected positions and having a cam recess therein, a camshaft journaled in said closure member

for rotary movement about its axis having a control knob fixed thereon externally of the closure member for manual rotation between opening and closing angular positions, the camshaft having first cam means thereon working in said cam recess for shifting said bolt to retracted and projected positions respectively when said shaft is rotated to said opening and closing positions, and means on said camshaft coactive with said cam follower for restraining the camshaft against opening movement when said control bar is restrained in lower position.

31. A combination lock as defined in claim 1, including a cam follower carried on said control bar below said casing, a horizontally reciprocative bolt supported on said closure member rearwardly of said cam follower for movement between retracted and projected positions and having a cam recess therein, a camshaft journaled in said closure member for rotary movement about its axis having a control knob fixed thereon externally of the closure member for manual rotation between opening and closing angular positions, the camshaft having first cam means thereon working in said cam recess for shifting said bolt to retracted and projected positions respectively when said shaft is rotated to said opening and closing positions and second cam means coactive with said cam follower to prevent rotation of said camshaft to opening position when the control bar is restrained in said lower position.

32. A combination lock as defined in claim 12, including a cam follower carried on said control bar below said casing, a horizontally reciprocative bolt supported on said closure member rearwardly of said cam follower for movement between retracted and projected positions and having a cam recess therein, a camshaft journaled in said closure member for rotary movement about its axis having a control knob fixed thereon externally of the closure member for manual rotation between opening and closing angular positions, the camshaft having first cam means thereon working in said cam recess for shifting said bolt to retracted and projected positions respectively when said shaft is rotated to said opening and closing positions and second cam means coactive with said cam follower to prevent rotation of said camshaft to opening position when the control bar is restrained in said lower position.

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