United States Patent

Schuh

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[54] SEQUENTIAL KEY LOCKING AND RELEASING ARRANGEMENT

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[58] **Field of Search** ..... 74/483 PB; 200/5 E

[56] **References Cited**

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[57] **ABSTRACT**

A taximeter is to be set to different operational conditions by corresponding keys. It is required that a certain starting condition, namely the condition "vacant" is first obtained by operation of a "vacant" key, before any other condition is selected, which is accomplished by locking all keys in a normal inoperative position, except the "vacant" key which, when actuated, unlocks all other keys for subsequent operation.

10 Claims, 3 Drawing Figures

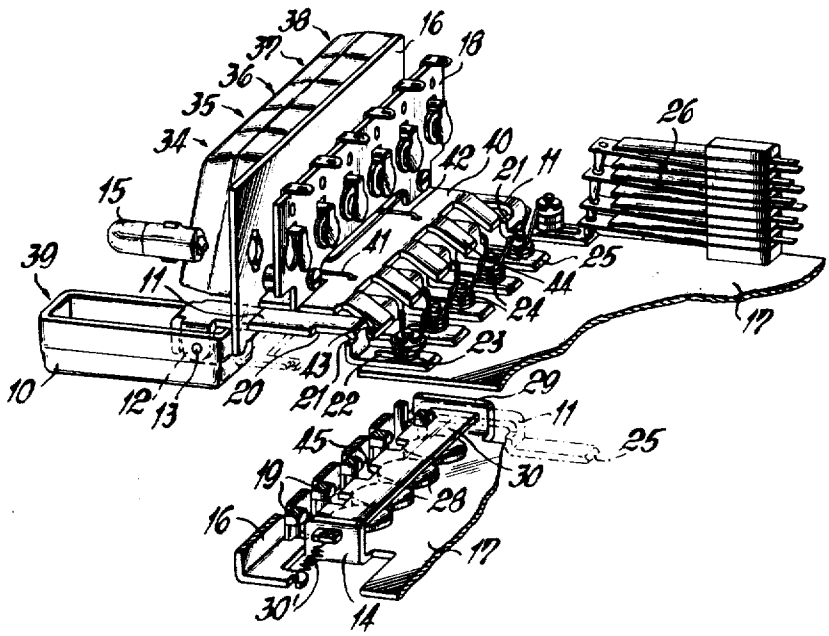
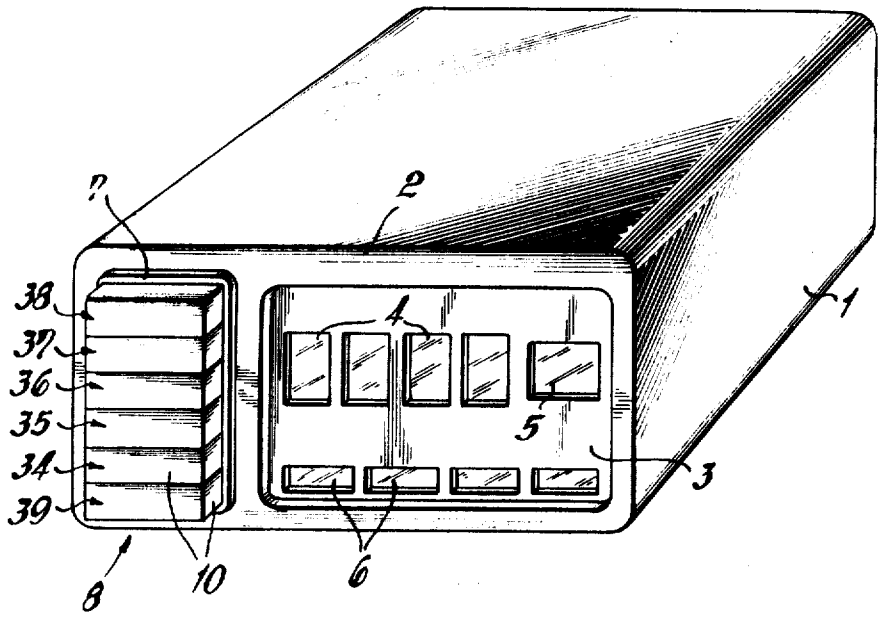


