Jan. 2, 1951 F. K. VAN ALMELO 2,536,829

SWITCHING DEVICE HAVING "HOLD" KEY

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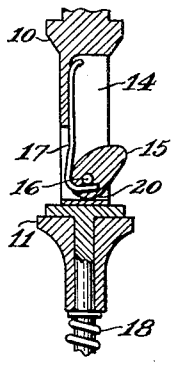


Fig. 8

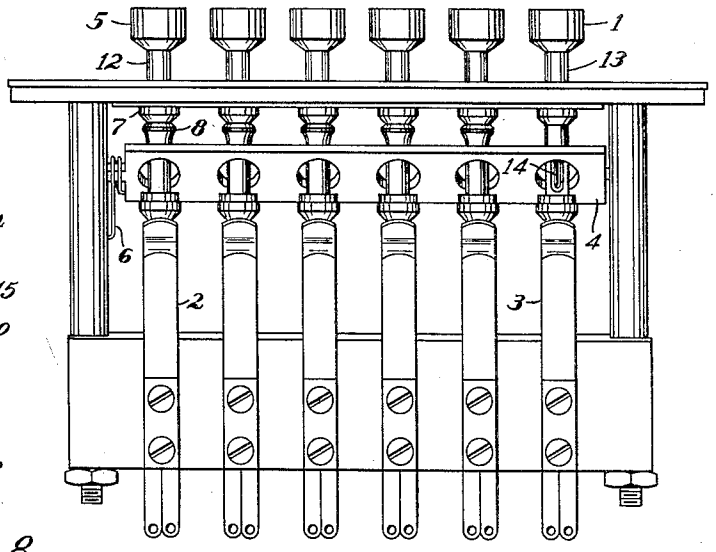


Fig. 1

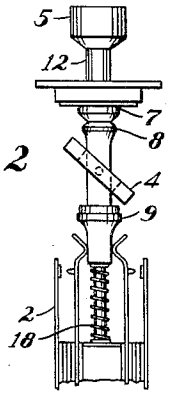


Fig. 2

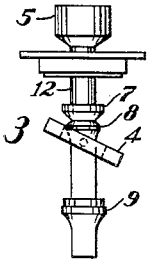


Fig. 3

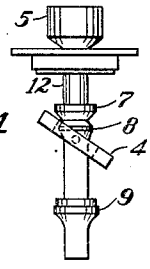


Fig. 4

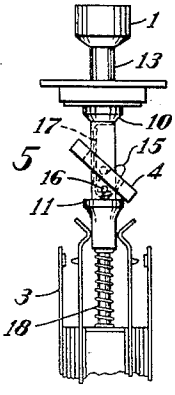


Fig. 5

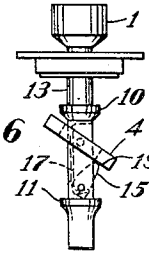


Fig. 6

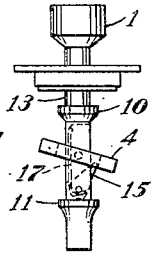


Fig. 7

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SWITCHING DEVICE HAVING "HOLD" KEY

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5 Claims. (Cl. 179—177)

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This invention relates to switching apparatus and it more particularly pertains to a key structure consisting of mechanically interlocking plunger keys for party line or intercommunicating telephone systems.

Key structures of the type disclosed in the present invention are arranged so that the depression of a button associated with a particular key of the structure causes a plunger rod to be actuated from its normal position, into a depressed position in which certain contacts may be closed, the key actuated plunger rod being retained in its depressed position. When a key plunger is caught and retained in a depressed position, the subsequent depression of another plunger of the same class (line selecting key for example) releases any other key which has been previously depressed and held in its intermediate position by the retaining means. In general, such a key structure is disclosed in Manson Patent #985,820, granted March 7, 1911.

It is an object of the present invention to modify the key structure of the Manson patent by providing a "hold" button which cooperates with the above-mentioned "line" buttons for a purpose which will be explained. Key structures of this type are frequently employed for switching purposes at subscribers' stations and are equipped with a non-locking "hold" key which, when actuated, serves to hold a telephone line while some other switching function is performed by the subscriber.

