PUBLISHED MAY 25, 1943. BY A. P. C.

B. BERIA

KEY INTERLOCK AND RELEASE FOR CASH REGISTER

Serial No. 305,382

Original Filed March 28, 1936 9 Sheets-Sheet 1

Fig. 1

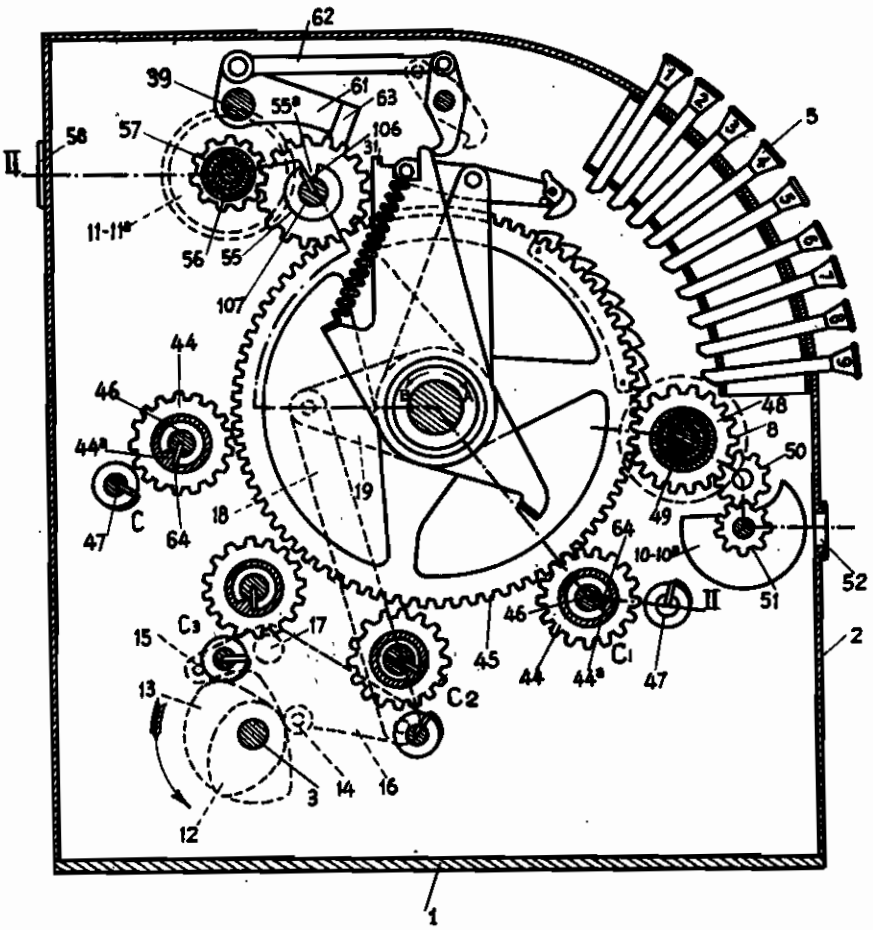

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Fig. 2

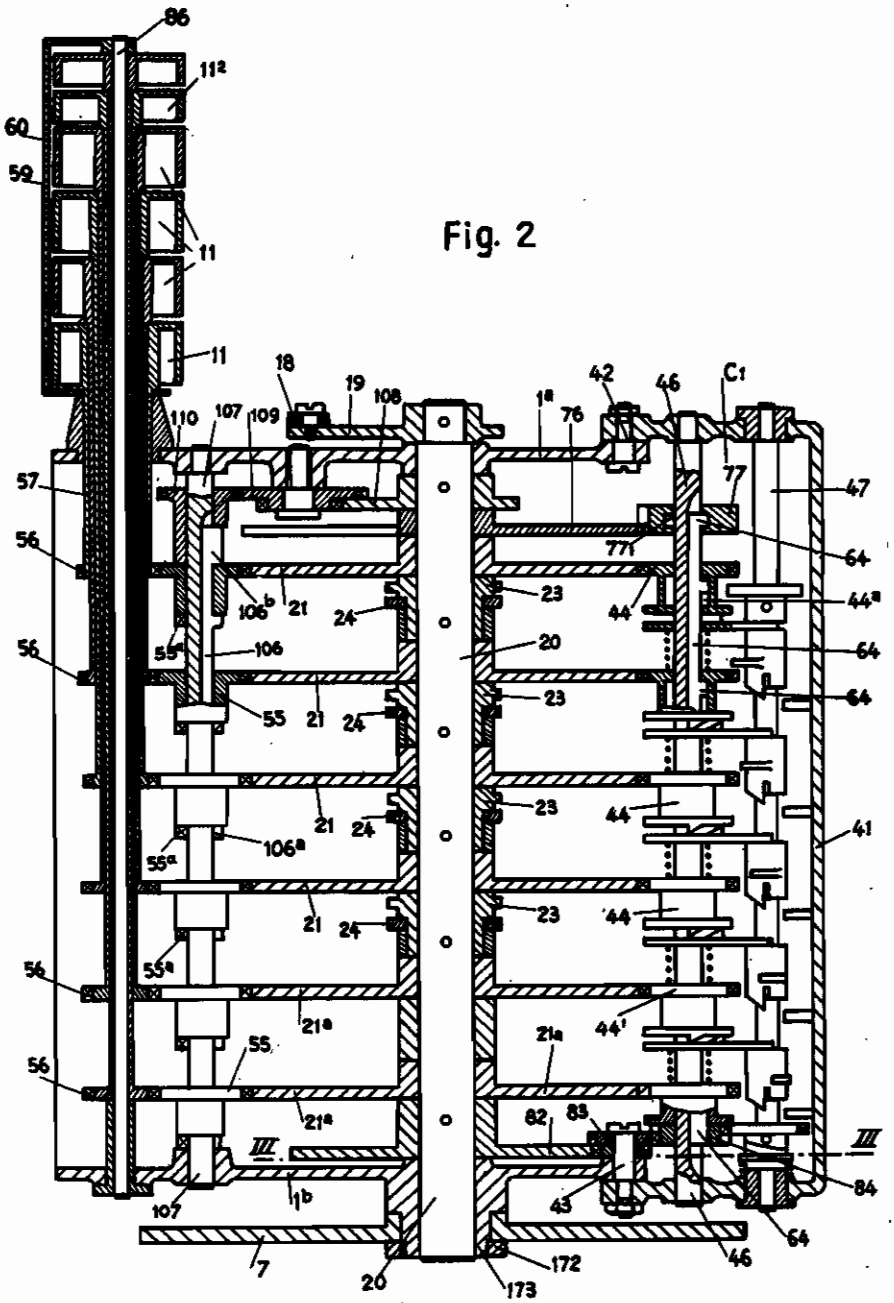

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Fig. 3

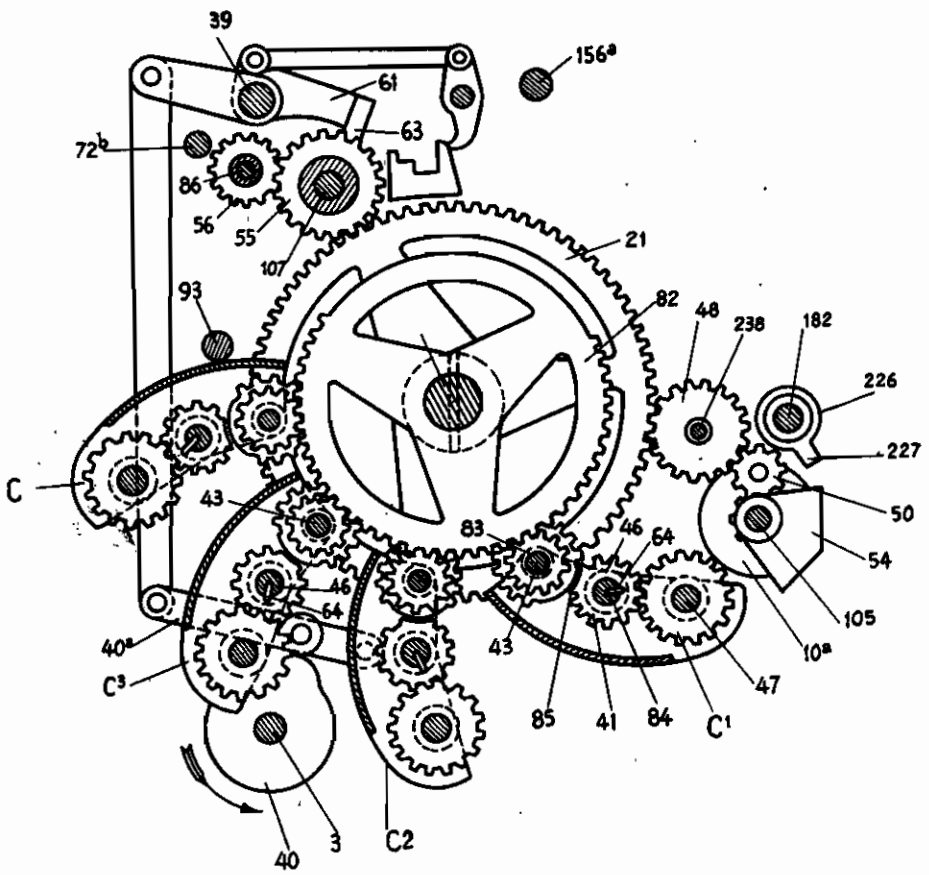

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Fig. 4

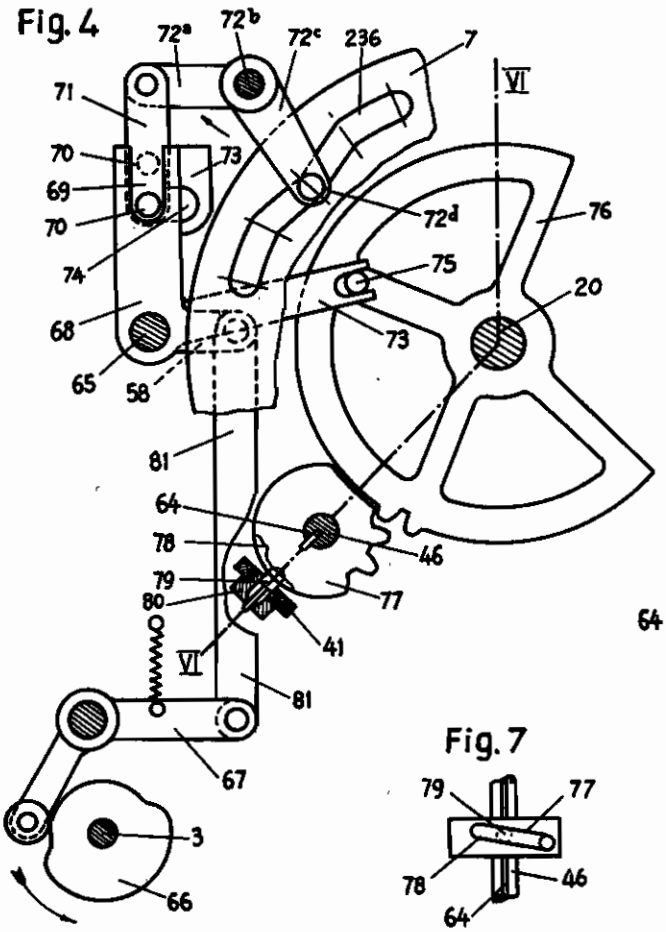

Fig. 6

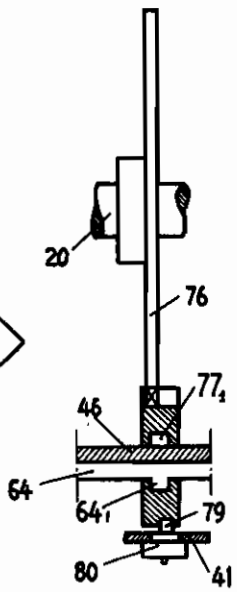

Fig. 7

Fig. 5

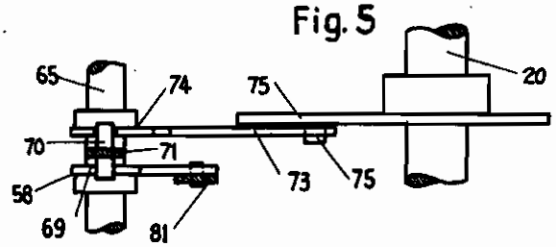

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Fig. 8

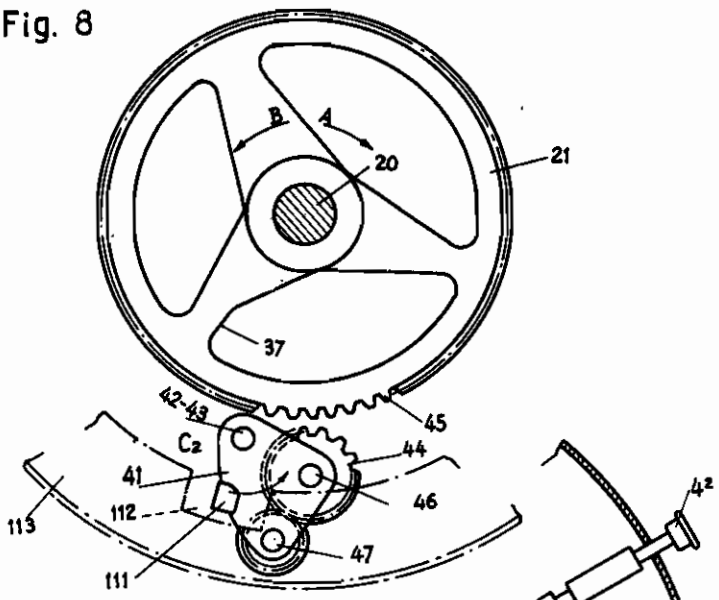

Fig. 9

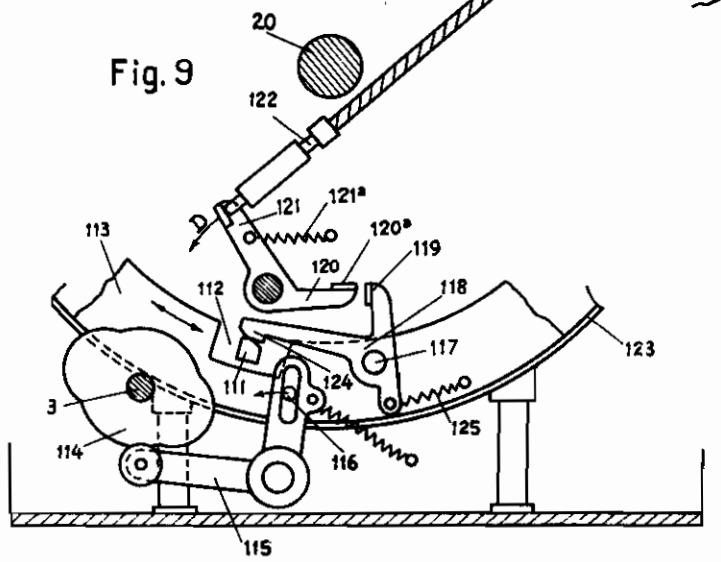

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Fig. 10

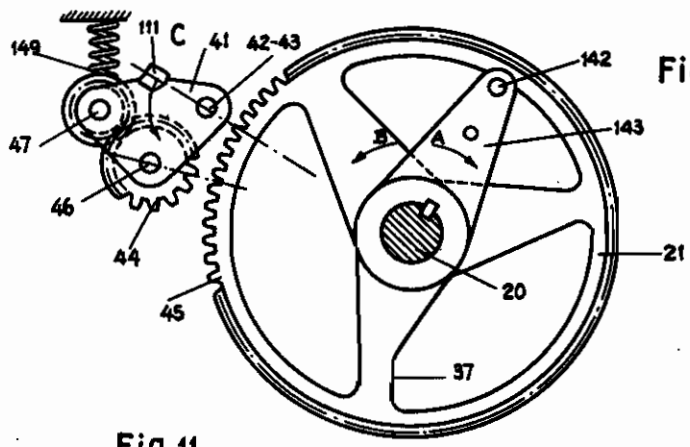

Fig. 11

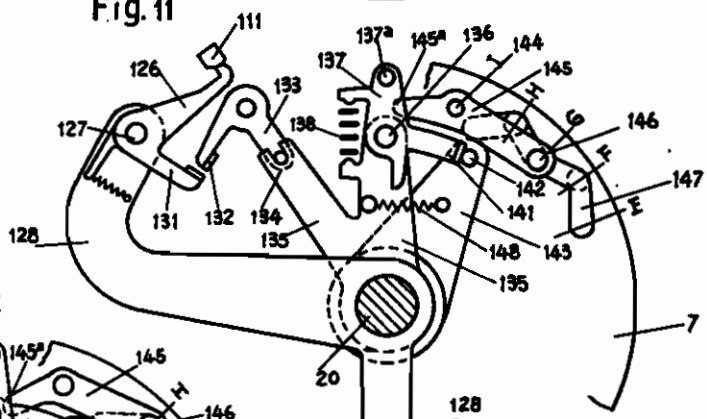

Fig. 12

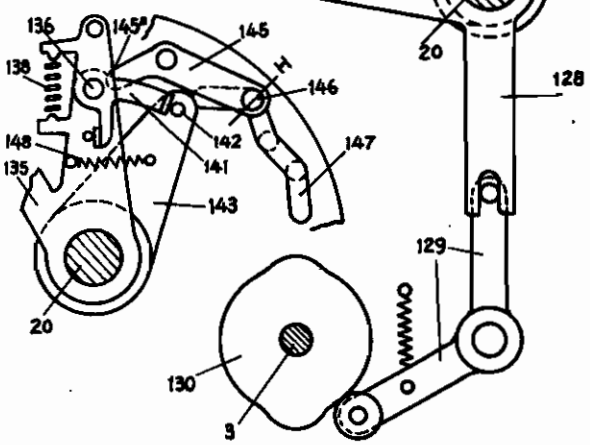

Fig. 13

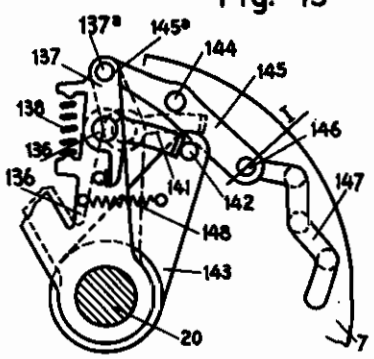

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Fig. 14

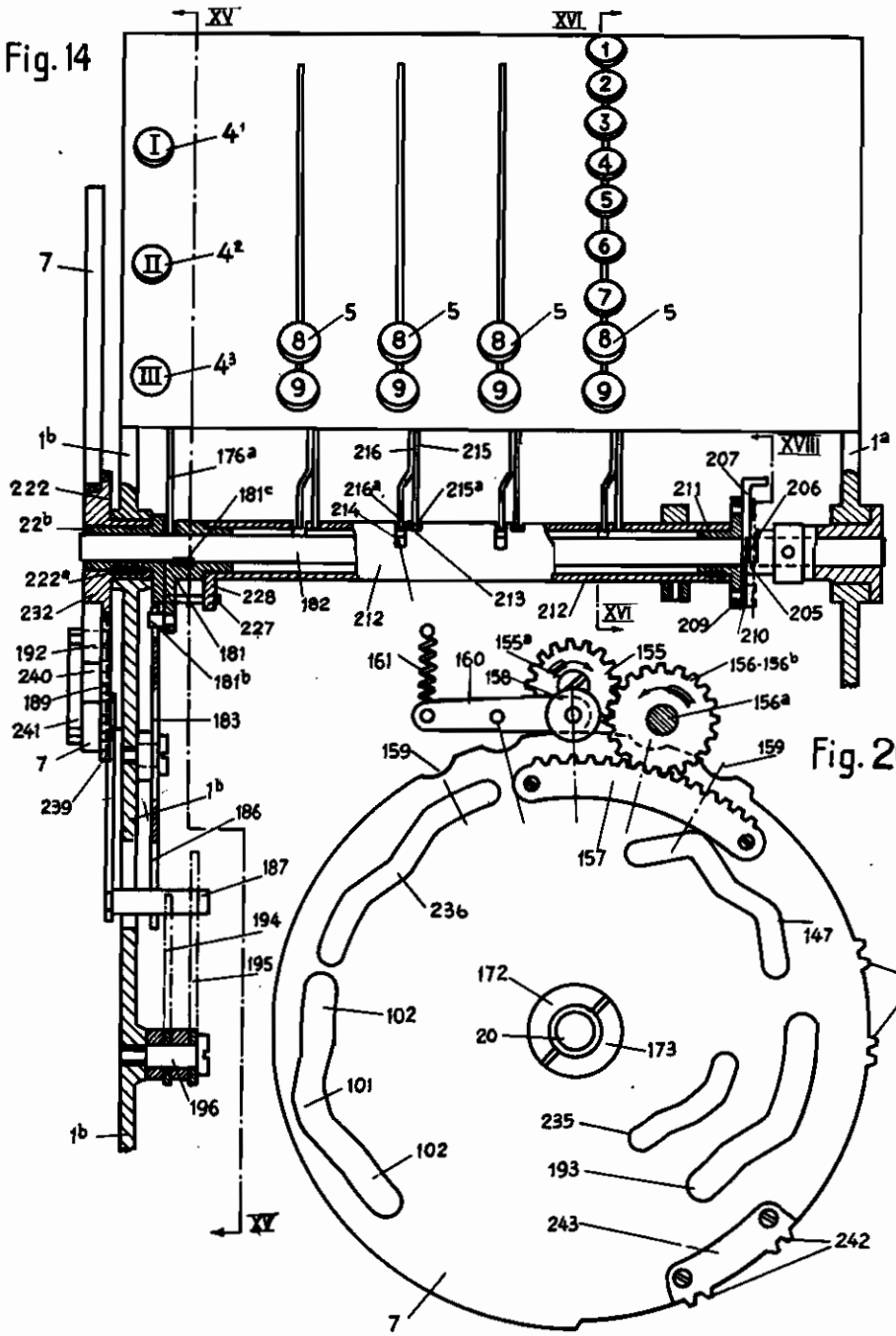

