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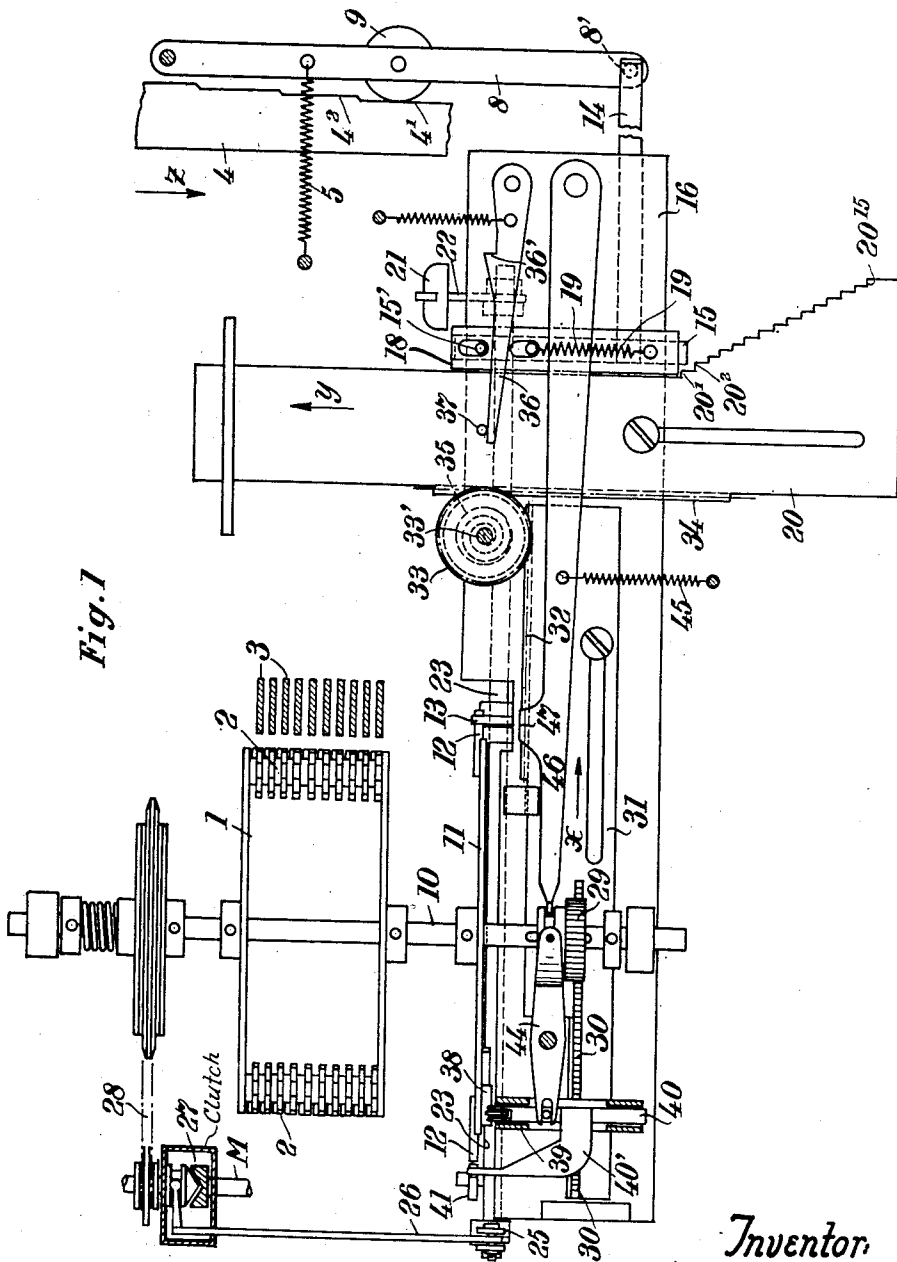
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MULTIPLE TOTALIZER STRUCTURE