In previous arrangements, the actuation of a "hold" button causes the release of any previously actuated "line" button during the down-stroke of the "hold" button, thus effecting the switching operation by the release of the previously actuated plunger at about the same time the switching operation is performed by the "hold" button. Recently developed station wiring plans require an appreciably longer time interval between the operation of the contacts controlled by the "hold" button and the release of any previously operated "line" button. One important reason for the development of a key structure as disclosed in the present invention is to make sure that there will not be an impulse generated in the line circuit when the "hold" button is actuated, such an impulse being effected in previous key structures by the release of the previously actuated "line" button to momentarily open up the line circuit for a short interval before the "hold" button is fully depressed for closing the line circuit or placing the "hold" condition thereon. This is due to the fact that previously constructed

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key structures cause the release of the "line" button on the down-stroke of the "hold" button.

The object of the present invention is to positively prevent the opening up of the line circuit when the "hold" button is depressed and is attained by causing the non-locking "hold" button actuated plunger to trip the "line" plunger latching mechanism on the up-stroke of the "hold" plunger rather than on its down-stroke.

The invention will be best understood by reference to the following description when taken in connection with the accompanying illustrations, showing one specific embodiment thereof, while the scope of the invention will be more particularly pointed out in the appended claims.

Fig. 1 is a front elevation of the bank of keys, this figure corresponding to Fig. 1 of the above-mentioned Manson patent, modified to include the non-locking "hold" button.

Figs. 2, 3, 4, 5, 6 and 7 are end views showing the interaction between the plungers and the latch plate.

Fig. 2 is an end view showing one of the "line" buttons in its normal position.

Fig. 3 shows the positions of the parts when a "line" button actuated plunger is part way down and just before the latching operation.

Fig. 4 illustrates the positions of the different parts when the "line" plunger has reached its fully depressed position.

Fig. 5 is an opposite end view showing the "hold" button and co-operating parts in the normal position.

Fig. 6 illustrates the positions of the various parts when the "hold" button has been fully actuated.

Fig. 7 illustrates the positions of the various parts when the "hold" button is part way up on its return stroke.

Fig. 8 is a sectional view of a portion of the "hold" plunger.

Since mechanically locked key structures to which the present invention is applied are well-known in telephone practice and since the present invention is illustrated as being applied to the structure disclosed in the above-mentioned Manson patent, it is not believed necessary to describe in detail all of the various features and parts of the key structure, except those relating to the application of the present invention to the previously described key structure.

Referring to Fig. 1, five "line" buttons and "hold" button 1, with their associated plungers and contacts, are shown assembled in a frame unit. Latch plate 4 is pivotally mounted in the

frame and is retained in the position shown by spring 6.

Referring to Fig. 2, plunger 12, actuated by button 5, clears latch plate 4 until the plunger is near its fully depressed position, at which time shoulder 8 tilts latch plate 4 as shown in Fig. 3 for releasing any previously latched "line" plunger to the position shown in Fig. 2. As the plunger is further advanced downward, latch plate 4 is caught by shoulder 8 for holding the actuated plunger in its depressed position, shown in Fig. 4, until the latch plate is next rotated in its counter clock wise direction, when the latched plunger is released.

Referring to Fig. 5, plunger 13, actuated by "hold" button 1, has an opening or slot 14 (more clearly shown in the sectional view, Fig. 8) in which pawl or rocker arm 15 is pivoted at point 16. The pawl or rocker arm 15 is maintained in the position shown in Fig. 5 by the outward thrust of a comparatively light spring 17, the upper end of which rests against the left inner portion of plunger 13 which is the back of slot 14. Tne lower portion of spring 17 engages rocker arm 15 so that this arm is normally swung to the position shown in Fig. 5. Spring 17 is prevented from rotating rocker arm 15 clockwise beyond the position shown in Fig. 5 by the abutment of shoulder stop portion 20 of the arm on the bottom of slot 14. The manner in which this occurs is clearly shown in Fig. 8. Arm 15 is rotated in a counter clock wise direction by plate 4 when plunger 13 is depressed.

Assuming that Fig. 5 illustrates the "hold" plunger just at the beginning of the down stroke, the pawl or rocker arm 15 will begin to recede into the slot in plunger 13 against the light pressure of spring 17 as the plunger moves downward. The resultant pressure of pawl 15 at the point of contact with the inclined surface of latch plate 4 is considerably less than the resultant pressure of the spring 6.

When the "hold" plunger moves downward to the position illustrated in Fig. 6, pawl 15 will take the position shown and latch plate 4 will not have been moved. This is because, during the down-stroke operation of the plunger, the pressure due to spring 17 against pivoted pawl 15 is insufficient to move the latch plate 4 from its normal position. Instead, pawl 15 is forced back into the slot 14 as it moves past latch plate 4.