FIG. 1



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FIG. 2

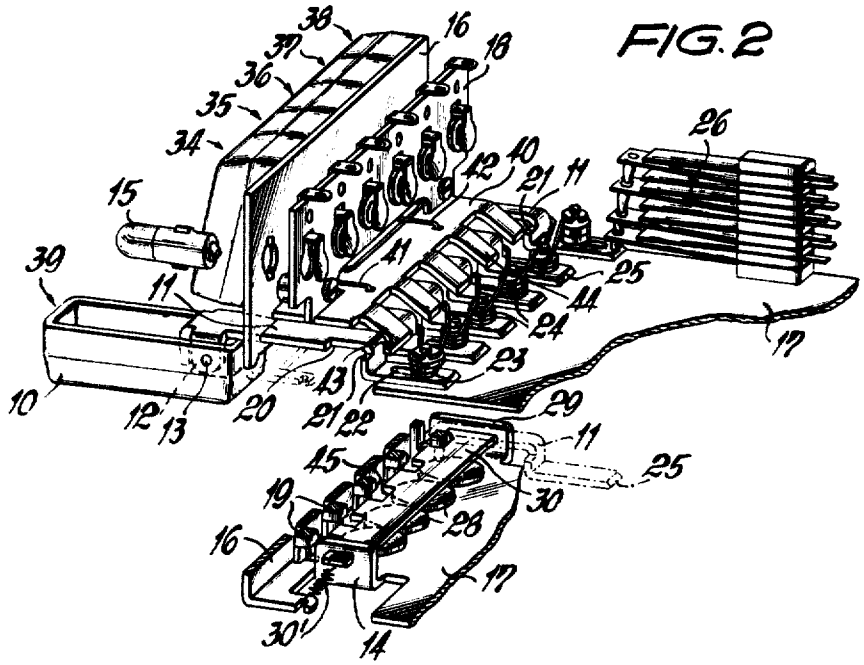
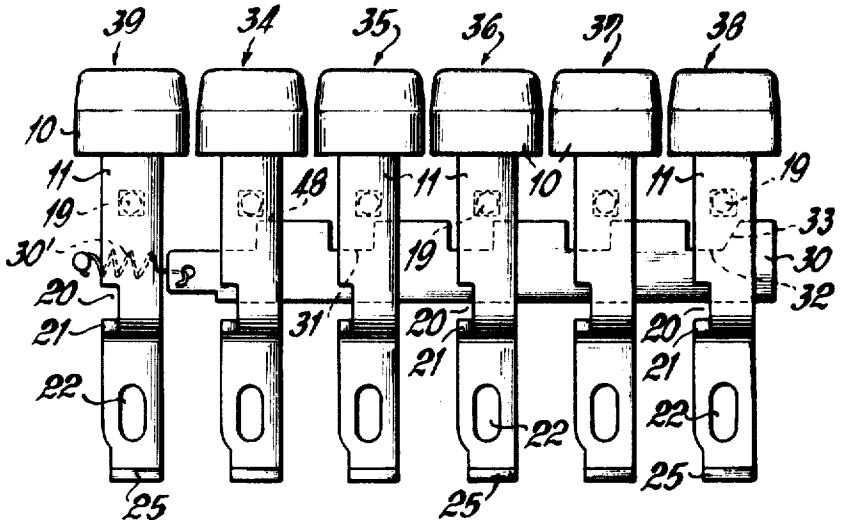


FIG. 3



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Atty

SEQUENTIAL KEY LOCKING AND RELEASING ARRANGEMENT

BACKGROUND OF THE INVENTION

It is known to set taximeters to different operational conditions and functions such as "vacant," "rate 1," "rate 2," "cash," and so forth by turning of a flag or a knob mounted on the taximeter casing. The angular displacements of the flag or knob are transmitted to a control shaft provided with cam lugs by which the respective different conditions of the taximeter are obtained in accordance with the angular positions of the flag or knob.

