March 19, 1968 J. J. PARROCK 3,373,583

COMBINATION LOCK WITH NORMALLY MASKED DRIVER GATE

Filed Dec. 28, 1965 7 Sheets-Sheet 1

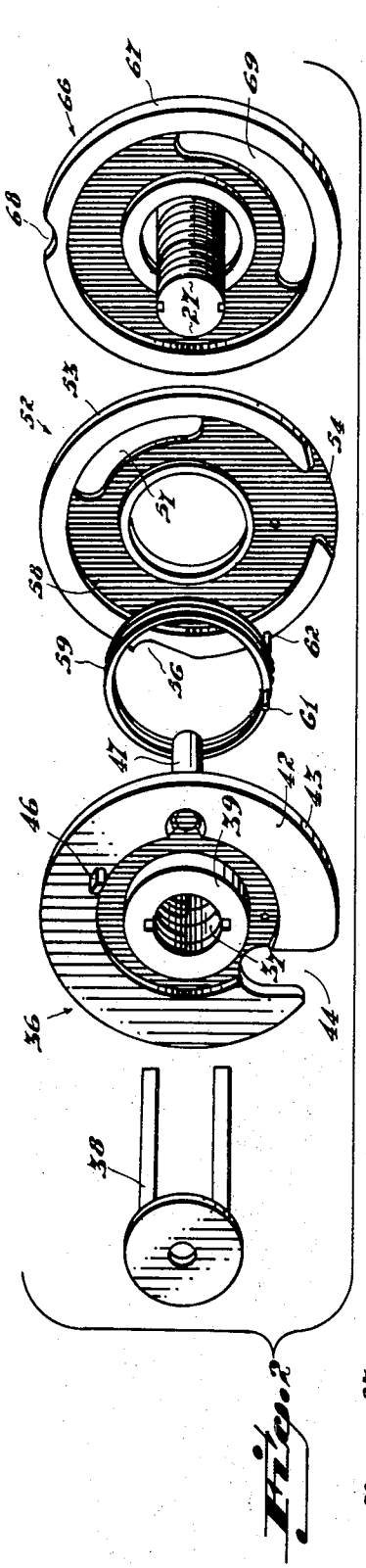


Fig. 2

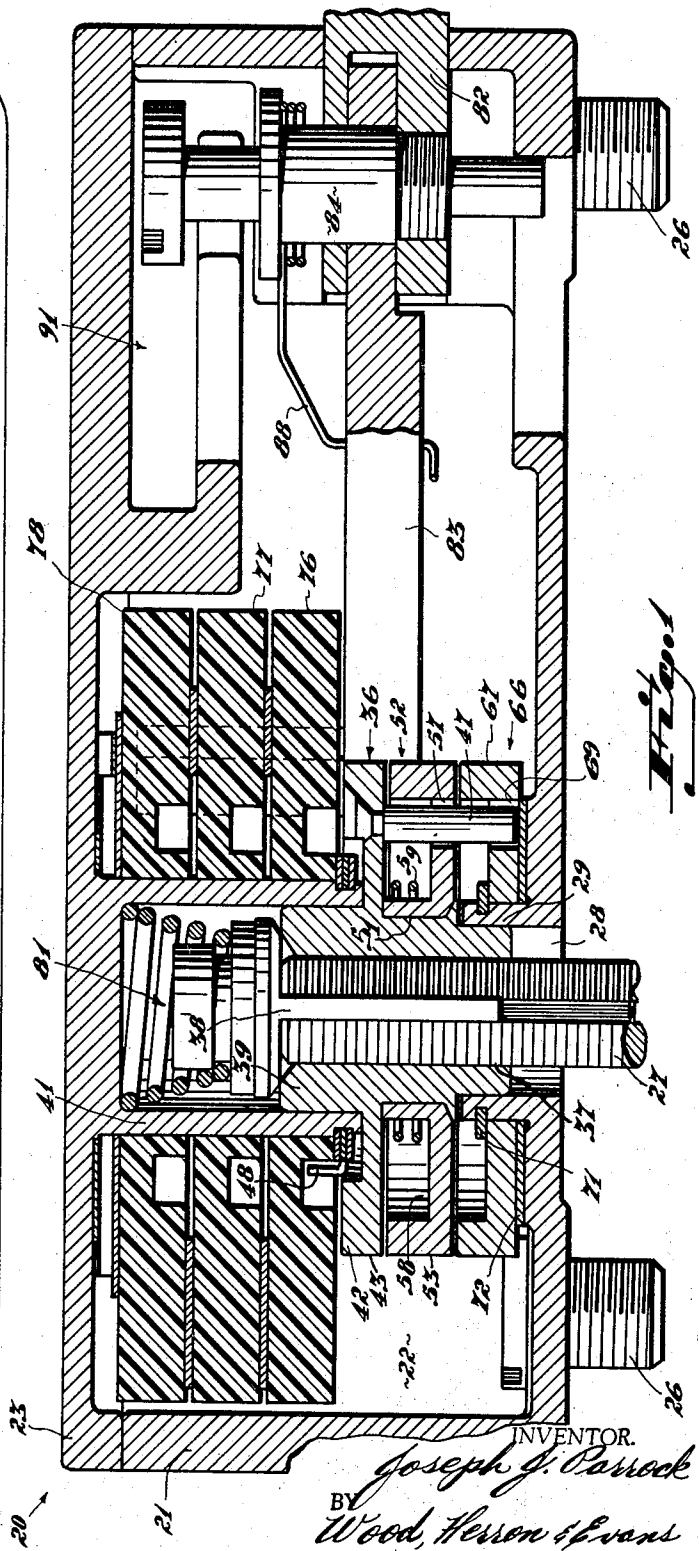


Fig. 1

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March 19, 1968 J. J. PARROCK 3,373,583