When the plunger starts its up-stroke movement, as shown in Fig. 6, pawl 15 encounters the lower working edge of the portion 19 of latch plate 4 and, the force of the plunger restoring spring 18 being greater than the resultant force of spring 6, latch plate 4 is caused to move about its pivot in a counter clock wise direction. The movement of the upper portion of the latch plate releases the previously depressed plunger, for example plunger 12, by clearing latch plate 4 from shoulder 8. At a point in the return stroke of the "hold" plunger as shown in Fig. 7, pawl 15 will clear portion 19 of plate 4 because the position of shoulder stop 20 is so chosen that pawl 15, in its extreme clockwise position, just clears the portion 19 of latch plate 4 when the latter is at or approaching its horizontal position. Plate 4 will restore to normal and at the end of the stroke the mechanism will be in the position illustrated in Fig. 5 ready to repeat the cycle.

It is apparent from the foregoing description that latch plate 4 experiences no longitudinal thrust when the non-locking "hold" plunger is depressed and it is not until some time after the plunger has reached its lowermost position and has then started its return movement that the latch plate is rotated to release any plunger which has been previously locked in its actuated position. The contacts controlled by the non-locking plunger are consequently actuated and remain actuated for a sufficient interval before those controlled by the non-locking plungers are restored to normal, thus providing an overlap which prevents the introduction of a pulse in the circuit controlled by the given contact springs, which pulse might provide faulty operation of the controlling circuits.

Having thus described my invention, what I consider new and desire to have protected by Letters Patent is pointed out in the appended claims.

What I claim is:

1. In a switching key; a depressible contact operating plunger; a latch for locking said contact operating plunger in its depressed position; a second plunger; releasing means controlled by said second plunger for releasing said contact operating plunger, said releasing means comprising a pawl pivotally mounted on said second plunger, a seat for said pawl in said second plunger, resilient means acting to move said pawl away from said seat, said pawl having means to limit movement of said pawl away from said seat, said pawl being arranged to contact said latch under pressure of said resilient means, and said pawl being contoured to allow said pawl to move freely past said latch by retraction toward said seat on the down-stroke of said second plunger, but to engage said latch and cause its release on the up-stroke of said second plunger.

2. In a mechanically interlocked switching key, a latching plate, first and second contact controlling plungers, means controlled by said latching plate for locking said first plunger in its actuated position, a pawl pivoted in said second plunger adapted to rotate in one direction to a stop position, means controlled by the down-stroke actuation of said second plunger for rotating said pawl to said stop position, and means controlled by said pawl in its stop position on the up-stroke of said second plunger for releasing said first plunger from its actuated position.

3. A switching device having first and second operating plungers and a latching plate controlled thereby for latching said first plunger in its actuated position; a rocker arm pivotally attached to said second plunger; a stop position for said rocker arm, resilient means acting to move said rocker arm toward its stop position, said rocker arm being rotated about its pivot point, away from said stop position and against the force of said resilient means, on the down-stroke of said second plunger by contact against said latching plate and said rocker arm being held in said stop position on the up-stroke of said second plunger, whereby said latching plate is unlatched and in turn releases said first plunger.

4. In a switching key; a depressible contact operating plunger; a latch for locking said contact operating plunger in its depressed position; a second plunger; releasing means controlled by said second plunger for releasing said contact operating plunger, said releasing means comprising a pawl pivotally mounted on said second plunger, a stop position for said pawl, resilient means acting to move said pawl into said stop position, said pawl being arranged to be held

by said resilient means in contact with said latch without actuating said latch during the down-stroke of said second plunger, said pawl being rotated into said stop position by said resilient means on the completion of the down-stroke, and said pawl being arranged to engage and move said latch on the up-stroke of said second plunger to release said contact operating plunger, and said latch being arranged to disengage itself from said pawl after said contact operating plunger is released.

5. In a switching mechanism a frame; a row of depressible, contact-controlling plungers mounted in said frame; a locking plate for locking an actuated one of said plungers in actuated position, said plate being mounted in said frame for pivotal movement about an axis extending lengthwise of said row of plungers; camming means on one of said plungers and said plate respectively and disposed on one side of said axis to tilt the plate about said axis in a certain sense during the down stroke of said plunger for releasing a previously actuated plunger from its locked position; another contact-controlling

plunger mounted in said frame; and camming means on said last-mentioned plunger and said plate respectively and disposed on the opposite side of said axis to tilt the plate about said axis in the aforementioned sense during the return stroke of said last-mentioned plunger for releasing a previously actuated plunger from its locked position, said last-mentioned camming means including a member yieldable in one direction, whereby said means is rendered ineffective during the down stroke of said plunger.

FRED K. VAN ALMELO.

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The following references are of record in the file of this patent:

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