It is also known to substitute for the knob or flag, an electric motor by which the control cam shaft is stepwise displaced, as disclosed in the German Pat. Nos. 1,083,581 and 1,092,709. A control key is provided by which the electromotor is actuated to turn the control cam shaft to the respective next following position, for example from the position "vacant" to the position "rate 1," from the position "rate 1" to the position "rate 2," and so forth.

It is necessary to arrest the control cam shaft in each angular position corresponding to a particular operational condition of the taximeter. Since it is necessary to arrest the control cam shaft in this manner, the control by means of a flag or knob, and also by means of an electromotor, is difficult, particularly if the taximeter is to operate at four different rates, and should permit direct movement from the "vacant" condition to the "rate 3" condition, and later from the "cash" condition again to the "vacant" condition. For example, if the control cam shaft is to be turned from the "vacant" position to the position corresponding to "rate 3," it is necessary to operate the control switch three times, and when the taximeter and control cam shaft is to be shifted from the position representing "rate 3" to the position "cash," the control switch has to be two times operated before the motor turns the control cam shaft to the correct position for operating the taximeter in the corresponding condition.

When a flag or knob is used, certain positions of the control cam shaft have to be skipped, and visual control is necessary for determination whether the flag or knob is in the correct position, which is undesirable for modern taxi operation. Furthermore, electronic taximeters have been recently constructed in which the several operational conditions are not obtained by angular stepwise displacement of the control cam shaft, but by operating a key or pushbutton controlling a set of switches for each operational condition of the taximeter.

For taxicab operations, it is absolutely necessary that the taximeter is cleared before a new trip is started, that means that the previously indicated fare must disappear from the indicator, and an amount of money indicated when a new customer has entered the taxi. This new amount of money represents an initial fare which has to be paid, irrespective of the further use of the taxicab.

Therefore, it is necessary that after termination of each trip, the taximeter should only be operated after it has been, at least momentarily, placed in the condition "vacant." In other words, a certain sequence of operation, which is obtained without difficulties by turning a knob or flag, must be assured even if selector keys associated with the different positions of the taximeter are used, which would be operable in any sequence, including an undesired sequence in which the taximeter is not temporarily set to the "vacant" condition between the uses of the taxicab by two different customers.

SUMMARY OF THE INVENTION

It is one object of the invention to provide a key locking and releasing arrangement, particularly suited for a taximeter, which permits actuation of the keys only in a predetermined sequence.

Another object of the invention is to provide a key locking and releasing arrangement for a taximeter in which the keys correlated with different operational conditions of the taximeter, must be operated in a sequence starting with the operation of the "vacant" key.

Another object of the invention is to operate a taximeter correctly by means of a series of keys so that no flag or knob is required.

With these objects in view, the present invention provides a keyboard for the operation of a taximeter, or like apparatus, in which a key is correlated with each operational condition of the taximeter. In order to obtain the proper sequence of key operations, locking means are provided for locking all keys, except the key associated with the "vacant" condition which can be actuated to operate the locking means to release all other keys for selection of a desired condition of the taximeter after the same was in the "vacant" condition.

The arrangement of the invention makes it possible that any one of selector keys correlated with taximeter conditions "rate 1," "rate 2," etc. or "cash," can be operated in any desired sequence, while before a new trip is started, the "vacant" key must be operated.

The principle of the invention is applicable to other apparatus having a plurality of different operational conditions, and requiring a starting condition, obtained by a starting key, before any other selector key is operated to obtain another operational condition of the apparatus.

A sequential key means locking and releasing arrangement according to one embodiment of the invention comprises a set of selector keys correlated with different conditions of an apparatus, such as a taximeter, and being movable between normal inoperative positions, and actuated positions for placing the apparatus in the respective conditions; releasable locking means for locking the selector key in the normal inoperative positions; and a starting key movable between an inoperative normal position, and an actuated position for obtaining the required starting condition of the apparatus, such as the "vacant" condition of a taximeter.