COMBINATION LOCK WITH NORMALLY MASKED DRIVER GATE

Filed Dec. 28, 1965 7 Sheets-Sheet 2

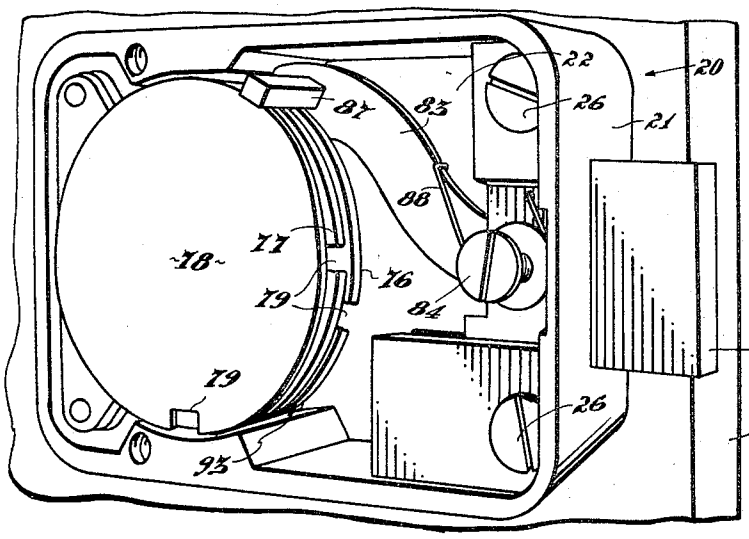


Fig. 3

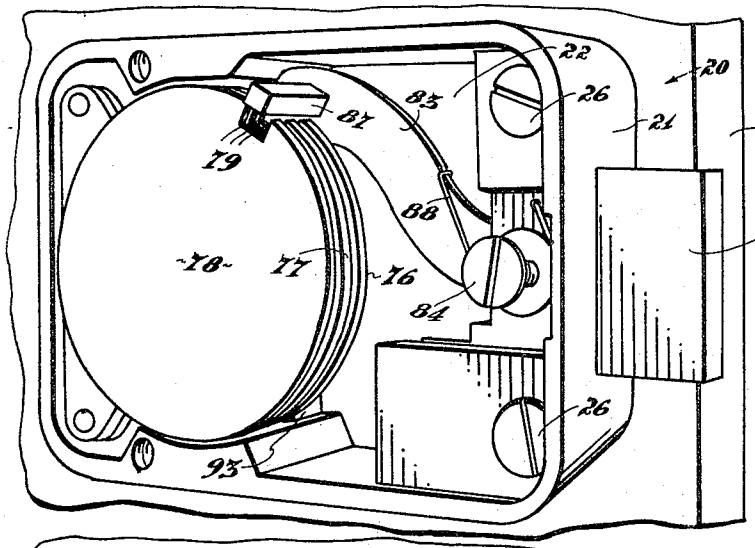


Fig. 4

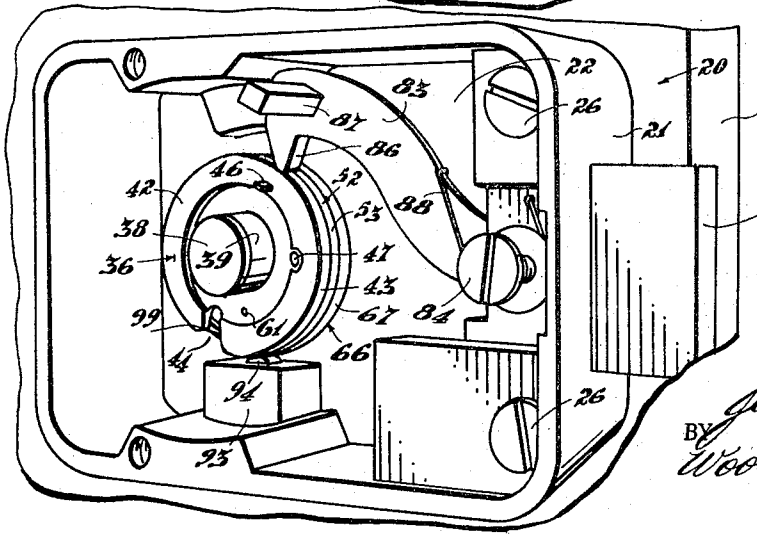


Fig. 5

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COMBINATION LOCK WITH NORMALLY MASKED DRIVER GATE

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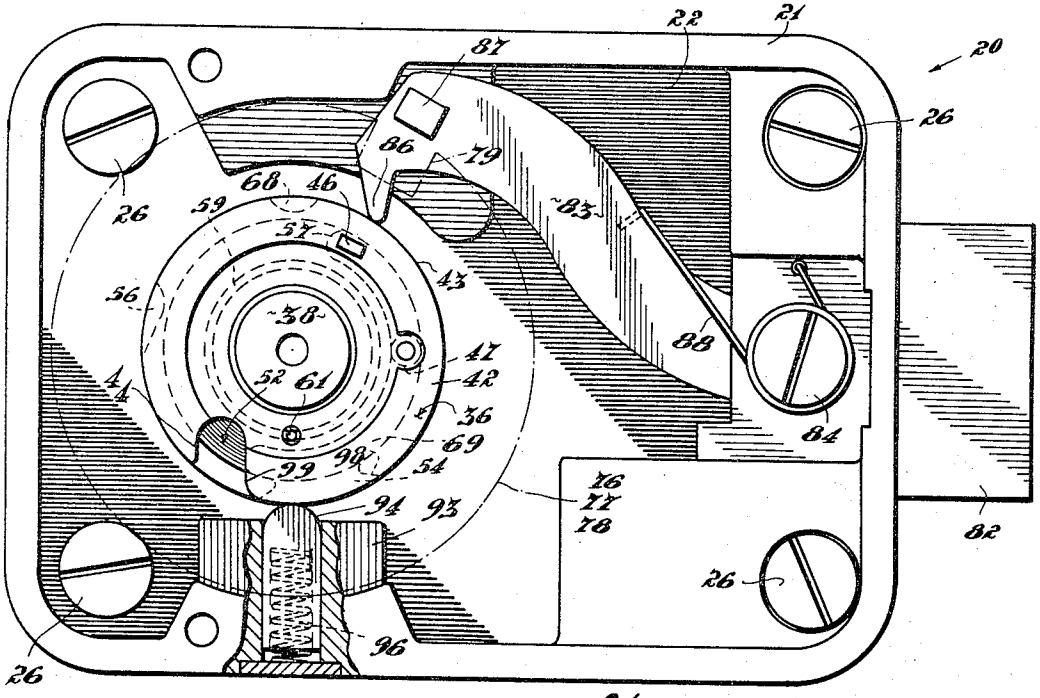


