

PATENT SPECIFICATION

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(54) COMBINATION LOCK

(71) We, WALTER KIDDE & COMPANY, INC., a corporation of the State of Delaware, United States of America, with a place of business at 35 Market Street, Elmwood Park, New Jersey 07407, U.S.A. do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to latching devices provided with keyless or combination locking means, and is more particularly directed to improvements in combination locks as disclosed in Patent Specification No. 1 254 609.

Background of the Invention.

In the combination lock disclosed in Patent Specification No. 1 254 609, the latch member has a compound motion; it travels in a plane parallel to the longitudinal axis of the shaft and in a plane perpendicular to the longitudinal axis of the shaft toward the frame member to permit a locking action between cooperable means provided by one end of the latch member and the frame member. The opposite end of the rather long latch member is provided with a hook portion for engagement with a keeper. The movement of the latch member in the plane perpendicular to the longitudinal axis of the shaft involves a tilting of the latch member, and, to permit the tilting, the latch member is connected to the puller by a ball joint. The tilting of the latch member causes its hook portion to assume an angle or tilted plane in its engagement with the keeper.

Combination locks made in accordance with the aforementioned Specification No 1 254 609 have been satisfactory for use in connection with luggage, except when the luggage case is overloaded. It has been found that in an overloaded case, the

frictional force holding the hook portion of the latch member against the keeper is considerable. With the device in locked or "off combination" condition, the tilted position of the latch member causes a very strong force to be exerted against the lifter spring, which bears against the end of the latch member opposite the end which is in engagement with the keeper. When turning the device to "on combination," the lifter spring is intended to act to raise the latch member out of locked position, or out from a recess in the frame. The aforementioned frictional force encountered in an overloaded luggage case, however, is at times so great that the lifter spring is inadequate to eject the latch member from the recess. If the strength of the lifter spring is increased, an unduly large force becomes necessary to drive the end of the tiltable latch member down into the recess.

Another problem encountered in using the combination lock of No 1 254 609 also stems from the fact that the latch member is structured and related to the bolt member so that the latch member must be tilted to accomplish its function and purpose in the device. When the device is on a luggage case, and the case is over-packed or overloaded, in dialing from "on combination" to "off combination," the force necessary to turn the dial closest to the puller is noticeably greater than the force necessary to turn the dial closest to the end of the latch member which enters the recess in the frame member. The unequal pressures encountered are due to the different lengths of lever arm; that is, the different distances of each dial and its sleeve means from the area of engagement of latch member and frame member at the recess.

The primary object of the invention is to provide an improved combination lock of the type disclosed in the aforesaid Specification No. 1 254 609.

A combination lock constructed in accordance with the invention eliminates the latch member from the train of forces or from the relationship of the elements acting to lock the device. Turning the dials and the related sleeve means pushes a bolt member against the force of a spring which is in direct engagement with the bolt member. The latch member is provided with means for interlocking engagement with the bolt member. The latch member is firmly riveted to the puller member and travels straight in a single plane and does not tilt. The advantage of the lock of No. 1 254 609, whereby the latch member is not directly engaged by the sleeve means is retained. In fact, the latch member is longitudinally spaced from and relatively remote from the dials and the sleeve means.

A combination lock in accordance with the invention comprises a face plate member having a plurality of aligned spaced slots, a shaft, dials positioned to extend partially through the slots, sleeve means for each dial on the shaft, each sleeve means having a flange portion and a flat portion, a slotted bolt member having the dials extended therethrough adjacent the sleeve means, means pivotally mounting the bolt member along a first side thereof on an axis extending parallel to the longitudinal axis of the shaft, resilient means urging the bolt member against the sleeve means, and a latch member spaced longitudinally from the dials and fixed for movement in a single plane, parallel to the longitudinal axis of the shaft, the latch member and the bolt member having interlocking means operative to lock the latch member in the fastening position when the bolt member is rotated about its pivotal mounting by a flange on a sleeve means.

Also, the combination lock of the invention is preferably constructed so that the dials are secured against rotation when the latch member is in the releasing position. In such position of the latch member a portion thereof is immediately underneath the bolt member, and acts to block or prevent displacement of the bolt member when one would try to turn a dial. As explained in the aforementioned Specification No. 1 254 609, it is highly desirable that the dials be secured against rotation in the releasing position of the latch member to minimize the problem of tampering.

These, and other advantages and improved results furnished by the combination lock of the invention will be apparent from the following detailed description of an illustrated and preferred embodiment of the invention.

Brief description of the Drawings.