Filed March 30, 1937

4 Sheets-Sheet 1



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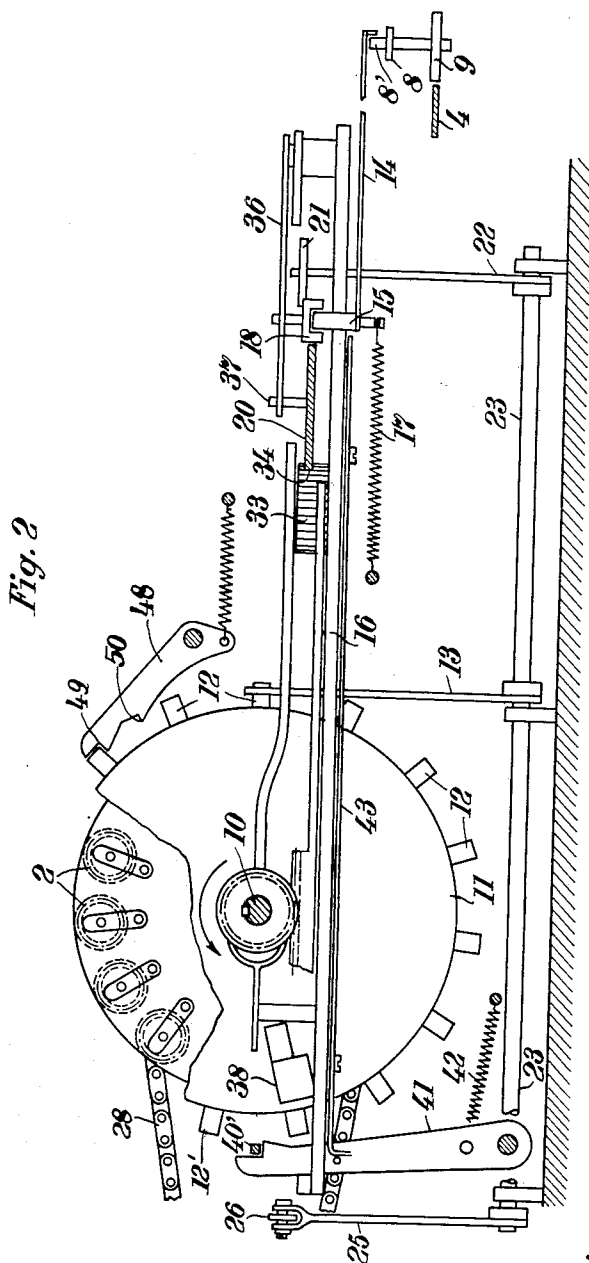
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Fig. 3

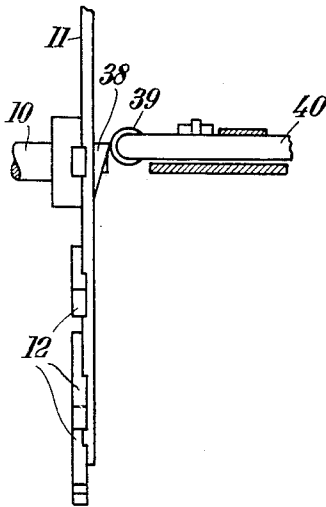


Fig. 4

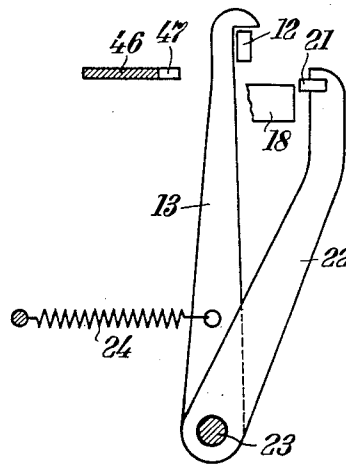
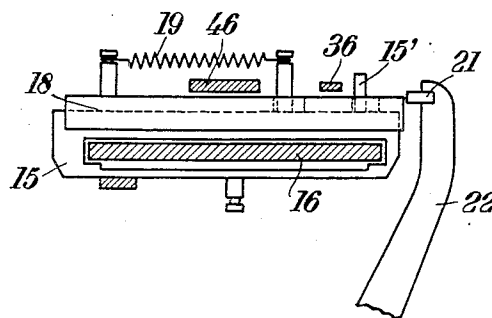