Fig. 6

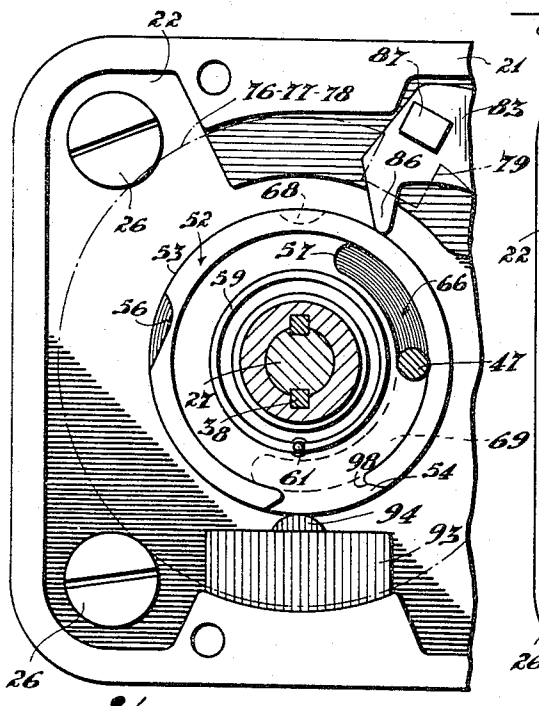


Fig. 7

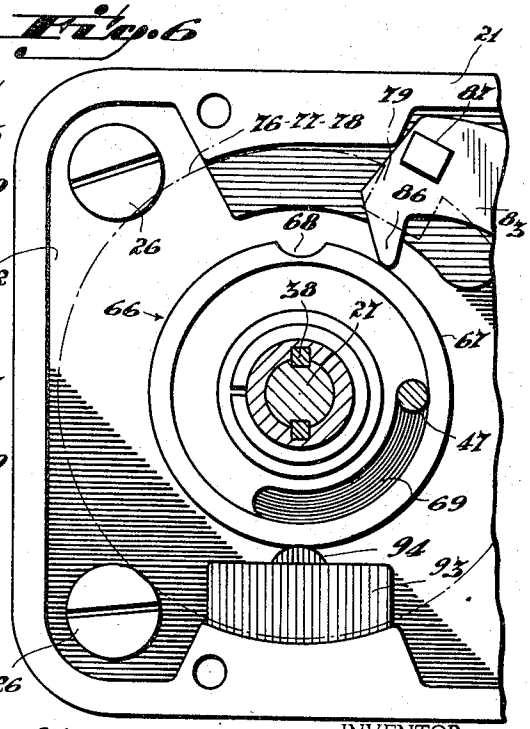


Fig. 8

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COMBINATION LOCK WITH NORMALLY MASKED DRIVER GATE

Filed Dec. 28, 1965 7 Sheets-Sheet 4

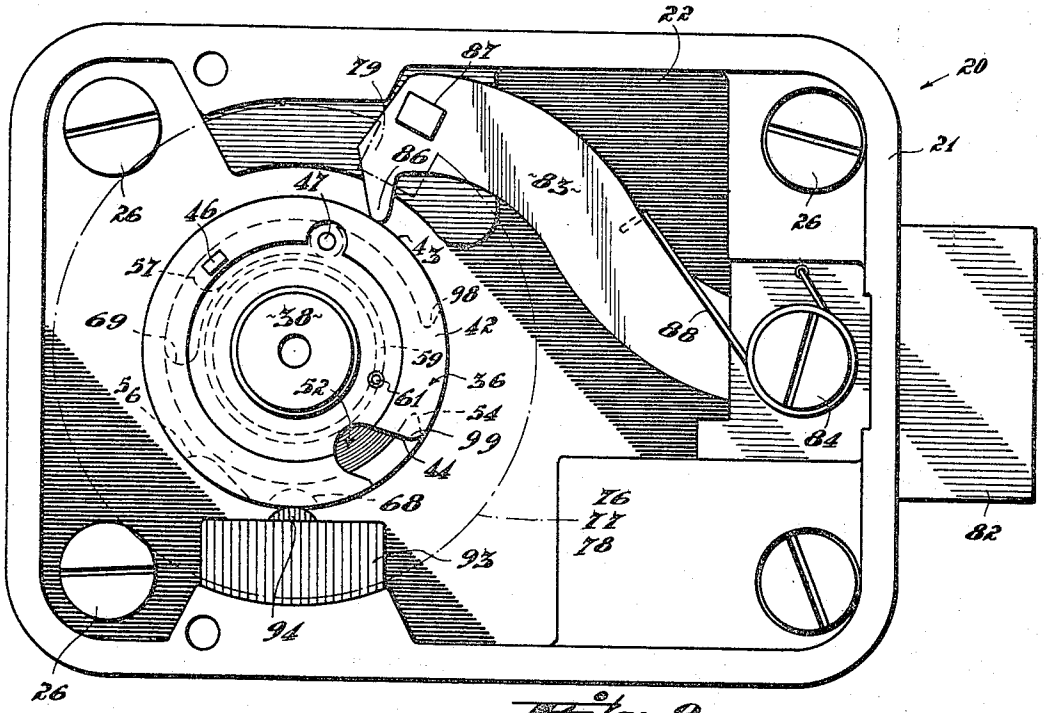


Fig. 9

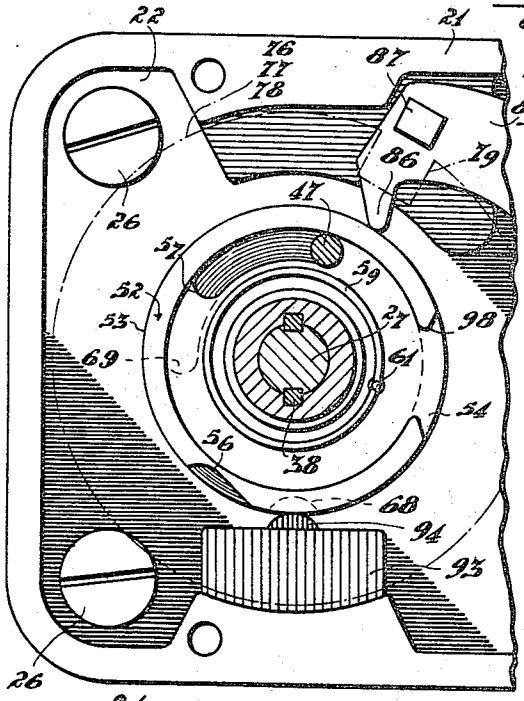


Fig. 10

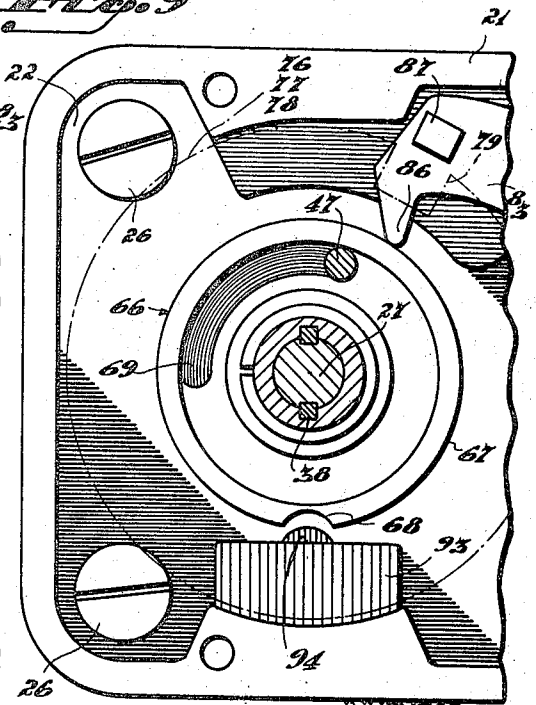


Fig. 11

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COMBINATION LOCK WITH NORMALLY MASKED DRIVER GATE

Filed Dec. 28, 1965 7 Sheets-Sheet 5

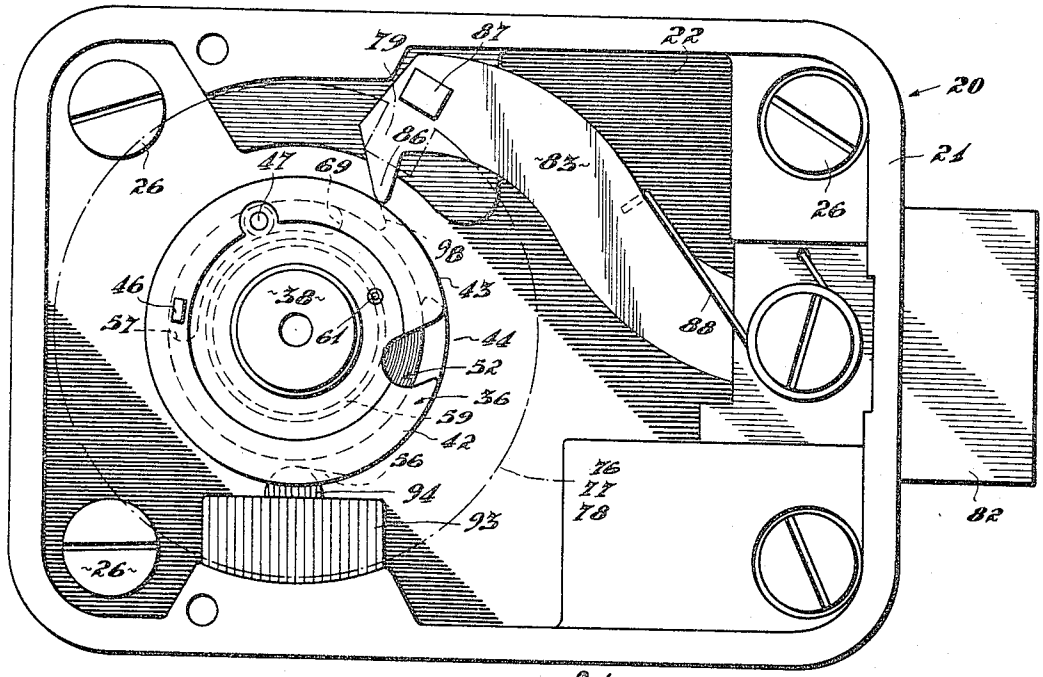


Fig. 1R

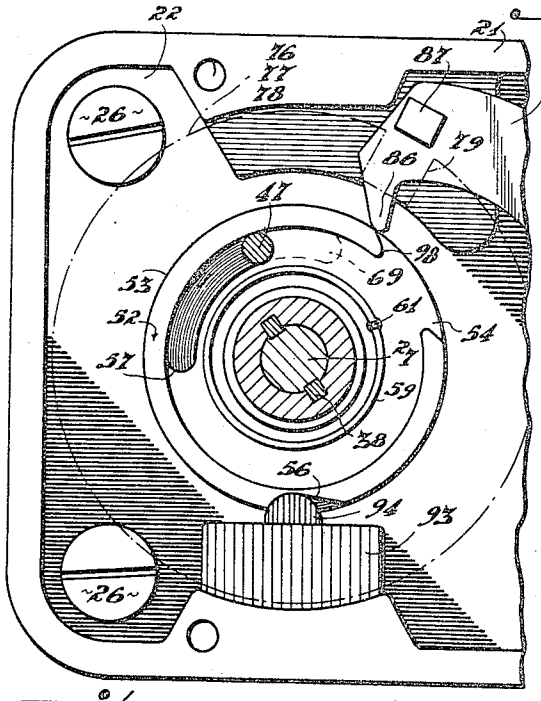


Fig. 1S

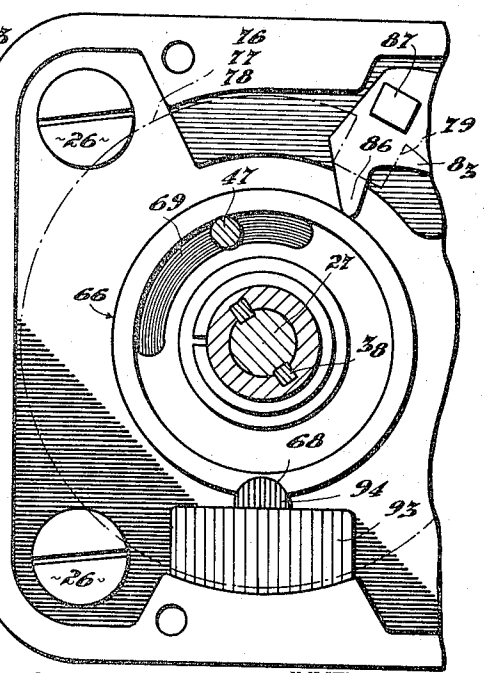


Fig. 1T

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March 19, 1968 J. J. PARROCK 3,373,583