Fig. 20

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Fig. 15

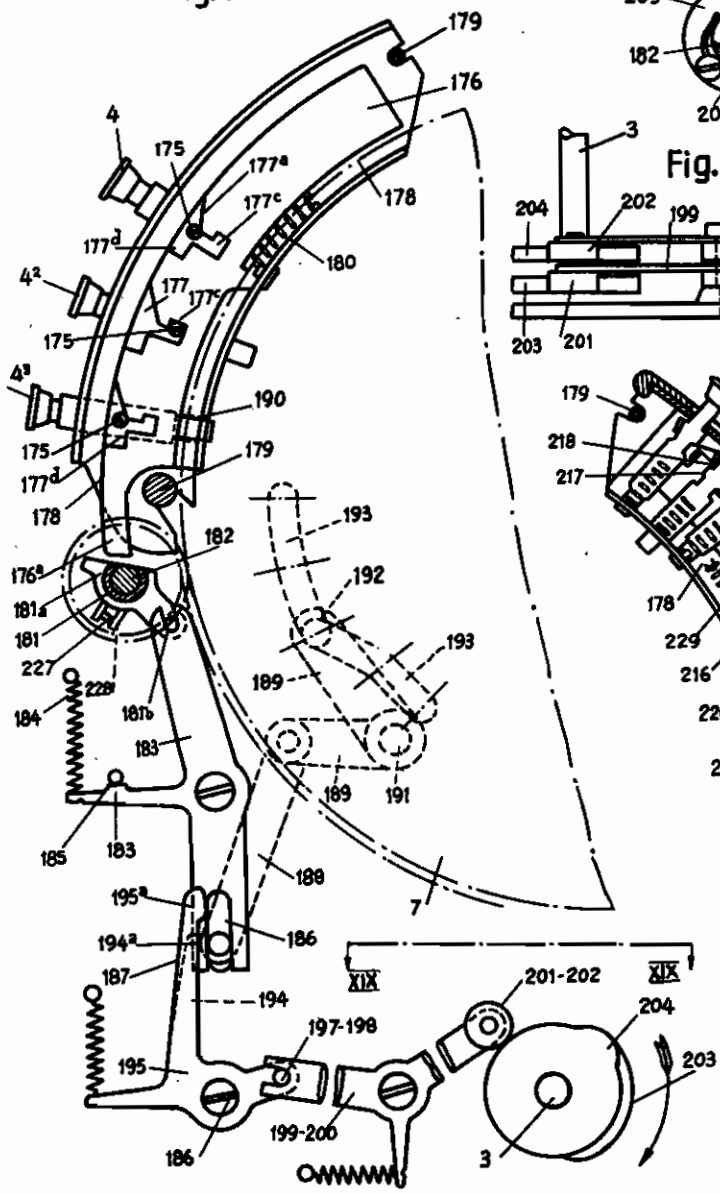

Fig. 18

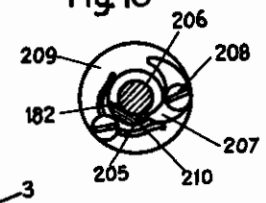

Fig. 19

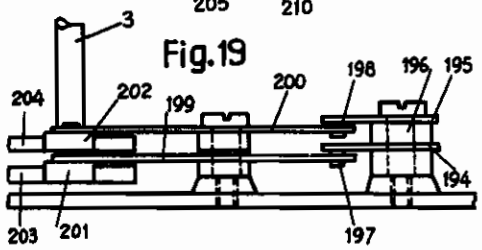

Fig. 16

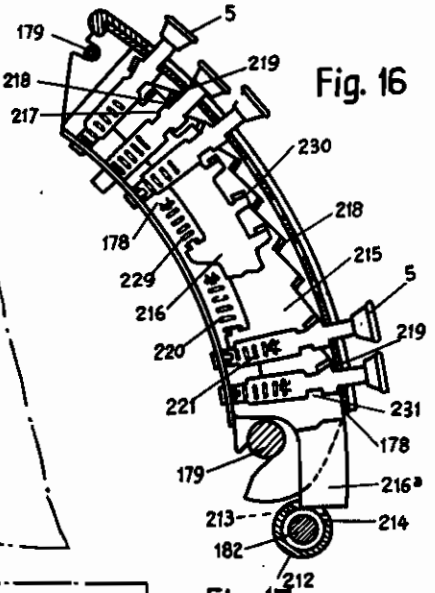

Fig. 17

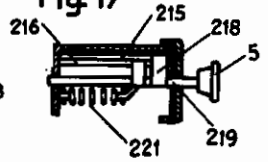

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Fig. 22

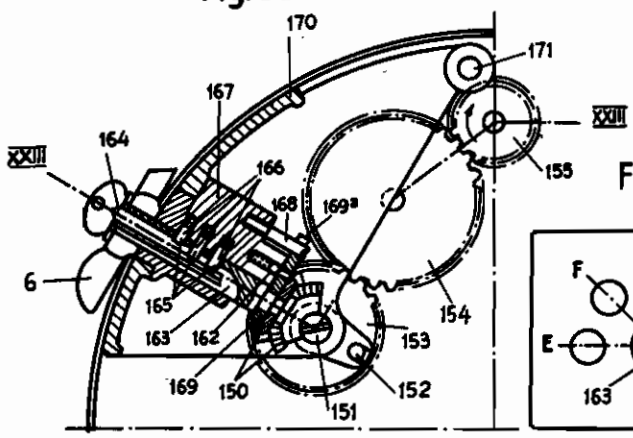

Fig. 21

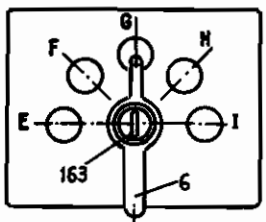

Fig. 23

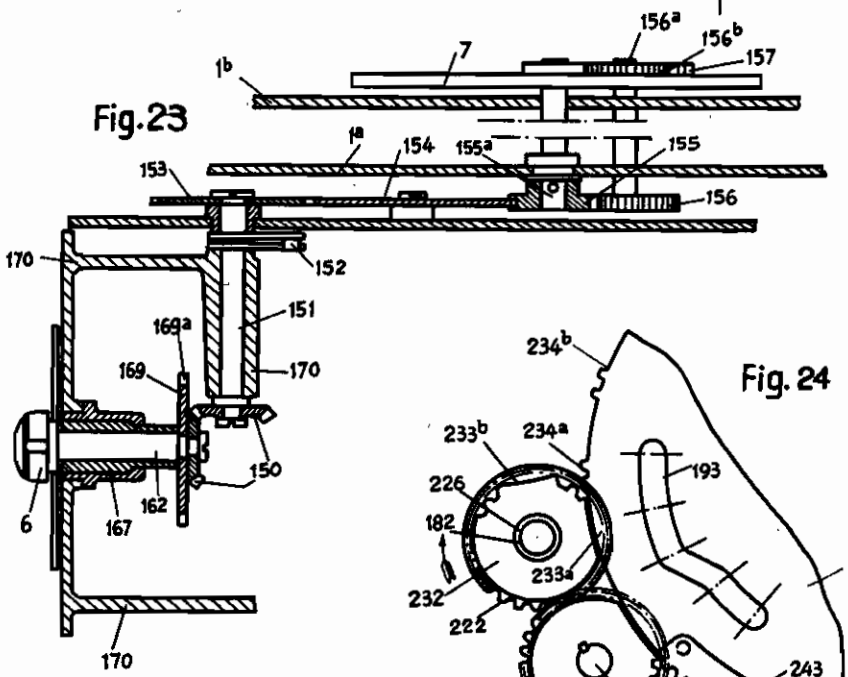

Fig. 24

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ALIEN PROPERTY CUSTODIAN

KEY INTERLOCK AND RELEASE FOR CASH REGISTER

Biagio Beria, Turin, Italy; vested in the Alien Property Custodian

Application filed November 20, 1939

This invention relates to cash registers of the type described in my patent application Ser. No. 71,522 and has for its object an improved arrangement for locking the selecting keys of the totalizers in their position during an operation and disengage such keys at the end of the operation.