Fig. 1 is a top plan view of a combination lock made in accordance with the invention,

the lock being shown in association with a keeper, this view also showing the lock and keeper as secured for example to a luggage case, which is partially shown;

Fig. 2 is a transverse, vertical cross sectional view taken approximately in the plane of line 2—2 of Fig. 1;

Fig. 3 is a transverse, vertical cross sectional view taken approximately in the plane of line 3—3 of Fig. 1, this view showing the sleeve means in "on combination" condition;

Fig. 4 is a transverse, vertical cross sectional view taken approximately in the plane of line 4—4 of Fig. 1;

Fig. 5 is a transverse, vertical cross sectional view taken approximately in the plane of 5—5 of Fig. 1;

Fig. 6 is a transverse, vertical cross sectional view taken approximately in the planes of line 6—6 of Fig. 1;

Fig. 7 is a longitudinal, vertical cross sectional view taken in the plane of line 7—7 of Fig. 1, this view showing the lock in locked or "off combination" condition;

Fig. 8 is a view similar to Fig. 7, except that the lock is shown in "on combination" condition and the latch member in the releasing position;

Fig. 9 is a top plan view of the bolt member; and

Fig. 10 is a top plan view of the latch member.

Description of Preferred Embodiment.

Referring to the drawings, a combination lock A made in accordance with the invention is cooperable with a keeper B. Generally, the combination lock A comprises a face plate member C, a shaft D, a frame E, a bolt member F, a latch member G, dials H, sleeve means I, and resilient means J acting upon and cooperable with the bolt member.

The face plate member C is provided with a plurality of aligned spaced slots 20. The shaft D is related to the face plate member so that the dials H are positioned to extend partially through the slots and the sleeve means I for each dial are mounted on the shaft. As shown in detail in the aforementioned Specification No. 1 254 609, each sleeve means has a flange portion 22 and a flat portion 24.

The bolt member F is provided with a plurality of spaced slots 26 to permit the dials H to be extended therethrough. The bolt member is positioned adjacent the sleeve means I, and is pivotally mounted to rock or rotate on an axis extending parallel to the longitudinal axis of the shaft D. The means for pivotally mounting the bolt member extends along one side of the bolt member. The frame member E is beneath the shaft, dials, sleeve means, bolt member and latch member, and is connected to the

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face plate member C. The bolt member is engaged by the resilient means J (Fig. 4), which acts to urge the bolt member against the sleeve means I.

5 The latch member G is spaced longitudinally from the dials H and is fixed for movement in a single plane. Further, the latch member extends parallel to the direction of the longitudinal axis of the shaft, and the single plane for movement of the latch member is offset or below the plane of the bolt member when the bolt member is in engagement with the flat portion of each sleeve means, or when the device is "on combination", as shown in Fig. 8.

10 The bolt member and the latch member are provided with interlocking means operative to lock the latch member in the fastening position when the bolt member is rotated about its pivotal mounting by a flange on a sleeve means; that is to say, when a dial is rotated to "off combination". The parts are related to one another so that a dial cannot be rotated to "off combination" when the latch member is in the releasing position. The latch member must be in the fastening position (Fig. 7) to allow a dial or dials to be rotated to place the device in "off combination" or "on combination" conditions. When the latch member is in the releasing position shown in Fig. 8, the latch member is below the level and closely adjacent to the bolt member. In such relationship of the parts, any effort to rotate a dial, and thereby rotate the sleeve means, is prevented; the bolt member cannot be displaced because the latch member, which is fixed for movement only in a plane lengthwise of the device or parallel to the longitudinal axis of the shaft D, blocks its movement.

15 In greater detail, as shown in Fig. 9, the slotted bolt member F is provided along one side with a pair of trunnions, there being a trunnion 30 extending outwardly from each end of the bolt member. At the opposite side and at the end adjacent the latch member, the bolt member is provided with an in-turned projection 32 to be received within a notch 34 of the latch member G when the bolt and latch members are in interlocking relationship as shown in Fig. 1 and 7. The bolt member is provided with a locating projection 36 for the spring J which, as shown in Fig. 4, is in the form of a coiled compression spring having its ends confined by the projection 36 and a locating means 38 provided by the frame member E. The spring urges the pivoted bolt member against the sleeve means I.

20 As previously indicated, the frame member E is connected to the face plate C. These two members preferably are made by diecasting and are formed to provide

longitudinally spaced bearings for the trunnions 30 of the bolt member and longitudinally spaced bearings for the shaft D. To connect the parts the face plate C is preferably provided with longitudinally spaced pairs of connecting studs 42 which are extended through aligned openings 44 in the frame member, following which the ends of the connecting studs are headed over to secure the parts to one another. A pair of the connecting studs is shown in Fig. 5.