Fig. 5



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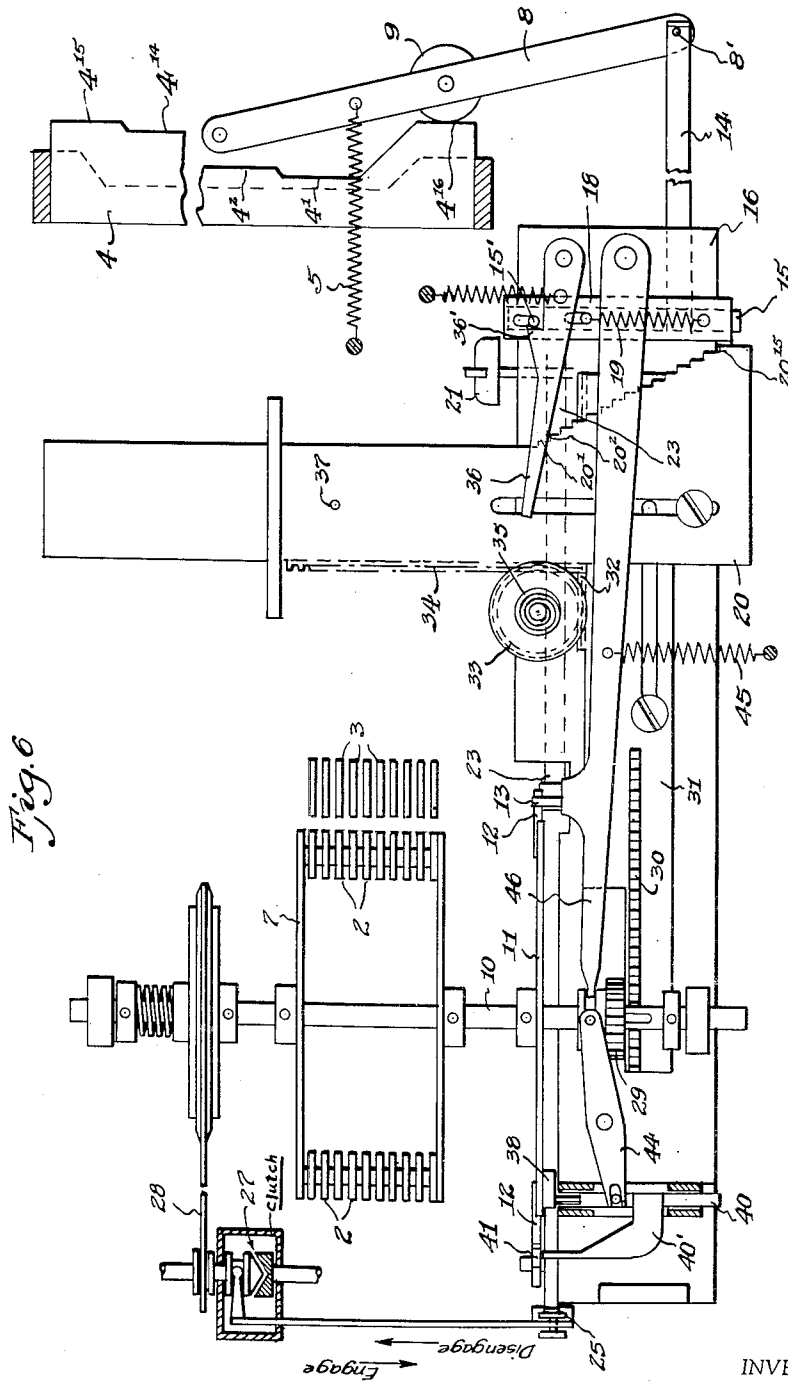
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MULTIPLE TOTALIZER STRUCTURE

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

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MULTIPLE TOTALIZER STRUCTURE

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5 Claims. (Cl. 235-60)

This invention relates to a calculating apparatus and has particularly to do with the mechanism for operating of totalizer drums.

In existing calculating apparatus, drums are employed which have a large number of totalizers arranged peripherally to be brought into engagement selectively with displaceable members of the calculating apparatus. Numerous devices for operating the totalizer drums are known. For instance, there has been a rotating arm coupled to the totalizer drum and so arranged that the projections in the periphery of the drums can be brought into the path of the arm by means of the operating keys. These projections selectively lock the totalizers in operative position. This type of device is complex and is not capable of efficient operation from the paper carriage of the apparatus.

Another old device is that in which spirally arranged projections are connected with the drum to cooperate with a projection operated by the paper carriage. The spiral arrangement of the projections involves mechanical difficulties. Moreover, it is desirable that the projection and a coupling pawl slide relatively to one another while being driven under considerable power. This causes a great stress on the operating parts.

The object of the present invention is to provide a simple and efficient drum controlling mechanism which may be operated from the paper carriage and one in which the operating parts are not subjected to unusual stress at any time. Further objects and features of the invention have to do with specific construction and fabrication of the apparatus as will be clearly brought out in the following description and claims.

In the drawings:

Fig. 1 is a plan view of the totalizer drum and its operating mechanism.

Fig. 2 is a side elevation of the parts illustrated in Fig. 1, portions of the elements being broken away to make the operation of the device more clear.

Figs. 3 to 5 are partial elevations of certain elements of Figs. 1 and 2 showing details of the mechanism.