Another object of the invention is to provide in a cash register of the abovementioned type means for detaining said totalizer keys in depressed position, means for locking said keys against depression and an element arranged to bring the detaining means to their releasing position and the locking means to their locking position, said element being operated by hand to produce a simultaneous release of the amount and totalizer keys.

These and other objects of the invention will appear from the following specification with reference to the annexed drawings, in which:

Fig. 1 is a vertical cross section through the central portion of the cash register, some of the parts intersecting the section plane being omitted for clearness sake.

Fig. 2 is a section on line II—II of Fig. 1;

Fig. 3 is a section taken on line III—III of Fig. 2;

Figs. 4 to 7 show the means operating the pick-up mechanism for the wheels of a totalizer, more particularly Fig. 4 is a side view, Fig. 5 a plan view, Fig. 6 a section on line VI—VI of Fig. 4 and Fig. 7 is a detail view.

Fig. 8 and 9 are two inner side views of the device for coupling and uncoupling partial totalizers.

Figs. 10 to 13 show the device for coupling and uncoupling the general totalizer, Figs. 10 and 11 are two inner side views, Figs. 12 and 13 are partial views of Fig. 11 with some members shown in another position.

Figs. 14 to 20 show the keyboard, more particularly Fig. 14 is a front view thereof with the members situated under the keyboard sectioned on line XIV—XIV of Fig. 15; Figs. 15 and 16 are sections taken on line XV—XV and XVI—XVI respectively of Fig. 14. Fig. 17 is a section of Fig. 16, Fig. 18 a section taken on line XVIII—XVIII of Fig. 14, Fig. 19 is a partial plan view on line XIX—XIX of Fig. 15. Fig. 20 is a partial side view of Fig. 14 in a slightly reduced scale.

Figs. 21 to 24 show the mechanism serving to prepare the cash register for the various kinds of operations, more particularly Fig. 21 is an outer view, Fig. 22 a vertical section through the axis of rotation of the handle,

Fig. 23 a section on line XXIII—XXIII of Fig. 22 and Fig. 24 a lateral inner view.

Referring to the drawings, the cash register comprises a supporting frame constituted by a bed plate 1 and two vertical walls 1*a*, 1*b* (Figs. 1 and 2) on which the cover plate 2 is mounted.