COMBINATION LOCK WITH NORMALLY MASKED DRIVER GATE

Filed Dec. 28, 1965 7 Sheets-Sheet 6

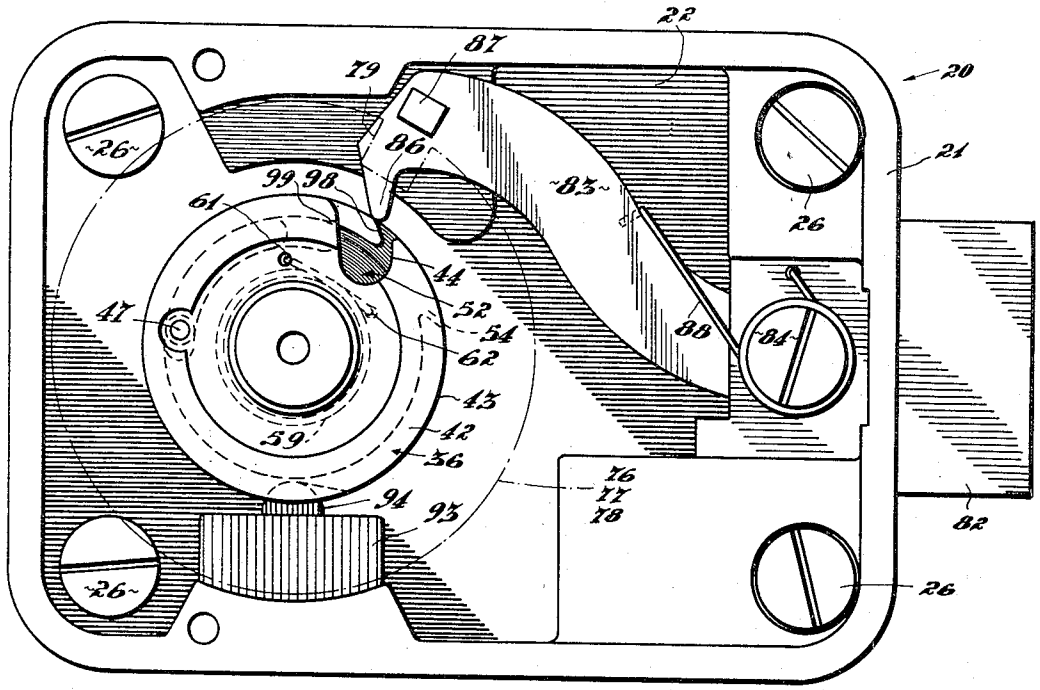


Fig. 15

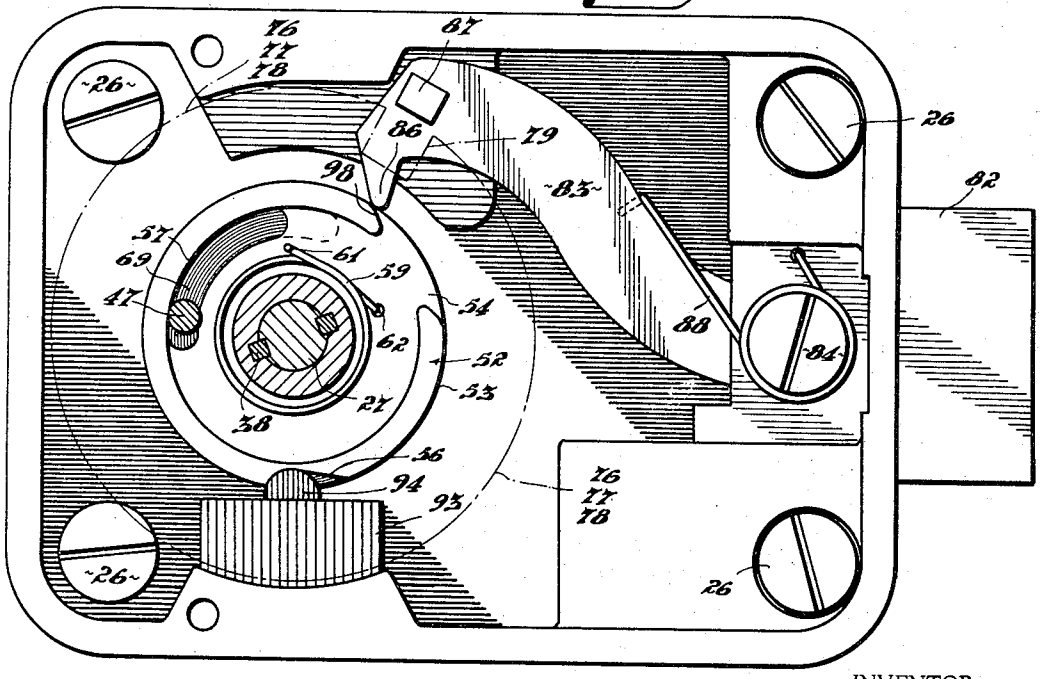


Fig. 16

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COMBINATION LOCK WITH NORMALLY MASKED DRIVER GATE

Filed Dec. 28, 1965 7 Sheets-Sheet 7

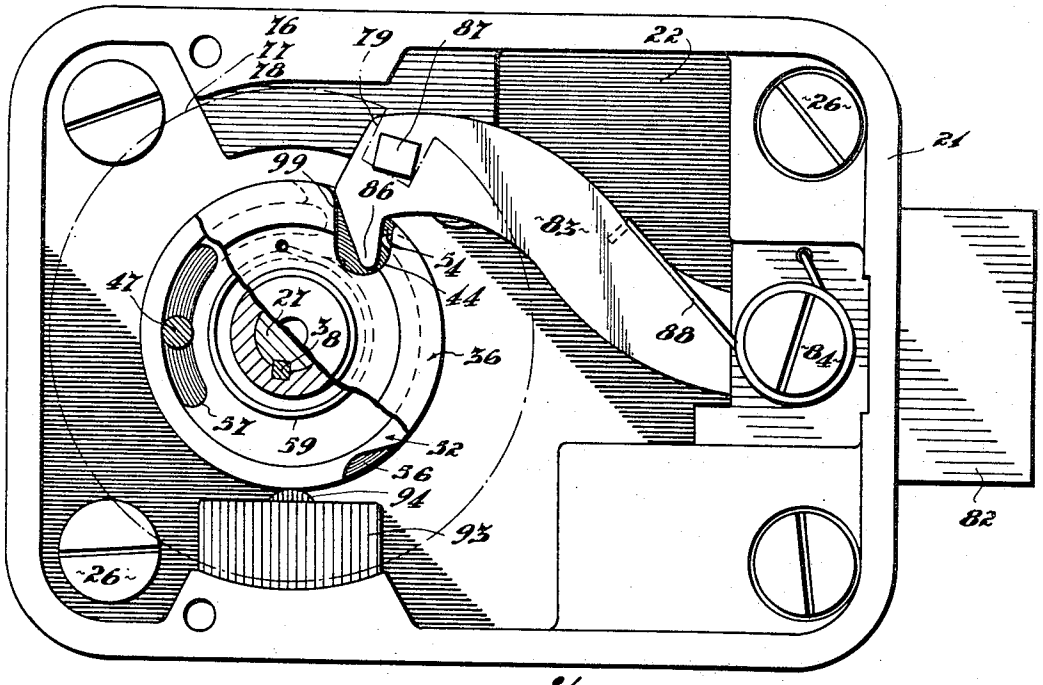


Fig. 17

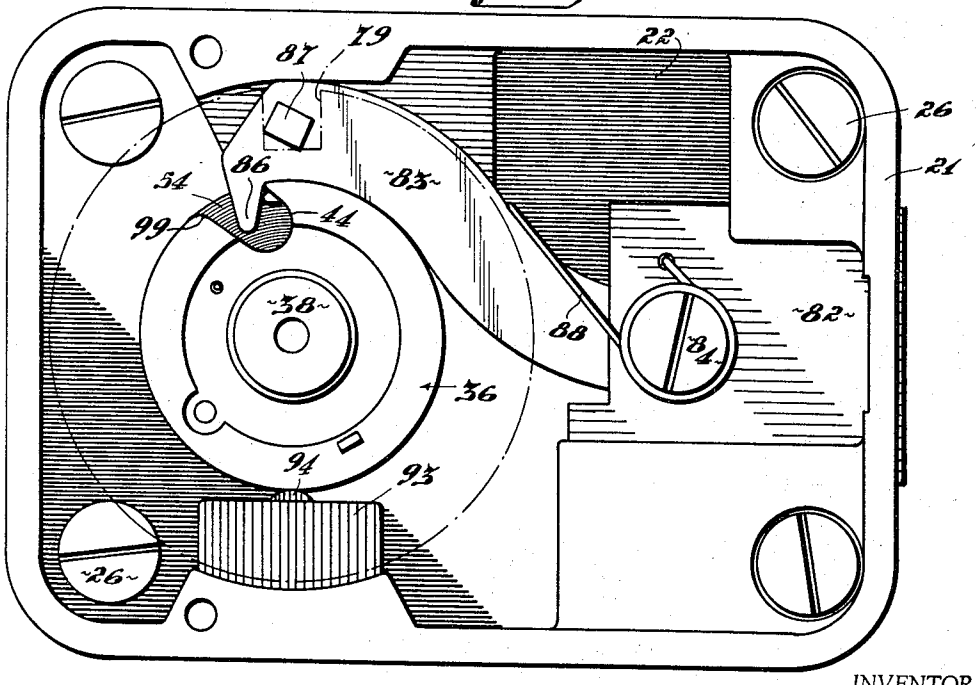


Fig. 18

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United States Patent Office 3,373,583
Patented Mar. 19, 1968

3,373,583

COMBINATION LOCK WITH NORMALLY MASKED DRIVER GATE

Joseph J. Parrock, Milford, Ohio, assignor to The Mosler Lock Company, Milford, Ohio, a corporation of Ohio

Filed Dec. 28, 1965, Ser. No. 517,017
18 Claims. (Cl. 70—303)

ABSTRACT OF THE DISCLOSURE

A combination lock having a shutter which normally blocks the driver gate at all driver positions, so as to prevent contact of the fence with the tumblers except when the shutter is opened to expose the driver gate. The shutter is openable only by a spring loaded snap action, and the fence cannot gradually or controllably be engaged with the tumbler peripheries.

This invention relates to combination locks of the tumbler type, and is more specifically directed to means for resisting surreptitious manipulative determination of the positions at which the tumbler gates are aligned.

One of the methods which has been used to determine the combination of a tumbler type combination lock without disassembling or damaging the lock, is to carefully observe differences in sound or feel which are created as the fence of the lock is slowly engaged and/or disengaged with the peripheries of the tumblers at different dial settings. Such engagement is observed by slowly operating the lock dial back and forth at a specific tumbler position while the driver gate or notch is aligned under the lever nose, thereby slowly lowering and lifting the nose onto and off of the cam surfaces on either side of the driver gate: a slight but detectably different sound and/or feel may result if the fence is lowered onto the tumblers when one or more of the tumblers is aligned. By carefully repeating this procedure over different tumbler positions it has sometimes been possible to determine the dial settings at which the individual tumbler gates are aligned opposite the fence, even though it is not possible, by this technique, to determine which of the tumbler gates is the one in alignment. Once this information is known, it then becomes a relatively simple process to run all of the permutations of the several dial settings corresponding to gate alignment to determine the exact order of the settings by which the lock is opened. Variations of this general method include spinning the arbor of the lock very rapidly (so as to cause wear on the relatively moving parts and thereby destroy close manufacturing tolerances intended to create uniform feel at all dial settings), use of amplifying apparatus, use of X-ray or radiographic methods to aid in determining the position of the tumbler gates, and so on.