25 As shown in Figs. 2 and 5, the frame member F is provided with upstanding bearing projections 46 which are cooperable with aligned recesses 48 formed in the face plate to provide the spaced bearings for the trunnions 30 to allow the bolt member F to pivot about the longitudinal axis provided by the trunnions. As shown in Figs. 5, 7 and 8, the frame member E is cast or formed with central, upstanding projections 50 to support the ends or provide spaced bearings 52 for the shaft D.

30 As shown in Fig. 10, the latch member G is provided with a hook portion 54 which is cooperable with the keeper B (Fig. 1). The latch member is moved by a puller M, which is connected to the latch member so that the latch member may move only in a plane parallel to the longitudinal axis of the shaft B. Referring to Fig. 10, the latch member is provided with an aperture 56 within which a ball 58 (Figs. 6, 7 and 8) is located. The ball is in communication with a vertically extending bore 60 provided in an extension of the puller M. A coiled compression spring 62 is positioned to bear against the ball at one end and a surface provided by the puller at the other end. The purpose of the ball is so that it may coact with a ramp 64 formed on the frame member E to furnish a snap action to resiliently maintain the puller in either the fastening (Fig. 7) or the releasing position (Fig. 8). Significantly, the puller is connected to the latch member G so that the latch member cannot tilt and is moveable by the puller in a single plane only. For this purpose the latch member is provided with a pair of transversely spaced apertures 66 through which aligned connecting studs 68 formed on the puller are extended and then headed over for the connection of the parts, as shown in Figs. 1 to 6. It will be noted that the latch member is a comparatively small piece which extends transversely with respect to the longitudinal axis of the shaft. As will be evident from a viewing of Fig. 1 the latch member is longitudinally spaced from the dials.

35 The puller M may be provided with an upstanding flange 70 to facilitate grasping between the fingers so that movement may be imparted to the puller. If desired, and for aesthetic purposes, the flange 72 may be

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provided along three sides of the face plate member as shown in Fig. 1. The puller is guided for the desired movement between the fastening and the releasing positions of the latch member by suitable guide means. As shown in Figs. 5 and 6, the face plate member C is provided with transversely spaced, longitudinally extending ribs 74 received in adjoining recesses 76 on the under-side of the puller.

In the preferred form of the invention the sleeve means I are each in the form of a sleeve separate from each dial H. The sleeves and dials are made with cooperable means for releasably keying them together to permit the selection of a combination of one's own secret choice. With separate sleeves formed for releasable keying to the dials, a spring L is provided around the end of the shaft D opposite the end to which a lever N is secured or mounted, as shown in Figs. 7 and 8. The spring L serves to maintain the individual sleeves in abutting, end-to-end relationship, and the lever N, which is rotatably mounted on the shaft D and which extends through a cut-out or opening 78 in the frame member may be rotated and pushed against the force of the spring L to disengage the sleeves from their respective dials to then enable the dials to be rotated to a selected combination of one's choice. Where the preferred sleeve means are in the form of individual sleeves for keying to the dials, the bolt member is provided with a cut-out or opening 80 so as to allow the lever to extend therethrough.

In the illustrated form of the invention there are three separate sleeves and three dials. With three dials each having ten indicia or numbers thereon there are one thousand different possible combinations available. It will be understood that any desired number of dials may be used to furnish the desired number of combinations. Also, the dials and sleeves are essentially the same construction as disclosed in the aforementioned Specification No. 1 254 609, and a dial cooperable spring member K (fig. 3) is related to the dials so that the dials are releasably maintained in selected circumferential position.

Also, in the preferred and illustrated form of the invention the combination lock is provided with visual indicator means as disclosed in United States Gehrie 3,416,338 granted December 17, 1968. For this purpose the sleeves are provided with visual or feeler means for alignment with openings 82 in the frame member E, as shown in Figs. 7 and 8. To allow access to the slot or visual means on the sleeves the bolt member is provided with aligned notches 84 (Fig. 9).

As shown in Figs. 1 and 6, the hook portion 54 of the latch member G is cooperable with the keeper B, and the latch

member projects through an opening 86 (Fig. 6) in the face plate C. As known in the art the engageable faces of the hook portion and the keeper are matingly angled to facilitate the drawing together of the luggage case sections or container parts when the combination lock A and keeper B are used for the luggage application as herein illustrated. In this regard, the preferred application or use of the device is the same as illustrated in the aforementioned Specification No. 1 254 609, thereby making it unnecessary to describe in detail the relationship of the lock and keeper to the luggage shells S,S' and the valance members V,V', as shown in Figs. 1 and 6.