On the supporting frame are mounted:

The driving shaft 3 with a certain number of cams (Figs. 1, 4, 9, 11, 15 and 19) to which a rotation through 360° is imparted for every operation (adding operation or total taking) by hand or by means of a motor;

The general totalizer C and three partial totalizers C_1, C_2 and C_3 (Figs. 1, 2, 3, 8 and 10). The keyboard (Figs. 1, 9 and 14 to 17) comprising as many columns of nine keys 5 as required by the importance of the amounts cashed and a column of keys 4_1, 4_2, 4_3, for the selection of a partial totalizer C_1, C_2, C_3. Two sets of indicator wheels 10, 10*a*—11, 11*a*, respectively, of which one is arranged in the front portion and the other in the rear portion of the cash register (Figs. 1 and 2).

The handle 6 (Fig. 21) actuating the preparing disc 7, of which the adjustment prepares the cash register to perform in the next operation either the addition or the taking of a subtotal or total in the general totalizer or in one of the partial totalizers. The handle 6 may therefore be brought to five positions which prepare the cash register as follows, respectively:

Position E: taking total in the general totalizer;

Position F: taking total in a partial totalizer;

Position G: adding operation;

Position H: taking a subtotal in a partial totalizer;

Position J: taking a subtotal in the general totalizer.

The preparing mechanism

The preparing disc 7 (Figs. 20 and 24) is rotatably mounted on an annular extension 173 of the wall 1*b* and held by the ring 172. The angular displacements of the handle 6 are transmitted (Figs. 22, 23 and 24) through the pin 162, bevel wheels 160, pin 161, pin and slot connection 152 and gears 153 and 154 to the pinion 155 rotatably mounted by means of its pivot 155*a* in the upper portion of the wall 1*a*. The pinion 155 meshes with the pinion 156 of which the shaft 156*a* extends to the wall 1*b*, where it carries a second pinion 155*b* meshing with a toothed segment 157 fixed through the preparing disc 7. In accordance with the positions E, F, G, H and I of the handle 6, the periphery of the disc 7 is provided

with five notches 159 successively receiving a roller 158 fixed to the end of a lever 160 with a fixed fulcrum, urged by the spring 161. The handle 6 may be rotated only when the key 164 is introduced into a slot 163 of the pin 162 (Fig. 22). When this does not take place, the pins 166 provided in a stationary stud 167 which encloses the pin 162 are pushed by springs into holes bored transversely in the pin 162 which is thus kept against rotation with respect to the stud 167. When the key 164 is fitted in the slot, the tappets 165 raise the pins 166 releasing the pin 162. The latter further carries attached thereto a disc 169 with a peripheral slot extending over 180°. This slot receives a stop 168 fixed on the stud 167, so that the rotation of the handle 6 ends in its positions E and I, respectively. The stud 167 is fixedly connected with a member 170 which incorporates the supports for the pin 151 and the second bevel wheel 150.

The member 170 can oscillate about the pivot 171 (Figs. 22, 23) with respect to the lateral wall 1a and is permitted by the pin and slot connection 152 to be lifted together with all the members mounted therein to uncover the members of the cash register situated underneath.

Adding operations

The differential mechanism.—The amounts cashed are set on the totalizers and transmitted to the printing rollers and indicator wheels in the following manner:

A double cam 12, 13 is mounted on the driving shaft 3 (Fig. 1) and on said cam ride the rollers 14 and 15 of a lever 16 pivoted on the stationary pivot 17. A rod 18 is articulated to the lever 16 and is connected by its upper end to the arm 19 keyed on the main shaft 20. By this arrangement the main shaft 20 in the first period of each turn of the driving shaft 3 receives an oscillation in the direction of the arrow A of Fig. 1 (return stage) and in a second period of the same turn an oscillation in the opposite direction (arrow B) (actuating stage), each oscillation extending over about 66°.

The totalizers.—The totalizers C, C_1, C_2, C_3, are equal in construction. The totalizers are mounted in the casings 41 articulated to the pivots 42 and 43 of the vertical walls 1a and 1b (Figures 1, 2 and 3). To set up an amount on the general totalizer C the latter is oscillated by means of a mechanism which shall be described with reference to Figures 10 to 13, so that its wheels are engaged by the teeth 45. A similar movement is performed by the wheels 44 of the partial totalizer C_1, C_2 or C_3 which has been pre-selected by depression of a key 4_1, 4_2 or 4_3, the appertaining clutch mechanism being described hereinafter with reference to Figures 16 and 17.

In Figures 1 and 3 the partial totalizer C_1 is shown in its position of engagement with the setting wheels 21.

In all the totalizers the wheels 44 are loosely mounted on the shaft 46 mounted in the casing 41. When the setting wheel 21 effects a maximum oscillation (60°) which corresponds to the value of the amount "9," its respective wheel 44 rotates through 324°, i. e. $^9/_{10}$ of a full turn. Transfer of the tenth figure from one wheel to the other is effected by a mechanism including the shaft 47. This mechanism is not a part of this invention and is therefore not described in detail. The amounts set up by lowering the keys 5 are added in the totalizers. As the capacity of the totalizers exceeds the maximum capacity of the individual amounts, in addition to the wheels 44, further wheels 44' are provided, for instance for two higher denominations, said wheels 44' meshing with transmission wheels 21a also loosely mounted on the main shaft 20 and not provided with driving means. During the return stage following a setting up, i.e. during the first period of the next operation, the totalizers are oscillated by means of a device which shall be described with reference to Figures 8 to 13 so as to disengage their wheels 44 and 44' from the setting wheels 21 and 21a, reaching the position shown in Fig. 1 and 3 for the general totalizer C and the partial totalizers C_3 and C_2.

Taking totals and subtotals

Also when taking totals and subtotals the driving shaft 3 oscillates the main shaft 20 and arms 23 in the direction denoted by the arrow A (Fig. 1) and the extensions 36 return to the zero position any setting wheels 21 as may have been displaced by a previous addition. The oscillation of the arms 23 in the direction of the arrow B during the second period is effected idly, for a lock mechanism described hereinafter with reference to Figures 16 and 17 prevents depression of any amount key 5 during taking of totals or subtotals, the setting wheels 21, 21a being actuated in this case by pick-up mechanism acting directly on the totaliser wheels 44, 44'.

The pick-up mechanism in the totalizers.—This pick-up mechanism consists for each totaliscr of a key in the shape of a comb 64 movable in a longitudinal groove in the shaft 46 (Fig. 1 and 2). By the longitudinal displacement of the key 64 its branches may be brought in alignment with the teeth 44a arranged inside the hubs of the totaliser wheels 44 and 44'. In the position shown in Fig. 2, the branches of the key 64 do not come within reach of the teeth 44a, this being the position taken by all the keys 64 for additions. Displacement of the key 64 in order to bring its branches into the path of the teeth 44a, as is required for taking totals or subtotals, is effected by means of the mechanism shown in Figures 4 to 7:

The cam 66 keyed on the driving shaft 3 imparts to the bell crank lever 67 at each turn of the driving shaft 3 a reciprocating oscillation which is transmitted through the rod 81 to the bell crank lever 68 moving on the fixed pivot 65. The cam 66 effects the forward oscillation of the lever 67 after coupling of the totalizer which takes place at the end of the return stage of the main shaft 20, namely at the end of the first period; the return of the lever 67 takes place towards the end of the actuating stage, namely of the complete operation. The free end of the upper arm of the bell crank lever 68 is formed with a longitudinal slot 69 entered by the coupling pin 70 fixed to the link 71. The link 71 is articulated to an arm 72a fixed on the shaft 72b. A second lever 73 is pivoted behind the bell crank lever 68 on the same pivot 65. The upper arm of the second bell crank lever 73 is formed with a longitudinal slot ending at its upper end into a cross slot 74 (Figs. 4 and 5). When the arm 72a and link 71 are in the position shown in Fig. 4 which they take on an adding operation the coupling pin 70 is in alignment with the cross slot 74, in which it moves idly when it is carried along by the bell crank lever 68 on oscillation of the latter, causing the link 71 to oscillate about its articulation joint to the arm 72a. The bell crank lever 73 remains therefore stationary. As

the cash register is prepared for taking totals or subtotals by the displacement of the preparing disc 7 in the slot 23*b* of which the pin 72*d* on the arm 72*c* fixed to the other end of the shaft 72*b* is guided, the arm 72*a* is moved in the direction of the arrow shown in Fig. 4, which produces lifting of the coupling pin 70 as indicated in dotted lines. Towards the end of the first period as the bell crank lever 68 oscillates clockwise, the coupling pin 70 carries along the bell crank lever 73, of which the oscillation about the pivot 65 is transmitted through the fork of the lever 73 embracing the pin 75 to a toothed segment loosely mounted on the main shaft 20. As the respective totalizer is coupled the segment 76 engages with a pinion 77 loosely mounted on the totalizer shaft 46, and of which the teeth extend only over a portion of its periphery. On the other portion an inclined slot 78 (Fig. 7) is formed which engages a pin 70 fixed to a member 66 fixedly connected with the totalizer casing 41. Rotation of the pinion 77 therefore results in a longitudinal displacement thereof which is transmitted to the key 64 by means of the tooth 64' on the key entering an annular inner groove 77' in the pinion (Fig. 6).