In A. J. Potzick Patent No. 3,073,145, issued Jan. 15, 1963, titled, "Manipulation Resistant Combination Lock," there is described a combination lock structure for resisting surreptitious attack by this method. In the structure there shown, a lock is provided with means which are automatically moved relative to the driver gate to block or "mask" the gate when the gate is brought into alignment with the lever nose. These shutter or mask means can be released to open the driver gate to the nose only at a rapid rate which is completely beyond the operator's control. In the Potzick lock the mask or shutter is released from driver gate masking position when the driver gate is in alignment with the nose, by a stressed spring which is automatically released and over which the operator has no control, so that when the mask is released and suddenly moves away from the gate, out from under the nose, the nose drops, under the influence of the lever

spring, toward the gate. If the tumbler gates are not aligned with the fence, the fence will drop rather abruptly and uncontrollably on the peripheries of the tumblers so that it is exceedingly difficult, if not impossible, to detect any meaningful differences of sound or feel as the fence hits the tumbler peripheries regardless of the alignment of one or more of the tumbler gates.

In the structure shown in the Potzick patent the driver gate is masked by the shutter only when the driver gate is in alignment with the lever nose; at all other positions the driver gate is open.

According to some thinking it is desirable to have the driver gate normally closed rather than normally open, as it is in the lock shown in the Potzick patent.

In the structure to which this invention relates, a lock is provided with a shutter or mask for blocking the driver gate, but the driver is normally masked by this shutter. In this lock the shutter can be released to open the driver gate by dialing an additional combination number and thereby releasing a spring which moves the shutter away from driver gate blocking position at a rapid and uncontrollable rate. When so released, the shutter is moved very rapidly away from the driver gate, and any contact between the fence and the tumbler peripheries is uncontrollably rapid, with the result that detection by feel or sound of tumbler gate alignment is rendered almost impossible by any existing technique.