The starting key in the actuated position operates the locking means to release the selector keys so that any condition of the apparatus can be selected by operation of the respective selector key only after the apparatus has been set to the required starting condition by the starting key, which is the "vacant" key in a taximeter.

The locking means preferably includes a shiftable locking slide which is biassed by springs and has abutments and slots for projections on the stems of the selector keys, while a projection on the stem of the starting key engages a slanted face of the locking slide for moving the same to a position unlocking the selector keys when the starting key is moved to the actuated position.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view illustrating a taximeter provided with a set of keys in accordance with the invention;

FIG. 2 is a fragmentary perspective view, partly exploded, illustrating an embodiment of the invention; and

FIG. 3 is an elevation illustrating the cooperation of the keys with the locking slide of the embodiment of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. 1, in a housing 1 having a front plate 2, a cover sheet 3 with indicia is arranged which has windows 4 through which indicator means showing the fare can be observed. Another window 5 permits a view of other indicator means showing additional charges, and windows 6 permits the reading of the indication of totalizers. Casing 1 has a rectangular opening in which a control unit 8, including a set of key buttons 10 of keys 34 to 39 is mounted. Key buttons 10 are hollow and transparent, and are illuminated to show indicia so that it is apparent that key 38 is correlated with the opera-

tional condition "vacant," key 37 is correlated with the operational condition "rate 1," and key 39 is correlated with the operational condition "cash." If the taximeter can be set to four different rates, in which the same mileage is differently charged, in addition to the keys 37, 38, 39, further three keys 34, 35, 36 for the additional rates "rate 2," "rate 3," and "rate 4," are provided.

As shown in FIG. 2 and 3, each key includes a hollow prismatic transparent key button 10, which is mounted on the respective key stem 11 for angular movement between a normal position, and a servicing position shown for key 39 in FIG. 2. Each key stem 11 has two bent lugs 12 supporting a pin 13 which is secured to the respective pushbutton 10. A spring, not shown, holds the key buttons 10 in the closed position in which keys 34 to 38 are shown, but each key button 10 can be opened for access to a lamp 15 so that the same can be exchanged, when required, in a convenient manner. Since the transparent key buttons 10 have printed indicia, representing the operational conditions of the taximeter, servicing of the lamps 15 while the respective key buttons 10 remain connected with the apparatus, prevents a mix-up between the several key buttons.

The stems of all keys 34 to 39 are guided in an angular support plate which has two walls 16 and 17. A connector plate 18 is mounted on the angular wall 16, 17 and has connecting elements for connecting the lamps 15 to a source of voltage. The shape of the stems 11 is best seen in FIG. 3. Each stem 11 has a projecting portion 19 which projects toward the wall 17. The lower portion of the exploded view of FIG. 2, is separated from the upper portion by a section directly under the stems 11 and through the projecting portions 19. Each key stem 11 has a cutout 20, and an arresting projection 21 adjacent cutout 20. The rear end of each stem 11 has a slot 22 through which a pin 23 secured to wall 17 passes. Torsion springs 24, wound about pin 23, and engaging stems 11 urge the stems 11 and the respective keys 34 to 39 to the normal inoperative position. The rear ends 25 of each stem 11 is slanted and cooperates with a set of contacts 26, so that operation of any key 34 to 39 selects an operation of the taximeter, corresponding to the operational condition, such as operation at a certain rate. Actuation of the set of contacts 26 associated with the key 38, will place the taximeter in a starting condition, set to the condition "vacant," while the selector keys 34 to 37 and 39 select other operational conditions which have to follow the "vacant" condition. The number and arrangement of the contacts of each set 26 depend on the construction of the taximeter, and each set 26 may include normally closed, normally opened, and shifting contacts. The specific manner in which the taximeter circuit is influenced by operation of any of the sets of contacts 26, is not an object of the invention.