Rotation of the shaft 46 and its key 64 is derived from the main shaft 20 and transmitted through the toothed wheel 62 keyed on the same shaft 20 (Figs. 2 and 3) and through the pinion 63 having a double set of teeth to the pinion 84 keyed on the shaft 46. The shaft 46 therefore performs its rotation in a direction opposite that in which the wheels 44 are rotated by the angular displacements of the setting wheels 21 during adding operations.

The type carriers.—The transmission ratio between the main shaft 20 and pinion 04 is such that the full oscillation of the main shaft 20 (66°) causes the shaft 46 and its key 64 to perform a rotation through 324° ($\frac{18}{10}$ of 360°). To prevent the oscillations of the totalizers which are necessary to couple and uncouple the wheels 44, 44' and the sets of teeth 45 on the setting wheels 21 and 21*a* from rotating the shaft 46, according to Figure 3 the pinions 03 and 64 meshing together are formed as Geneva gears to give a lost motion so that during oscillations of the totalizer the first teeth of both pinions 63 and 84, engage together as the wheels 44 come into mesh with the sets of teeth 45 on the setting wheels 21.

When the key 64 is moved to its coupling position with respect to the teeth 44*a* and the actuating oscillation of the shaft 20 (second period) starts, as the wheels 44 and 44' come into engagement with the teeth 45 on the setting wheels 21, 21*a*, the following movement takes place. The shaft 46 with the key 04 is rotated through 324°. After a certain idle movement of which the width (0° to 324°) varies according to the position taken by each of the wheels 44, 44', the branches of the key 64 pick-up the tooth 44*a* of the respective wheel carrying it along through the remaining part of the rotation of the shaft 46. The angular extent of the rotation of the wheel 44, 44' is proportional to the position of the wheel at the beginning of the operation, more particularly it is greater as the value appearing on the wheel as a result of previous additions is higher. When the value on the wheel is "9", the idle movement of the key 64 is nought, namely the wheels 44, 44' are carried along through 324°; when the value on the wheel is "0" the idle movement is 324°, namely the wheels 44, 44' remain at rest, not being carried along. In fact, the direction of rotation in which the wheels 44, 44' are carried along by the key 64 is opposite the direction in which the wheels are rotated by the setting wheels 21 to effect an adding operation.

The resetting pick-up mechanism.—After taking a total or subtotal, the setting wheels 21, 21*a*, indicator wheels 10, 10*a*, 11, 11*a* and printing rollers 8 are zeroized during the first period of the next operations, whether this be the taking of a total or subtotal or an adding operation. This return cannot be effected by the extension 36 on the arm 23 (Fig. 1) which zeroizes the gear after an adding operation. In fact, the extension 36 cannot return the setting wheels 21, 21*a* until their displacement in the direction denoted by the arrow B, while for taking totals or subtotals the setting wheels 21 are moved in the direction denoted by the arrow A. Return after taking a total or subtotal is produced by the key 106 arranged in a longitudinal groove in the shaft 107 on which the pinions 55 are loosely mounted (Figures 1 and 2).

The pinions 55 perform, on a full oscillation of the setting wheels 21 and 21*a*, a rotation only through 162°. The shaft 107 is rotated by the main shaft 20 through the toothed segment 108, pinion 100 with a double set of teeth and pinion 110 keyed on the shaft 107 by means of the tooth 106*b* on the key 106 through 162° at each oscillation through 66° of the shaft 20. The teeth 106*a* of the key 106 are aligned with the teeth 55*a* on the pinions 55. The arrangement is such that during adding operations the teeth 55*a* move over one semicircle, while the teeth 106*a* move over the other semi-circle, so that any interference between the movements of these two members is avoided. When on taking a total or subtotal the direction of rotation of the setting wheels 21 and pinions 55 is varied, while that of the shaft 107 and key 106 remains unaltered, the teeth 106*a* move during the actuating oscillation (second period) over the same semicircle preceding the teeth 55*a*. During the return oscillation of the main shaft 20 (first period of the next operation) the teeth 106*a* pick-up the pinions 55 and zeroize the setting wheels 21 restoring them to the position shown in Fig. 1.

The coupling and uncoupling of the partial totalizers

After taking a total if the following additions of the respective totalizer have to start again from zero, during the first period of the next operation the totalizer should remain uncoupled from the setting wheels 21, i. e. it should act in the same manner as after an adding operation. Conversely, of the pending addition has to be contained after taking the subtotal, the wheels 44, 44' of the respective totalizer should remain connected with the setting wheels 21, 21*a* also during the return oscillation.

As regards the partial totalizers C_1 C_2 C_3 selected by means of the keys 4_1 4_2 4_3, timing of uncoupling of the selected totalizer is effected by varying the time at which the respective depressed key is released. This timing mechanism will be described hereinafter with reference to Figures 22 to 28.

The mode of connecting and disconnecting the partial totalizers is shown in Figures 8 and 9. A stud 111 is attached to the casing 41 of each partial totalizer and is engaged by a notch 112 in a segment 113 to which is imparted a reciprocal oscillation about the shaft 20 at the end of the first period and at the end of the second period,

by virtue of the double cam 114 keyed on the driving shaft 3 which causes the bell crank lever 115 to perform two reciprocating oscillations on each turn of the said shaft. This movement is transmitted by means of a pin and slot guide 116 to the segment 113. The latter controls all the partial totalizers in the cash register returning them to their disconnected position by its movement to the left as the right-hand edges of the notches 112 strike against the studs 111. To simplify the drawings, only the control for the partial totalizer C_2 is shown in Figures 8 and 9. The segment 113 is guided in the stationary cradle 123. In association with each partial totalizer a lever 118 is articulated to a pivot 117 on the segment 113, one arm of which carries the abutment 119 cooperating with the abutment 120*a* on the arm 120 of a bell crank lever of which the other arm 121 is oscillated by the member 122 in the direction of the arrow D when the key 4_2 is depressed.

On depression of the key 4_2 the arm 120 is lifted. If the segment 113 is now moved to the left, the abutment 120*a* remains out of the path of the abutment 119. The spring 125 acts therefore on the lever 118 causing its hook 124 to ride on the stud 111 as shown in Fig. 9 and snap downwardly behind the latter. During the next return of the segment 113 to the right, the hook 124 carries along the stud 111, this causing the totalizer to oscillate as shown in Fig. 8 about the pivots 42, 43, while the wheels 44, 44' come into mesh with the sets of teeth 45 on the setting wheels 21, 21*a*.

When the key 4_2 is not depressed, the spring 121*a* holds the bell crank lever 120, 121 in the position shown in Fig. 9, in which during movement of the segment 113 to the left the abutment 120*a* enters the path of the abutment 119, so that the lever 118 is oscillated clockwise against the action of the spring 125, this resulting in the release of the hook 124 from the stud 111. In this case the segment 113 returns to the right without carrying along the stud 111. The totalizer remains disconnected. The first reciprocating oscillation of the segment 113 is performed at the end of the first period to connect the selected partial totalizer for the actuating movement. The second reciprocating oscillation starts towards the end of the second period to enable the partial totalizer disconnected by the right-hand edge of the notch 112 on striking to remain disconnected during the first period of the next operation, as is required after an adding operation and a total-taking is distinct from the taking of a subtotal. This anticipated definite disconnection obviously takes place if the key 4_2 is no longer depressed when the segment 113 performs its reciprocating oscillation at the end of the second period. If the key is still depressed in this period the disconnected partial totalizer is promptly connected again by virtue of the hook 124 on the return oscillation of the segment 113.