This invention can best be further explained by reference to the accompanying drawings in which:

FIGURE 1 is a horizontal section of a combination lock embodying a preferred form of the invention;

FIGURE 2 is an exploded view of the assembly of the driver, shutter, detent disk and associated elements on the arbor of the lock;

FIGURE 3 is a perspective view of the lock with the cover removed, showing the bolt in extended position with the tumbler gates misaligned;

FIGURE 4 is a view similar to FIGURE 3 but shows the tumbler gates in alignment with the fence, the shutter gate being misaligned with respect to the driver gate,

FIGURE 5 is a perspective view showing the lock with both the cover and tumbler assembly removed, showing the lever nose riding on the peripheries of the driver and shutter;

FIGURES 6, 7, and 8 are elevations of the lock with the cover removed, and show the relative positions of the driver, shutter, and detent disk respectively when the shutter gate and detent gate are misaligned and the shutter detent notch and the detent disk notch are not engaged by the detent, FIGURES 7 and 8 being partly broken away;

FIGURES 9, 10 and 11 are similar to FIGURES 6–8 but show the positions of the driver, shutter and detent disk respectively when the detent disk notch is aligned with the detent but the shutter detent notch is not aligned with the detent;

FIGURES 12, 13 and 14 are similar to FIGURES 6–8 but show the positions of the driver, shutter, and detent disk respectively when both the shutter detent notch and the detent disk notch are engaged by the detent;

FIGURE 15 is an elevation and FIGURE 16 is a section showing the relative positions of the driver and shutter respectively when the shutter detent notch is engaged by the detent and the driver gate is just coming into alignment with the lever nose;

FIGURE 17 is similar to FIGURE 15 but shows the configuration of the lock elements when the nose is engaged in both the driver gate and the shutter gate, the bolt still being in extended position; and

FIGURE 18 is similar to FIGURE 17 but shows the configuration of the lock elements when the bolt has been withdrawn, the fence remaining engaged with the tubular

gates and the lever nose still being engaged in the driver and shutter gates.

A preferred combination lock construction which embodies the principles of this invention is designated generally in FIGURE 1 by the numeral **20**. This lock **20** includes a generally rectangular case, body or housing **21** which presents a rearwardly opening internal chamber **22** in which the lock mechanism is contained. The case **21** is closed by a cover **23** which is secured to it by suitable means not shown.

In typical use of the lock, case **21** is mounted to the inside surface of a safe door or file cabinet door **24** (see FIGURES 3, 4 and 5) by mounting screws **26**. It will be understood that the door **24** onto which the lock **20** is mounted also mounts a conventional lock dial, not shown, on the outer surface of the door, and that rotation of this dial operates a shaft or arbor **27** which is suitably journalled for rotation about an axis perpendicular to the door.

Arbor **27** projects through an opening **28** in case **21** and into the interior **22** thereof. Case **21** is provided with an internal boss or journal **29** turned to cylindrical form, through which the opening **28** is formed coaxially.

A driver **36** is rotatably journalled by arbor opening **28** of the case, and this driver **36** presents a central bore **37** into which the arbor **27** is assembled. A key **38**, which may be two pronged as shown in FIGURE 2, positively connects driver **36** to arbor **27**. The outer end (as viewed from the cover side of the lock) or hub **39** of driver **36** projects loosely into a coaxial hollow cylindrical boss or journal **41** formed on cover **23** which projects into chamber **22** of the case.

As is best shown in FIGURE 2, driver **36** includes a cylindrical flange, skirt or shoulder **42** outwardly of hub **39**, and this flange **42** has a circular edge surface or rim **43** in which is formed a driver gate **44**. A tumbler drive pin **46** projects from the outer face of driver flange **42** for engaging and operating conventional tumblers through a lost motion disk **48** mounted on cover boss **41**, as will be explained. The driver is also provided with a shutter drive pin **47** which projects from flange **42** in the opposite direction from pin **46**, that is, the pin **47** projects toward door **24**.

Between driver flange **42** and the end of driver **36** which is received in the case opening **28**, the driver is formed with a cylindrical shoulder **51** of smaller diameter. On this shoulder **51** is journalled a shutter, blocking means or mask which is designated as **52**.

Shutter **52** is generally in the form of a circular disk and is the same diameter as the driver rim **43**. An opening or gate **54** is formed adjacent the edge surface rim or periphery **53** of the shutter, and preferably extending through only a portion of the thickness of the shutter, being formed on the outer face of the shutter, i.e., toward cover **23**.

At a position on shutter edge **53** which is spaced circumferentially from gate **54**, there is formed a shutter detent recess or notch **56**. The shutter drive pin **47** of the driver projects through an arcuate spring wind-up or lost motion slot **57**. The shutter **52** is preferably recessed, as at **58**, between edge **53** and its central bore or aperture to receive a coil torsion spring **59**. One end **61** of spring **59** is attached to the driver **36**, while the other end **62** of spring **59** is attached to the shutter. Shutter **52** is thus interconnected to the driver **36** through spring **59** and, unless impeded by a retarding force, will rotate with the driver as the arbor **27** is turned. The normal angular positional relationship of the driver gate **44** to the shutter gate **54**, which exists when the shutter is rotating freely with the driver through spring **59**, is shown in FIGURES 6 and 7 of the drawings. It will be noted from these figures that the shutter gate **54** is ordinarily not aligned with the driver gate **44** but rather is misaligned, being spaced somewhat in the counterclockwise direction from the driver gate **44**.

Inward of shutter **52** a detent preventer or detent disk **66** is rotatably mounted on case boss or journal **29**. The detent disk **66** is of generally circular outline and is preferably of the same diameter as the shutter **52** and driver rim **43**. Like the shutter, the detent disk may be intermediately recessed, as shown in FIGURE 2. A detent disk notch **68** is formed in the periphery **67** of the detent disk **66** and the disk also has a lost motion slot **69** into which the shutter drive pin **47** of the driver extends (see FIGURE 1). Slot **69** provides deliberate misalignment of shutter detent notch **56** and detent disk notch **68** during rotation in either direction until the proper number has been dialed to align detent disk notch **68** with a detent, as will be explained. Slot **69** is longer than slot **57** of the shutter **52**, and the preferred relationship of their respective angular extents is shown in FIGURE 7. Detent disk **66** is suitably prevented from axial movement on journal **29**, for example by a spring clip **71** bowed. A tension washer **72** is provided between case **21** and detent disk **66** to exert a frictional drag on detent disk **66** and thereby prevent its free rotation.

A series of tumblers, preferably three in number, are mounted for rotation on journal **41**. These tumblers, designated **76**, **77**, and **78** may be entirely conventional insofar as the present invention is concerned, and need not be described in detail herein. A lost motion disk **48** may be included between driver **36** and tumbler **76** to function as a fourth tumbler to allow conventional four tumbler lock operation. Each tumbler **76**, **77** and **78** has a gate or notch **79** in its periphery, as shown in FIGURES 3 and 4. It is preferable that the lock be provided with the vibration damping mechanism designated generally at **81** in FIGURE 1, comprising a spring loaded plug within journal **41** which bears frictionally against the end of arbor **27**, although this mechanism forms no part of the present invention. This vibration damping mechanism is described in detail in R. W. Maynard Patent No. 3,106,-083, issued Oct. 8, 1963, to which reference is hereby made.

Lock **20** includes a bolt **82** which is movable through an opening in case **21** and which, in the extended position shown in FIGURE 3, is adapted to engage a keeper, not shown, on the safe body. Bolt **82** may be conventional and for purposes of illustration is shown in the drawings as being mounted for sliding movement in corner blocks formed in the case **21**.

An angle bar or lever **83** is pivotally connected at one end to bolt **82** by means of a lever stud **84**. On the other end of lever **83** is formed a nose **86** projecting radially toward arbor **27** and driver **36**. Lever **83** also includes a fence **87** overhanging the tumblers **76**, **77**, and **78**.

When the several tumbler gates **79** are all aligned opposite fence **87** at the position shown in FIGURE 4, and when the driver gate **44** and shutter gate **54** are also both aligned opposite the nose **86**, the lever spring **88** rotates the lever **83** about the lever stud **84** and nose **86** is thereby swung into engagement within the driver gate **44** and shutter gate **54** in the manner shown in FIGURE 17. Only then can the bolt **82** be withdrawn from extended position to permit the door **24** to be opened. As shown in FIGURES 1 and 5, the position and dimension, measured in the direction parallel to the axis of arbor **27**, of nose **86** is such that both the driver gate **44** and the shutter gate **54** must be aligned opposite the nose, in addition to the tumbler gates **79** all being aligned, before the nose **86** can pass into the driver gate **44** for the bolt to be operated. If either driver gate **44** or shutter gate **54** is not aligned opposite nose **86**, then the nose will ride on the periphery **43** or **53** of the misaligned element and will thereby be prevented from engaging the aligned gate **54** or **44**. Nose **86** does not at any time engage the periphery **67** of the detent disk **66**.