Fig. 6 is a view similar to Fig. 1 showing the parts just prior to the return operation.

Referring to the drawings, a totalizer drum 1, rotatably mounted on a shaft 10, is provided with peripherally spaced totalizers 2. In the device shown, there are fifteen totalizers spaced around the drum. Each of the totalizers 2, when

in operative position, is engageable with racks 3 suitably mounted to be operated from the keyboard (not shown) of the machine.

The present invention has to do with the control of the movement of the totalizer drum 1. The operation of drum 1 is directly controlled by the paper carriage (not shown) which shifts a stepped bar or rail 4. The rail 4, in the normal movement of the carriage from left to right, moves in the direction of the arrow Z (Fig. 1). Steps 4¹, 4², etc., up to 4¹⁵, are arranged in order along the bar or rail 4 and a final and highest step 4¹⁶ is provided adjacent step 4¹. A follower lever 8 has a contact roller 9 arranged to ride on the steps of rail 4. A spring 5 acts upon the lever 8 to maintain the roller in contact with rail 4. In the position shown in Fig. 1, the contact roller 9 bears on step 4¹ and the totalizer drum is correspondingly turned into a position in which the first totalizer 2 may cooperate with the racks 3.

On shaft 10 is also mounted a wheel 11 having spaced radial projections 12 which correspond in number to the totalizers 2 and which cooperate successively with a hook-like detent 13 (see Figs. 1 and 4), mounted on a shaft 23. Movement of shaft 23 will shift detent 13 either into or out of engagement with the projections 12. If projections 12 are not engaged by detent 13, then shaft 10 may be turned by a motor shaft M acting through a clutch 27 and a belt 28. Clutch 27 is a suitable disengageable type illustrated diagrammatically and arranged to be controlled by a rod 26, movement of which will be later explained.

Movement of control shaft 23 and detent 13 is effected through a lever 22, also secured to shaft 23. At the top of lever 22 is a broad end 21 arranged to be contacted by a slide-member 18 slidable longitudinally of a slide 15. A spring 19 tends to hold slide-member 18 in the position shown in Fig. 1, thereby tending to hold detent 13 in engaged position. Slide 15 is shiftable longitudinally of a support plate 16 of the machine frame. A spring 17 tends to hold slide 15 to the left as viewed in Fig. 2. A rod 14 on slide 15 extends toward follower-lever 8 and is provided with a bent over end which is contacted by a pin 8' on lever 8. If the paper carriage is shifted so that another step, for example, step 4², is contacting roller 9, lever 8 will be shifted and through pin 8' and rod 14 will draw slide 15 and slide-member 18 to the right against the action of spring 17.

A spring 24, Fig. 4, of greater strength than

spring 19, between slide 15 and slide-member 18, tends to turn shaft 23 in a direction to release the projections 12 of wheel 11 from the locking action of the detent 13. This release is, however, controlled by steps 20¹, 20², 20¹⁵, on a bar 20 which is transversely slidable on plate 16. As viewed in Fig. 1, slide-member 18 bears at one end on step 20¹ of bar 20. Bar 20 is movable in a direction parallel with the operative movement of the paper carriage and rail 4. As soon as slide 15 and slide-member 18 are displaced to the right, as above explained (Fig. 1), by the movement of rail 4 and follower-lever 8, slide-member 18 will no longer be supported by step 20¹ of bar 20. Consequently, spring 24 acting on shaft 23 may turn lever 22 and the broad-end 21 will shift slide-member 18 against spring 19. This movement of shaft 23 releases detent 13 from wheel 11.

Mounted also on shaft 23 (Fig. 2) is a forked lever 25 connected to previously mentioned rod 26 leading to the clutch 27. During the turning movement of shaft 23 permitted by the displacement of slide 15 to the right, the clutch 27 will be engaged to couple motor shaft M to chain drive 28 and drum shaft 10. The drum shaft will then be rotated in the direction of the arrow, Fig. 2.

Slidably splined to shaft 10 is a pinion 29 which meshes with a rack 30 on a slide bar 31, the latter being slidable lengthwise of plate 16. The drum-shaft 10, in turning as above described, moves the slide bar 31 in the direction of the arrow x in Fig. 1. A second rack 32, carried on slide bar 31, meshes with a pinion 33 mounted on plate 16. Stepped bar 20 is also provided with a rack 34 which meshes with pinion 33. Movement of the slide bar 31 in the direction of arrow x therefore causes an equal movement of stepped bar 20 in the direction of arrow y in Fig. 1. This movement lasts until one of the succeeding steps 20² et cetera meets the end of shifted slide-member 18 to take the place of the preceding step. Instantly the contacting step on bar 20 moves the slide-member 18 into the original position thereby shifting broad-end 21, lever 22 and detent 13 against spring 24. The hook-like detent 13 seizes the succeeding projection 12 on wheel 11 and holds the drum shaft fast. Simultaneously, movement of shaft 23 opens clutch 27 through movement of fork-lever 25 and rod 26, thereby cutting out the drive between the motor-driven shaft M and drum shaft 10.