The coupling and uncoupling of the general totalizer

The control of the general totalizer to connect it or not and, in the affirmative case, to definitely disconnect it in advance or with delay is effected by means of the preparing disc 7 moved by the handle 6 rotatable about its pivot 162.

The casing 41 of the general totalizer (Figs. 10 to 13) articulated to the pivots 42, 43 is also provided with a stud 111 that may be carried along by the hook 126 articulated to the pivot 127 of a double bell crank lever 128 loosely mounted on the main shaft 20. The lower arm of this lever 128 is connected by means of a pin and slot guide to the end of the bell crank lever 129 to which the double cam 130 on the driving shaft 3 imparts once at the end of the first period and once at the end of the second period a reciprocating oscillation.

Similarly to what has been described above in connection with the hook 124 of the partial totalizer C_2 (Figures 8 and 9) the hook 126 carries along the stud 111 causing the wheels 44, 44' of the general totalizer to mesh with the set of teeth 45 on the setting wheels 21, 21*a* when on the upward movement of the upper arm of the lever 129 the abutment 131 of the hook 126 is not retained by the tooth 132 on the lever 133 pivoted on a fixed point. The lever 133 is operated through the pin and slot guide 134 by an arm 135 in the shape of a V which is also loosely mounted on the main shaft 20 so that the tooth 132 comes within the path of the abutment 131 or not. For this purpose one of the V-shaped arms 135 is provided with a pivot 138 to which an extension 137 is articulated, of which the free end carries the pin 137*a*. The spring 138 compressed between extensions on the arm 135 and extension 137 tends to hold the latter in the position shown in Figs. 11 and 12, in which an abutment 139 on the member 137 touches the pin 140 on the arm 135. The extension 137 further carries a projection 141 cooperating with a tooth 142 on the arm 143 keyed on the main shaft 20. A spring 148 is stretched between the arms 143 and 145.

A beam 145 is pivoted to the fixed pivot 144 and carries at one end the pin 146 movable in the W-shaped slot 147 in the preparing disc 7. The five angles of the slot 147 are denoted by the reference letters E. F. G. H. and J in accordance with the five position of the handle 8 (Fig. 21); the pivot 146 is situated in the angle of the W-slot denoted by the same letter as the positions taken by the handle 6. The five angles of the W lie on three circles of different radii on the disc 7. On the circle of greatest radius lie the angles F and H in which the pin 146 is situated for taking totals or subtotals in the partial totalizers (Fig. 12). The angle G in which the pin 146 is situated for the adding operations lies on the circle of intermediate radius on which the angle E also lies, wherein the pin 146 is situated for taking totals in the general totalizer. On the circle of smallest radius lies the angle J, in which the pivot 146 is situated for taking subtotals in the general totalizer (Fig. 13). The beam 145 can take therefore three different positions:

For adding operations and for taking a total on the general totalizer the front end 145*a* of the beam 145 is situated between the pin 136 and pin 137*a* (Fig. 11). When the arm 143 during the first period moves in the direction denoted by the arrow A (Fig. 10) with the shaft 20, it carries along by means of the spring 148 the arm 135 which can freely follow the movement for the end 145*a* of the beam 145 enters as stated above the space between the pin 136 and pin 137*a*. The tooth 132 on the lever 133 is therefore oscillated inwardly coming out of the path of the abutment 131. When at the end of the first period the double bell crank lever 128 performs an upward and a downward motion, the general totalizer is oscillated during the latter about the pins 42, 43 and its wheels 44, 44' are engaged by the setting wheels 21, 21*a*. During the second

period when the arm 143 returned in the direction denoted by the arrow B, its tooth 142 strikes the projection 141 returning the V-shaped arm 135 to the position shown in Fig. 11, in which the tooth 132 retains the abutment 131 when the arm 128 towards the end of the second period performs for the second time its upward movement. In this case the hook 128 does not engage the stud 111 so that the general totalizer already disconnected by the action of the spring 149 (Fig. 10) remains disconnected during the next downward movement of the arm 128 at the end of the second period. The general totalizer is therefore disconnected from the setting wheels 21 during the first period of the next operation, as is required after an adding operation or total-taking.

For taking totals or subtotals in the partial totalizers the general totalizer should be disconnected during the second period of the operation as well as during the first time of the next operation. This is obtained by the fact that according to Figure 12 the end 145*a* of the beam 145 is situated before the pivot 138 when the preparing disc 7 is adjusted in such manner that the pin 148 is situated in the angle F or in the angle H of the W-shaped slot 147. The arm 135 cannot follow the movements of the arm 143 and at the end of the first period as well as at the end of the second period the lever 133 is situated with its tooth 132 in the position shown in Fig. 11 where it prevents the stud 111 from being carried along by the hook 126.

To take a subtotal in the general totalizer, the latter should be connected both during the actuating rotation taking place in the second period and in the first period (return rotation) of the next operation. For this purpose the end 145*a* of the beam 145 is situated before the pin 137*a* on the extension 137 when the pin 148 is in the angle J of the slot 147. In this case the arm 135 may follow the arm 143, the extension 137 is, however, oscillated against the action of the spring 138 and its projection 141 is raised, as shown in dotted lines in Fig. 13. At the end of the first period the tooth 132 has come out of the path of the abutment 131 and the general totalizer is connected for the second period. During the next upward motion of the arm 143, its tooth 142 does not meet the projection 141 for it remains underneath the latter (position shown in dotted lines in Fig. 13). The spring 148 pulls further to the right the V-shaped arm 135 which remains in its displaced position in which the tooth 132 is inwardly displaced. Towards the end of the second period as the arm 128 performs its second oscillation to and fro the abutment 131 is not retained and the general totalizer C remains connected by virtue of the stud 111 being carried along for the second time by the hook 126 during the first period of the next operation; in which the projection 141 is released from the tooth 142, unless this operation is again a sub-total taking in the general totalizer.

The releasing mechanism for the totalizer keys

Timing of disconnection (with advance or delay) of the partial totalizers is obtained, as stated above, by the fact that the keys 4_1 4_2 4_3 for the pre-selection of the partial totalizers remain in their depressed position for a more or less long time.

For this purpose each key 4_1 4_2 4_3 (Figs. 14 and 15) is provided with a cross pin 175 and a segment 178 is provided with a notch 177 for each key in which the cross pin 175 is movable.

The segment 176 is mounted capable of displacement in a support 178 attached to the rods 179 fixed through the walls 1*a* and 1*b* of the frame. The spring 180 tends to push the segment 176 downwardly.

On depression of a key the cross pin 175 strikes the inclined edge 177*a* of the notch 177 (see key 4_1 fig. 15), so that the segment 178 is moved against the action of the spring 180 upwardly and the cross pin 175 passes by its portion 177*b* into the portion 177*c* of the notch 177 extending upwardly (see key 4_2 fig. 15). The segment 178 is now lowered again by the spring 180 and the key cannot resume its raised position under the action of the return spring 190 unless the segment 178 is positively lifted. Lifting is produced by the nose 181*a* on the sleeve 181 fixed by means of the key 181*c* on the shaft 182 striking against the lower extension 176*a* on the segment 178 (figs. 14 and 15), which takes place when the sleeve 181 is rotated anti-clockwise. To effect this rotation a pin 181*b* on the sleeve 181 is guided in a slot in the end of a three-arm lever 183, of which the horizontal arm is normally held by the spring 184 against the fixed stop 185. The lower arm of the lever 183 is also formed with a slot 186 through which the pin 187 fixed to the lower end of the link 188 projects. The pin 187 may be brought within the slot 186 into an upper position and a lower position. It is brought to its upper position for taking a subtotal. For adding operations and for total-taking the pin is brought to its lower position. Displacement of the pin 187 is obtained by the fact that the rod 188 is articulated to the bell crank lever 189, articulated to the fixed pivot 191 and guided by its pin 192 in the slot 193 in the preparing disc 7. The slot 193 is of such shape that in the positions G, E, F, (adding operations and total-taking) the pin 192 is at a distance from the center of the disc 7 greater than in the case of subtotal-taking (positions H and J). When the pin 192 enters the portion of the slot 193 nearer the center, the rod 188 is pulled upwardly and the pin 187 is accordingly moved towards the top of the slot 186 (position shown in dotted lines in fig. 15).