Locking means are provided for locking all selector keys 34 to 37 in the normal inoperative position, while the starting key 38, associated with the "vacant" condition is not locked. A locking slide 30 is mounted in bent over wall portions 14 and 29 of supporting plate 17, as best seen in the lower portion of FIG. 2, and is slidable in the same in longitudinal direction between a normal position in which abutments 48, see FIG. 3, are located in the path of movement of the projections 19 of keys 34 to 37 and block movement of the same in the normal position of locking slide 30 into which the same is urged by a spring 30' secured to a hook portion of the fixed support plate 17. The projecting portion 19 of key 38 cooperates with the slanted face 33 of a recess 32 so that the depression of key 38 will cause engagement between projection 19 and slanted face 33 for moving locking slide 30 to the right as viewed in FIG. 3 to a releasing position in which the recesses 31 are located in the path of movement of the projections 19 of keys 34 to 37, permitting movement of any selected key to an actuated position. During movement of any key to the actuated position, the respective pin 23 slides in the respective slot 22 while spring 24 is tensioned. In the position of the locking slide 30 shown in FIG. 3, selector keys 34 to 37 are locked, but starting key 38 is operable. Key 39, associated with the "cash" condition of the taximeter, is not locked since a special construction is shown in FIG. 3. However, it is possible to extend locking slide 30 so that selector key 39 is also locked in the normal position in which it is shown in FIG. 3. When key 38 is operated and has pushed locking slide 30 to the releasing position described above, key 38 is arrested by an arresting means 40 so that the stem 11 of key 38 remains in the position shown in the upper portion of FIG. 2, while the projections 19 of the selector keys are located opposite recesses 31, permitting movement of any selector keys 34 to 37 to the actuated position.

Any actuated key is arrested in the actuated position by an arresting comb 40 which has a set of prongs 44 respectively cooperating with arresting projections 21 on the stems 11 of the keys. Arresting comb 40 is mounted for angular movement and is biassed by springs 41 and 42 to turn in clockwise direction, as viewed in FIG. 2 to a position in which the prongs 44 respectively rest on the stems 11.

When one of the keys is depressed, and the respective stem 11 is displaced, the bent-over portion of the respective stem 11 displaces arresting comb in counter-clockwise direction since a prong 44 cooperates with the bent-over portion of the respective stem 11. When the arresting projection 21 has passed the prong 44, arresting comb 40 is returned by springs 41 and 42 to its initial position, and engages arresting projection 21 to arrest the respective stem and key in the actuated position, as shown for key 38 and the respective stem 11 in the upper portion of FIG. 2.

When after operation of key 38, key 37 is depressed, for example, the bent-over portion of stem 11 of key 37 lifts the arresting comb 40 again so that first the stem 11 and arresting projection 21 of key 38 is released by the arresting prong 44 so that key 38 can return to its normal position due to the action of its spring 24. The depressed key 37 first lifts the arresting comb, and is then arrested by engagement of the respective prong 44 with arresting projection 21 thereof.

All prongs 44 of arresting comb 40 are constructed in the same manner, except a prong 43 which cooperates with key 39 which is correlated with the operational condition "cash" of the taximeter. Depression of key 39 causes an angular displacement of arresting comb 40 in counter-clockwise direction, and consequently release of all other keys. Due to the shape of prong 43, key 39 is not arrested but returns to its normal inoperative position due to the action of spring 24. The reason for this construction will be explained hereinafter, and is due to a particular circuit and construction of the taximeter.

In order to prevent that several keys are depressed at the same time, a plurality of round circular discs 28 is located in a confined space between walls 14 and 29, and wall 17 and locking slide 30. The sum of all diameters of the round discs 28 is less than the distance between the walls 14 and 29, and corresponds to the width of projections 19 which normally guide the key stems in slots of plates 16 and 19 in which corresponding matching slots 45 are provided. When any key is operated, the respective projection 19 enters between two round discs 28, pushing the discs apart so that the free space is taken up, and no other key stem can enter between the round discs 28 whereby each key in the actuated position, locks all other keys in the normal inoperative position.

As noted above, in the "vacant" condition of the taximeter, the previously indicated fare must be cleared, and all electrical and mechanical parts returned to the initial condition. At the same time, the operation of the "vacant" key will result in the indication of an initial fare which must be paid by the customer even if he uses the taxicab only for a very short distance. Four different rates or tariffs are associated with the selector keys 34 to 37. Operation of these keys sets the taximeter to the respective rate, so that different fares will be charged for the same distance. The time rate is also operative, which means that the fare is increased even if the car does not travel, but waits for the customer, or stops in traffic.