It is preferred, although not necessary, that the lock **20** be provided with a cover-lever stud interlock of the type designated generally at **91** in FIGURE 1 whereby

the cover 23 can be removed from the case 21 only when the bolt 82 is in extended position. This arrangement forms no part of the present invention and is described and claimed in R. W. Maynard Patent No. 3,038,325, issued June 12, 1962, to which reference is hereby made.

As shown in FIGURES 5 and 6, case 21 is provided with a boss 93 in which a detent 94 is retained. Detent 94 projects radially toward arbor 27 and is positioned to engage both the shutter detent notch 56 and the detent disk notch 68. The dimension of detent 94 measured in the direction parallel to the axis of arbor 27 is approximately equal to the axial dimension of shutter 52 plus that of detent disk 66. Detent 94 does not engage the driver periphery 43. Detent 94 is constantly urged towards arbor 27 by a spring 96.

In operation of the lock, assuming that the tumbler gates are misaligned and the bolt 82 is extended, the tumbler gates 79 are first brought into alignment opposite fence 87 in the conventional manner, by operating the lock dial through a series of alternating clockwise and counterclockwise turns to predetermined positions corresponding to the first numbers of the combination. During these operations the driver gate 44 and the shutter gate 54 are disaligned with respect to each other, the shutter 52 moving with the driver by reason of its rotational coupling to the driver through spring 59. Consequently, regardless of any chance alignment of driver gate 44 with nose 86 of lever 83, even when all the tumbler gates 79 are aligned with fence 87, the nose still cannot engage notch 44 because that notch is "blocked" by the periphery 53 of shutter 52 until the gates 44 and 54 are brought into alignment. Such gate alignment is effected after the tumbler gates have been aligned, by a final series of dial settings.

For shutter gate 54 to be brought into alignment with driver gate 44 and nose 86, the shutter must be rotated relative to the driver, against the torque of coupling spring 59. Detent disk 66 ordinarily prevents engagement of detent 94 with shutter notch 56 to restrain the shutter. Such relative shutter-driver movement is carried out by aligning the shutter detent notch 56 with detent 94 when the detent notch 68 of the detent disk is also aligned with the detent. Detent 94 will then move into engagement with both detent notches 68 and 56, thereby restraining the shutter against further rotation with the driver. This series of operations is shown in detail in FIGURES 6–17.

FIGURES 6, 7, and 8, the three tumbler gates 79 have been aligned with fence 87. The detent notch 68 of the detent disk 66 is misaligned with respect to the detent notch 56 of the shutter, and neither of the two detent notches 56 or 68 is engaged by detent 94. Also, shutter gate 54 is misaligned with respect to the driver gate 44, and neither is in alignment with nose 86. This configuration of these several lock elements corresponds, for example, to a situation in which the tumbler gates have been aligned but the detent disk, shutter and driver have not yet been operated for permitting the bolt to be withdrawn.

The next step in the operation is the dialing of a constant fourth number which brings detent notch 68 of the detent disk into alignment with the detent 94, as shown in FIGURE 11. As shown in FIGURES 9 and 10, which illustrate the positions of the driver and shutter respectively just as the detent notch 68 has been so positioned detent notch 56 of the shutter 52 is not yet aligned with the detent 94.

Counterlockwise rotation of the dial after aligning detent notch 68 brings the shutter detent notch 56 opposite detent 94, whereupon the detent 94 engages both the notches 56 and 68. The relative positions of the driver, shutter, and detent disk at this point are shown in FIGURES 12–14 respectively. Also, it will be noted that under these conditions the shutter gate 54 is very nearly in alignment with the nose 86, and the nose in fact is riding just at the edge of gate 54 over the angulated cam surface 98 adjacent the gate. However, the driver gate 44 is still misaligned with respect to the nose 86 (FIGURE 12). Under these conditions detent 94 holds shutter 52 stationary as the driver is rotated further, against the increasing torque of the shutter spring 59.

In FIGURES 15 and 16, the detent disk notch 68 and the shutter detent notch 56 both remain engaged by detent 94, but the driver gate 44 has now been rotated to a position aligned with nose 86. Shutter spring 59 is now quite stressed, tending to rotate the shutter against the restraining influence of the detent 94 so as to bring the shutter 52 into its normal angular relation to driver 36. Very small further movement of the driver 36 in the counterclockwise direction, as seen in FIGURES 15 and 16, brings the shutter drive pin 47 into engagement with the end of the shutter spring wind-up slot 57 (see FIG. 16) and detent disk lost motion slot 69, thereby establishing a positive drive relationship between driver 36, shutter 52, and detent disk 66. The shutter and detent disk are thereby turned counterclockwise with the driver, camming detent 94 out of shutter detent notch 56 and detent disk notch 68. Detent 94 thereafter rides on shutter periphery 53 and detent disk periphery 67 as shutter spring 59 rapidly spins the shutter 52 counterclockwise (in FIGURE 16) toward its normal condition of minimum stress. As this occurs, the shutter gate 54 is spun rapidly into alignment with the driver gate 44 directly under the nose 86. As shown in FIGURE 17, nose 86 is then swung into the aligned driver gate 44 and shutter gate 54 under the urging of lever spring 88, provided tumbler gates 79 have been aligned with fence 87 as shown. Rotation of the arbor 27 in the counterclockwise direction as viewed in FIGURE 18 draws the lever 83 to the left and draws in bolt 82.

When the arbor is moved clockwise from the position shown in FIGURE 18, the driver gate moves nose 86 and lever 83 to the right, again throwing the bolt to extended position. The nose is cammed out of the driver gate 44 by the cam surface 99 on the left side of that gate. As soon as the nose 86 is out of driver gate 44, spring 59 again spins shutter 52 to its normal state of misalignment from the driver gate, and the driver gate is masked by the shutter periphery 53.

It will thus be seen that the driver gate 44 is ordinarily closed by the shutter 52. Attempts to determine the positions at which one or more of the tumbler gates 79 are aligned with the fence, as by observing the feel or sound when the dial is set slowly at different numbers, are thereby thwarted, it being impossible to control the rate at which the nose drops toward the driver gate 44 by reason of the rapidity of movement of the shutter 52.

It may be noted that detent spring 96 is selected to provide a force on the shutter and/or detent disk such that the detent does not overcome the force of shutter spring 59 and thereby retard movement of the shutter when the detent is not engaged in the notches 56 and 68. Also, lever spring 88 is selected to provide a force on the lever which does not prevent movement of the shutter past nose 86 when the shutter is moving with the driver, but which is sufficient to swing nose 86 into the gates 44 and 54 during the brief period in which the shutter gate moves under the nose when the driver gate is aligned.

Although the foregoing embodiment constitutes the preferred construction of a combination lock in accordance with my invention, it will be appreciated that the principles of the invention may be used with other locks falling within the scope of the following claims.

I claim:

1. In a combination lock,

a rotatable driver having a driver gate,

a series of tumblers positionable by said driver, each tumbler having a notch,

a lever connected to operate a bolt, said lever having a nose engageable with said gate when said gate is aligned opposite said nose, said lever also having

a fence engageable with the notches of said tumblers when all said notches are aligned with said fence,
means constantly urging said nose toward said driver,
a rotatable shutter having a shutter gate ordinarily misaligned with said driver gate and blocking said nose from engaging said driver gate except when said shutter gate and driver gate are aligned with each other opposite said nose,
spring means yieldably connecting said shutter in driven rotational relation to said driver,
a detent releasably engageable with said shutter to restrain the same from rotating with said driver,
a detent preventer movable relative to said shutter and normally preventing said detent from engaging said shutter, said detent preventer permitting said detent to engage said shutter to restrain the shutter only at preselected angular position at which said shutter gate and driver gate are misaligned with each other and with said nose,
and means releasing said shutter from restraint by said detent only as said driver gate is turned to a position of alignment opposite said nose while said shutter gate is misaligned with said nose, said shutter thereupon being quickly rotated relative to said driver by said spring means through a position of alignment with the driver gate opposite said nose to a position of misalignment therewith unless said shutter gate is stopped in said position of alignment by engagement of said nose in said shutter gate.