In this position the pin 187 is situated opposite the abutment 195*a* on a lever 195 while in the lowered position it comes opposite the abutment 194*a* on a lever 194. The three-arm lever 183 is therefore oscillated in accordance with the oscillations of the lever 194 or of the lever 195 according to the position of the pin 187. Both levers 194 and 195 are pivoted on the common pivot 196 (see also fig. 19) so that the lever 194 carries its abutment 194*a* by a shorter arm than that by which the lever 195 carries its own abutment 195*a*. The pins 197 and 198, each of which is mounted on one of the levers 194 and 195, are guided in the slots of the bell crank levers 199, 200, respectively, each of which is provided with a roller 201, 202 riding on a cam 203, 204, respectively, on the driving shaft 3. The operative part of the cam 203 acting on the roller 201, connected by means of the bell crank lever 199 with the shorter lever 194 is longer than the operative part of the cam 204 controlling the roller 202 connected through the bell crank lever 200 with the longer lever 195. The sloping portions of both cams 203, 204 are situated side by side while the rising portion of the cam 203 is displaced forward with respect to the corresponding portion of the cam 204. The cam 203 lifts the roller 201 during the second period while the cam

204 lifts the roller 202 only shortly before the end of the second period. Therefore, when the pin 187 is in the lower portion of the slot 186, the movement of the lever 183 and striking of the nose 181*a* against the extension 176*a* of the segment for releasing the keys 4_1 4_2 4_3 are completed before the segment 113 (figs. 8 and 9) performs its second reciprocating oscillation at the end of the second period, so that after the adding operation or total-taking the respective partial totalizer may be disconnected from the setting wheels 21 during their return to zero. When the cam 204 raises the roller 202, the longer lever 185 oscillates idly.

If the pin 187 is in the upper portion of the slot 186, the movement of the lever 183 for releasing the keys 4_1 4_2 4_3 takes place after the second oscillation of the segment 113, as is required for taking subtotals to cause the wheels to follow the zeroizing movement of the setting wheels 21 and resume their initial position. In this case the shorter lever 184 performs the movement idly.

The mechanism described for releasing the keys of the totalizers is associated with the mechanisms which;

(*a*) release the amount keys 5 after each adding operation and when the handle 6 is brought to one of the positions for taking totals or subtotals after the amount keys had been depressed, having changed one's mind;

(*b*) lock the amount keys when the cash register is prepared for taking totals or subtotals;

(*c*) lock the keys 4_1 4_2 4_3 of the partial totalizers when the cash register is prepared for taking a total or subtotal in the general totalizer.

Releasing and locking mechanism for the amount keys

Release of the amount keys 5 is effected at the same time as release of the keys 4_1 4_2 4_3 of the partial totalizers. The sleeve 181 releasing the latter is rigidly fixed on the shaft 182 by means of the key 181c. A sleeve 205 (Figs. 14 and 18) is keyed on the end of the shaft 182 mounted in the wall 1*a* and is provided with a cross cut 206 receiving the tooth 207 mounted capable of rotating about the pivot 208 on the disc 209. The spring 210 also anchored to the disc 209 pushes the tooth 207 against the shaft 182. The disc 209 is keyed by means of its hub 211 in a tube 212. This tube is provided for each column of amount keys 5 with two transverse cuts 213, 214 angularly displaced to each other in the manner shown in Figs. 14 and 16. The end 216*a* of a segment 216 is located in the front cut 214 and its upward movement produces locking of the amount keys 5 against depression. The end 215*a* of the segment 215 effecting release of the amount keys 5 enters the rear cut 213. The rotary movement of the sleeve 181 to release the keys 4_1 4_2 4_3 is transmitted through the shaft 182 and the edge of the cut 206 in the sleeve 205 to the tooth 207 and is imparted by the latter through the members 209 and 211 to the tube 212 pushing the segment 215 upwardly by the edges of its cuts 213. This segment 215 is provided with inclined abutments 218 (Figs. 16 and 17) resting under the action of springs 220 on inclined portions 217 of the keys 5 when the latter are in their lifted position. The spring 220 is compressed between the segment 215 and the stationary support 178 for the keyboard. On depression of a key 5 its inclined portion 217 causes the segment 215 to slide and after a certain length the spring 220 causes the abutment 218 to enter a notch 218 in the key 5 situated at the end of the inclined portion 217 as shown in Fig. 16 in connection with the key having the value "2." The amount keys 5 cannot all resume their initial position until the tube 212 is rotated as described in such manner that the edges of their notches 213 lift the segments 215.

For taking totals or subtotals the amount keys 5 are locked by the pinion 222, of which the rotation is transmitted through the key 222*a* to the sleeve 226, the tooth 227 of which projects into a fork 228 forming the end of the tube 212 in the manner of a flange. The pinion 222 is rotated anti-clockwise when the preparing disc 7 is moved from the position for adding operations to that for taking totals or subtotals; the pinion 222 performs a first partial rotation when the handle 6 is moved to the position F and H for taking totals and subtotals in a partial totalizer, and a second partial rotation is effected when the handle 6 and disc 7 move to the positions E and J for taking a total or subtotal in the general totalizer.

The pinion 222 is provided with a lateral disc-shaped extension 232 (Fig. 24), two portions of the periphery of which are provided with teeth ahead of which portions 233*a* and 233*b* deprived of teeth extend and are formed in the manner of Maltese crosses. In accordance therewith the edge of the preparing disc 7 is formed with two spaced sets of teeth 234*a*, 234*b*. On moving the disc 7 from its position G to its position F in a first step, the edge of the disc 7 slides on the smooth portion 233*a* of the extension 232 whereupon the set of teeth 234*a* advances the disc 232 and pinion 222 through a certain angle. On further rotation of the disc 7 to the position J, its edge slides on the second portion 233*b* deprived of teeth where-upon the teeth 234*b* advance the pinion 222 clockwise through a second angle. To insure advance of the pinion 222 also in clockwise direction when the disc 7 goes over to its positions H and J by an anti-clockwise rotation, the said pinion 222 meshes with a second pinion 239 keyed on the pivot 240 to which the disc 241 is secured, the periphery whereof is equal in shape to that of the disc 232.

The teeth on the disc 241 cooperate with teeth 242 forming part of a member 243 secured on the preparing disc 7 to eliminate any interference between the teeth 242 and the teeth on the disc 232 as well as between the teeth 234*a*, 234*b* and the teeth on the disc 241.

The angular extent of rotation of the disc 232 is such that in the first step the tube 212 lifts the segments 215 to release any depressed key 5, whereupon the edge of the notches 214 pushes the segments 216 upwardly against the action of the springs 228. The projections 230 on the segments 216 are thereby caused to enter lower notches 231 in the keys 5 preventing depression of the latter.

During the rotation of the driving shaft 3 transmitted through the three-arm lever 103 to the shaft 102, the latter oscillates idly the tooth 207 having already been drawn away from the edge of the notch 206 when the tube 212 has been angularly displaced by effect of the rotation of the pinion 222; a further rotation of the sleeve 205 is therefore no longer transmitted to the tube 212.

The locking mechanism for the totalizer keys

The second partial rotation of the pinion 222 causes the fork 228 to effect an angular displace-

ment in the direction of the arrow shown in Fig. 15 and meet the back of the nose **181** which is carried along so that the extension **178***a* of the segment **176** is not only temporarily lifted, but also maintained in its highest position in which the segment **176** is raised by an extent such that the cross pins **175** of the keys 4_1 4_2 4_3 enter the upper portions **177***d* of the notches **177** preventing any depression of the keys. During this displacement the three-arm lever **183** effects a clockwise rotation so that in the next oscillation derived from the driving shaft **3** the abutments **194***a* and **195***a* do not reach the pin **187**.

The keys 4_1 4_2 4_3 of the partial totalizers are thus locked by the preparation for taking totals or subtotals in the general totalizer. The amount keys **5** already locked by the first partial rotation of the pinion **222** remain locked because the lower edges of the extension **218***a* on the further rotation of the tube **212** come out to the notches **214** and rest on the cylindrical outer wall of said tube **212**.

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