However, when the special key **39** "cash" is operated, the time drive is disconnected, and only the distance drive remains operative for indicating the fare for travelled distances, while no additional fare is indicated when the taxicab does not move.

The purpose of the "cash" key **39** is to permit the driver of the taxicab, to move on for a short distance after completion of a trip after stopping the car for the purpose of unloading bags and suitcases. During such unloading operations, it may be necessary to move the car a small distance, which is to be charged, but no charge is to be made to the customer for the time required for unloading the vehicle after the destination has been reached. Since in the "cash" condition of the taximeter, the time drive is disconnected, the time during which the taxicab is at a standstill during unloading operations, is not charged.

Before a new trip is started, selector keys **34, 35, 36, 37** are locked, because projections **19** are located opposite the projecting abutments **48** of locking slide **30**. The driver can operate the "cash" key **39**, since no abutment **48** is located in the path of movement of projection **19** of key **39**, and when key **39** is in the actuated position, it is not arrested by arresting comb **40** due to the special construction of the respective prong, and is returned by spring **24** to its normal inoperative position so that the taximeter is not set to the condition "-cash." If the driver correctly operates the "vacant" key first, which must be operated when a new trip is started, locking slide **30** is displaced due to the engagement of projection **19** with the slanted face **33**, and key **38** operates the arresting comb **40**, as described above, so that the first prong **44** engages behind the arresting projection **21** of stem **11** of key **38**, as shown in FIG. **2**.

The taximeter now properly indicates the initial fare, and previous indications are cleared.

When one of the selector keys **34** to **37** is actuated, the taximeter is set to the respective selected rate or tariff. The respective selector key is arrested by a prong **44** of arresting comb **40**, while at the same time, the lifted arresting comb **40** releases the arresting projection **21** of the stem **11** of key **38**, so that the key **38** returns to its normal inoperative position due to the action of the respective spring **24**.

Operation of any key **34** to **37** is possible after operation of key **38** because the same shifts locking slide **30** to the releasing position in which the projections **19** are located opposite the recesses **31**. Any of the selector keys **34** to **37** can be actuated in any desired sequence so that at any time a different rate may be selected. Each operated selected key releases the last operated and arrested key, and is arrested in the advanced actuated position. Return of any actuated key to its normal position is required before the locking elements **28** permit any other key to move to the actuated position. Each selector key in the advanced actuated position, holds the locking slide **30** in the releasing position due to the engagement between its projection **19** with the shoulder of the respective abutment **48** when projection **19** is located in recess **31**.

At the end of a trip, the driver depresses "cash" key **39**, so that the respective key in the actuated position is released to return to its normal position under the action of spring **24**, and since its projection **19** releases the shoulder of abutment **48**, spring **34** returns locking slide **30** to the normal locking position shown in FIG. **3**.

All the selector keys **34** to **37** are again locked by the locking slide, so that the driver must actuate the "vacant" key **38** before he operates one of the selector keys **34** to **37**. Consequently, the driver is compelled to operate the "vacant" key **38** after he has operated the "cash" key **39** so that the taximeter starts a new trip in the correct condition in which the indication of the previous fare is cleared, and a new initial fare is indicated. Due to the sequential locking and releasing arrangement of the invention, keys can be used instead of a turnable knob or flag for initiating and continuing operations of the taxicab in a necessary sequence. The interlock arrangement of the invention accomplishes locking functions which are conventionally obtained by a turnable flag or knob due to the fact that the same must always return to the starting position corresponding to the condition "vacant" of the taximeter. Generally speaking, key **38** is a starting key obtaining a starting condition of the taximeter which must precede setting of the taximeter to any other operational condition.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of key locking and releasing arrangements in other types of key locking and releasing arrangements differing from the types described above.