2. The lock of claim **1** wherein said detent preventer and shutter are separate and each has a recess which is engageable by said detent, said recesses ordinarily being misaligned with one another, and further in which the recesses of both said detent preventer and said shutter must be engaged by said detent before said detent can restrain said shutter.

3. The lock of claim **2** in which said detent preventer is rotated by said driver through a lost motion coupling.

4. The lock of claim **3** wherein said releasing means comprises a pin projecting from said driver which engages said shutter to establish a positive drive relation between said driver and said shutter overcoming the restraint of said detent.

5. The lock of claim **4** wherein said driver, detent preventer, and shutter are circular elements coaxially arranged and have substantially equal diameters, and wherein said recesses are located on the peripheries of said shutter and said detent preventer.

6. The lock of claim **1** wherein said spring means comprises a torsion spring connected between said driver and said shutter.

7. In subcombination,
a rotatable driver for a combination lock, said driver having a nose-receiving gate therein,
means for blocking said driver gate,
spring means yieldably coupling said blocking means to said driver in gate-blocking relation therewith,
said blocking means being movable relative to said driver from gate-blocking relation therewith to non-gate blocking relation therewith, said spring means being increasingly stressed as said blocking means is moved relative to said driver toward said non-gate blocking relation therewith,
restraining means selectively engageable with said blocking means to restrain said blocking means from rotating with said driver, so as to stress said spring means as said driver is rotated relative to said blocking means,
means releasing said blocking means from said restraining means at a given position of said blocking means with respect to said driver at which said spring means is stressed but said blocking means is blocking said gate,
said spring means being effective upon release of said blocking means to move said blocking means rapidly with respect to said driver through a non-gate blocking position to a gate-blocking position unless said blocking means is arrested in said gate-blocking position,
and preventing means moveable relative to both said blocking means and said restraining means, said preventing means preventing said restraining means from engaging said blocking means except at a preselected position thereof at which said gate is closed by said blocking means.

8. In a combination lock,
a rotatable driver having a driver gate,
a series of tumblers positionable by said driver, each tumbler having a notch,
a lever connected to operate a bolt, said lever having a nose adapted to engage said gate when said gate is aligned opposite said nose,
a fence moving with said nose, said fence being adapted to engage the notches of said tumblers when all said notches are aligned with said fence,
means constantly urging said nose toward said driver,
means for blocking said driver gate,
spring means yieldably coupling said blocking means to said driver in gate-blocking relation therewith,
said blocking means being movable relative to said driver from gate-blocking relation therewith to non-gate blocking relation therewith, said spring means being increasingly stressed as said blocking means is moved relative to said driver toward said non-gate blocking relation therewith,
restraining means selectively engageable with said blocking means to restrain said blocking means from rotating with said driver and thereby to stress said spring means,
means releasing said blocking means from said restraining means at a given position of said blocking means with respect to said driver at which said driver gate is aligned opposite said nose but said spring means is stressed and said blocking means is blocking said gate,
said spring means being effective upon release of said blocking means to move said blocking means rapidly with respect to said driver through a non-gate blocking position opposite said nose to a gate-blocking position unless said blocking means is arrested in said gate-blocking position,
and preventing means moveable relative to both said blocking means and said restraining means, said preventing means preventing said restraining means from engaging said blocking means except at a preselected position thereof at which said gate is closed by said blocking means and at which said gate is not opposite said nose.

9. The lock of claim **8** wherein said blocking means comprises a member having a peripheral portion ordinarily blocking said gate, said member also having a peripheral opening which is aligned with said gate in said non-gate blocking relation.

10. The lock of claim **8** wherein said preventing means is a disk including a portion which ordinarly holds said restraining means away from said blocking means, and further wherein said preventing means also includes an opening alignable with said restraining means to permit said restraining means to restrain said blocking means.

11. The lock of claim **10** including means frictionally restraining said preventing means against free rotation and wherein said preventing means is driven by said driver through a lost motion coupling.

12. In a combination lock,
a rotatable driver having a driver gate,
a series of tumblers positionable by said driver, each tumbler having a notch,
a lever connected to operate a bolt, said lever having a nose engageable with said gate when said gate is aligned opposite said nose, said lever also having a

fence engageable with the notches of said tumblers when all said notches are aligned opposite said fence,

means constantly urging said nose toward said driver,

blocking means ordinarily moving with said driver and ordinarily blocking said nose from engaging said driver gate, said blocking means being movable relative to said driver to a non-blocking position to permit said nose to engage said driver gate,

restraining means releasably engageable with said blocking means to restrain the same from moving with said driver,

preventing means moveable relative to both said blocking means and said restraining means, said preventing means preventing said restraining means from engaging said blocking means except when said blocking means is blocking said driver gate and said driver gate is disaligned with said nose,

means releasing the restraint on said blocking means only when said driver gate is a position of alignment opposite said nose while said blocking means is blocking said gate,

and spring means moving said blocking means relative to said driver, upon release of said restraint, to said non-blocking position and, if said tumbler notches are not aligned opposite said fence, to the blocking position of said blocking means with respect to said driver.

13. In a combination lock,

a rotatable driver having a gate,

a lever connected to position a bolt, said lever having a nose engageable with said gate when said gate is aligned opposite said nose,

means constantly urging said nose toward said driver,

a rotatable shutter ordinarily blocking said nose from engaging said gate, said shutter having an opening permitting said nose to engage said gate when said gate and opening are both aligned opposite said nose, said opening ordinarily being disaligned from said gate,

spring means yieldably connecting said shutter in driven rotational relation to said driver,

means releasably engaging said shutter to restrain the shutter from rotating with said driver,

preventer means separate from and moveable relative to said shutter, said preventer means permitting said engaging means to engage said shutter only at a preselected disaligned position of said shutter opening and driver gate,

and means releasing said shutter from said engaging means only when said driver gate is aligned opposite said nose, said shutter thereupon being quickly rotated relative to said driver by said spring means through a position of alignment of said shutter opening with the driver gate opposite said nose, toward

a position of disalignment of said shutter opening with the driver gate.

14. The lock of claim 13 wherein said spring means comprises a torsion spring interconnecting said driver and shutter.

15. The lock of claim 13 wherein said shutter is journalled on said driver, said shutter and driver are of equal diameter, and the driver gate and shutter opening are formed in the peripheries of said driver and shutter respectively.

16. The lock of claim 15 wherein said nose engages the peripheries of said driver and shutter when neither said gate nor said opening is aligned opposite said nose.

17. The lock of claim 16 wherein said releasing means includes means mounted to said driver which abuts said shutter to move said shutter out of engagement with the engaging means.

18. In a combination lock,

a rotatable driver having a driver gate,

a series of tumblers positionable by said driver, each tumbler having a notch,

a lever connected to operate a bolt, said lever having a nose engageable with said gate when said gate is aligned opposite said nose, said lever also having a fence engageable with the notches of said tumblers when all said notches are aligned opposite said fence,

means constantly urging said nose toward said driver,

blocking means ordinarily moving with said driver and ordinarily closing said driver gate during the complete revolution of said driver, said blocking means being movable relative to said driver to non-closing position at which said gate is open,

and selectively operable snap action means automatically snapping said blocking means from position closing said driver gate to non-closing position when said gate is aligned opposite said nose, said snap action means automatically continuing to move said blocking means on to a gate closing position if said nose does not engage said gate,

said lock also including preventing means orientable separately from said blocking means, for preventing said snap action except at a certain orientation of said preventing means.

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