The combination lock as herein illustrated and described operates as follows. With the device "on combination," or with the dials rotated so that each of the sleeve means 1 has its flat portion 24 in engagement with the bolt member as shown in Fig. 8, the puller M may be moved from the fastening to the releasing position and vice versa. When the puller is in the releasing position shown in Fig. 8, the latch member G has a portion thereof below and immediately adjacent the end of the bolt member. In such relationship of the parts, the dials H cannot be rotated because the latch member is rigidly connected to the puller M, cannot tilt, and blocks the displacement of the bolt member.

When it is desired to lock the device or to place the device "off combination" the puller M is moved to the position shown in Fig. 7, and then one or more of the dials is or are rotated so that a flange or flanges 22 pivots the bolt member about the axis of rotation provided by the trunnions 30. The bolt member F is pivoted from the solid line showing to the dot-dash line showing in Figs. 4 and 6. This rocking motion of the bolt member against the resilient force of the spring J causes the projection 32 on the bolt member to enter the notch 34 in the latch member, thereby locking the latch member in the fastening position.

WHAT WE CLAIM IS:—

1. A combination lock comprising a face plate member having a plurality of aligned spaced slots, a shaft dials positioned to extend partially through the slots, sleeve means for each dial on the shaft, each sleeve means having a flange portion and a flat portion, a slotted bolt member having the dials extended therethrough adjacent the sleeve means, means pivotally mounting the bolt member along a first side thereof on an axis extending parallel to the longitudinal axis of the shaft, resilient means urging the bolt member against the sleeve means, and a latch member spaced longitudinally from the dials and fixed for movement in a single plane parallel to the longitudinal axis of the



provided along three sides of the face plate member as shown in Fig. 1. The puller is guided for the desired movement between the fastening and the releasing positions of the latch member by suitable guide means. As shown in Figs. 5 and 6, the face plate member C is provided with transversely spaced, longitudinally extending ribs 74 received in adjoining recesses 76 on the under-side of the puller.

In the preferred form of the invention the sleeve means I are each in the form of a sleeve separate from each dial H. The sleeves and dials are made with cooperable means for releasably keying them together to permit the selection of a combination of one's own secret choice. With separate sleeves formed for releasable keying to the dials, a spring L is provided around the end of the shaft D opposite the end to which a lever N is secured or mounted, as shown in Figs. 7 and 8. The spring L serves to maintain the individual sleeves in abutting, end-to-end relationship, and the lever N, which is rotatably mounted on the shaft D and which extends through a cut-out or opening 78 in the frame member may be rotated and pushed against the force of the spring L to disengage the sleeves from their respective dials to then enable the dials to be rotated to a selected combination of one's choice. Where the preferred sleeve means are in the form of individual sleeves for keying to the dials, the bolt member is provided with a cut-out or opening 80 so as to allow the lever to extend therethrough.

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WHAT WE CLAIM IS:—

1. A combination lock comprising a face plate member having a plurality of aligned spaced slots, a shaft dials positioned to extend partially through the slots, sleeve means for each dial on the shaft, each sleeve means having a flange portion and a flat portion, a slotted bolt member having the dials extended therethrough adjacent the sleeve means, means pivotally mounting the bolt member along a first side thereof on an axis extending parallel to the longitudinal axis of the shaft, resilient means urging the bolt member against the sleeve means, and a latch member spaced longitudinally from the dials and fixed for movement in a single plane parallel to the longitudinal axis of the

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shaft, the latch member and bolt member having interlocking means operative to lock the latch member in the fastening position when the bolt member is rotated about its pivotal mounting by a flange on a sleeve means.

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2. A combination lock according to claim 1 wherein the interlocking means comprises a projection provided by the bolt member on a side opposite said first side for entry into a notch provided in the latch member.

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3. A combination lock according to claim 1 or 2 wherein the single plane for movement of the latch member is below and closely adjacent the bolt member when the bolt member is in engagement with the flat portion of each sleeve means, the latch member preventing pivoting of the bolt member when the latch member is in the releasing position.

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4. A combination lock according to claim 1, 2 or 3, including a frame member beneath the shaft, dials, sleeve means and bolt member connected to the face plate

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member, the means pivotally mounting the bolt member comprising a trunnion extending outwardly from each end of the bolt member, the trunnions being positioned between spaced bearings provided by the face plate and frame members.

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5. A combination lock according to any one of the preceding claims wherein the sleeve means are separate sleeves, the dials and sleeves each being provided with cooperable means for keying a sleeve to a respective dial, a spring for normally keying the sleeves to their respective dials, and means for disengaging the sleeves from the dials to permit changing the combination.

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6. A combination lock as claimed in claim 1, substantially as described with reference to the accompanying drawings.

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