While the invention has been illustrated and described as embodied in a sequential key locking and releasing arrangement for the keys of a taximeter, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

I claim:

1. Sequential key locking and releasing arrangement for an apparatus having different operational conditions, comprising: a set of selector keys correlated with the different conditions of the apparatus, respectively, and being movable between normal inoperative positions, and actuated positions for placing the apparatus in said conditions, respectively; releasable locking means for locking said selector keys in said normal inoperative positions; and a starting key movable between an inoperative normal position, and an actuated position for obtaining a required starting condition of the apparatus, said starting key in said actuated position operating said locking means to release said selector keys of said set so that any condition of the apparatus can be selected by operation of the respective selector key only after the apparatus has been set to the required starting condition by said starting key.

2. Arrangement as claimed in claim **1** wherein said apparatus is a taximeter; wherein said starting key is correlated with the vacant condition of the taximeter, and is a "vacant" key.

3. Arrangement as claimed in claim **1** wherein each selector key and said starting key includes a key stem; wherein said locking means includes a locking slide extending across said key stems, and spring means urging said locking slide to a normal position locking said key stems of said selector keys, said locking slide being operable by said key stem of said starting key in said actuated position to move to said releasing position for unlocking said key stems of said selector keys.

4. Arrangement as claimed in claim **3** wherein said locking slide has a slot and an abutment for each key stem of said selector keys so that said abutments block said selector keys in said normal position of said locking slide, and said slots permit movement of said selector keys to said actuated positions in said releasing position of said locking slide, said locking slide having a slanted face cooperating with said key stem of said starting key so that movement of said starting key to said actuated position moves said locking slide to said releasing position.

5. Arrangement as claimed in claim **1** comprising arresting means for arresting said selector keys and said starting key in said actuated positions, respectively; and wherein movement of any selector key to said actuated position operates said arresting means to release said starting key arrested in said actuated position; and wherein subsequent movement of any other selector key operates said arresting means to release the preceding last arrested selector key.

6. Arrangement as claimed in claim 5 wherein each selector key and said starting key includes a key stem having a projection; wherein said arresting means includes a spring biassed arresting comb mounted for angular movement and having prongs respectively abutting said key stems so that during movement of any key to said actuated position said projection lifts said arresting comb whereupon said projection is engaged by the respective prong for arresting the respective key in said actuated position, and sO that movement of any other key to said actuated position lifts said arresting comb to release said projection of the last operated key whereupon said other key is arrested.

7. Arrangement as claimed in claim 6 further comprising a special key having a special key stem with a smooth surface cooperating with a prong of said arresting comb for lifting said arresting comb to release said projection of the last operated and arrested key during movement of said special key to said actuated position, said smooth surface slidingly engaging the respective prong so that said special key is not arrested in said actuated position thereof.

8. Arrangement as claimed in claim 7 wherein said apparatus is a taximeter; wherein said starting key is correlated with the vacant condition of said taximeter; wherein said starting key is a "vacant" key; and wherein said special key is a "cash" key correlated with a condition of said taximeter in which only the distance of travel is measured.

9. Arrangement as claimed in claim 1 wherein each of said selector keys and said starting key include a key stem, and a transparent hollow push button mounted on said key stem for angular movement between a normal position for enveloping a lamp, and a servicing position in which the lamp is accessible.

10. Arrangement as claimed in claim 1 wherein said selector keys and said starting key are spring-biassed toward said normal position; wherein each selector key and said starting key includes a key stem having a projection; wherein said locking means includes a locking slide extending across said key stems and having a slot and an abutment for each projection of said selector keys, and spring means urging said locking slide to a normal position in which said abutments are located in the paths of movement of said projections of said selector keys, said locking slide having a slanted face cooperating with said projection on said key stem of said starting key so that movement of said starting key to said actuated position moves said locking slide to a releasing position in which said slots are located in the paths of movement of said projections of said selector keys; comprising a supporting plate parallel with said locking slide and forming a confined space with the same, and a row of round locking elements located in said space so that said projection of any single key stem enters between two locking elements during movement of the respective key to said actuated position whereby said locking elements block movement of said projection of any other key stem during movement of the respective other key to said actuated position.

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