There is arranged between the pinion 33 and a shaft 33', supporting said pinion, a spiral spring 35 which becomes stressed during the movement of the bars 31 and 20 from the initial position. This spring is used, as will later be described, upon return of the paper carriage, to effect return of bars 20 and 31 to their initial positions.

The actuation of the device corresponding to other positions of rail 4 need not be described since they are the same as above described.

The described operating mechanism works with complete safety and allows exceptionally high speed to be obtained, irrespective of whether the operation is from one totalizer to the next in order, or whether any desired number of totalizers are skipped; thus, for example, one can pass from the first to the eighth, tenth or twelfth totalizer. Special regard is required only in respect of the operation involved in passing from the last totalizer to the first, because here care must be taken that the drum does not shift before the described bars and levers for operating the drum again reach their initial positions. When shifting does occur, the drum takes the

short way to the home position, i. e., from the fifteenth to the first totalizer.

When the paper carriage has performed its return movement to home or untabulated position, the slide 15 is moved fully to the right by the described contact follower-lever arrangement so that the slide member 18 which is shiftable on the slide 15, is then outside the range of the last step 20¹⁵ of the bar 20. This movement of slide 15 fully to the right is effected by a step 4¹⁶ on the stepped rail 4, which is still higher than that of the fifteenth counter and which is arranged on the stepped rail 4 adjacent step 4¹ in such a way that it is opposite follower 9 when the paper carriage has passed through its return movement. At the same time, a pin 15' upwardly extending from the slide 15 passes and engages a dog 36' on a latch 36 which is pivotally attached to the frame 16. The slide 15 with the slide-member 18 is accordingly held in this extreme right position. Just at the end of the return movement of the bar 20, which will be subsequently explained, a pin 37, on the bar, presses the latch 36 again into the initial position, so that the slide 15 is freed and may shift to the left by action of spring 17.

With the slide 15 in the above described extreme right position, the slide-member 18 will be moved off the last step 20¹⁵ of bar 20. The detent 13 is then moved to release position under the influence of spring 24. At the same time clutch 27 is engaged through rod 26, and motor shaft M turns the totalizer drum. As drum 1 and wheel 11 start the movement between the fifteenth and the first positions, a lateral cam 38 on the wheel 11 (see Fig. 3) engages and shifts a follower-roller 39 on a rod 40 mounted slidably on the frame. A lateral extension 40' on rod 40 normally serves as a lock for a latch 41 which is urged toward wheel 11 by a spring 42. When rod 40 is shifted by cam 38, the extension 40' will be withdrawn from latch 41 which will move toward wheel 11 and come in the path of projections 12, thereby locking wheel and drum 1 after the wheel 11 has rotated slightly more than half-way from the fifteenth projection toward the first. At this point the follower 39 is about to ride off cam 38 but the return of the part 40 to its original position is prevented by reason of contact of lateral extension 40' with latch 41.

The latch 41, in its movement into the locking position, also moves to the right, a rod 43 disposed under plate 16. This rod serves to return latch 41 to its initial position at a later time when slide 15 shifts to its extreme left position and contacts the right end of rod 43.

Pivoted on plate 16 is a lever 44 having one end forked over a pin on rod 40, the other end being provided with a pin which rides in an annular groove of an extension on pinion 29. A second lever 46 pivoted on plate 16 also has an end which rides in said annular groove. A spring 45 acts on lever 46 tending to hold pinion 29 in engagement with rack 30. When cam 38 shifts rod 40, the pinion 29 is also shifted out of engagement with rack 30 by movement of lever 44. The lever 46, through a shoulder 47, acts on the hook-like detent 13 and presses this again into the locking position where it will catch the projection 12 corresponding to the setting of the first totalizer when wheel 11 is moved further toward the starting position.

When the pinion 29 moves away from rack 30, the spring 35 in the pinion 33 can then unwind and return the bars 31 and 20 to their initial

positions in a direction opposite to those of arrows x and y . As this movement takes place, pin 37 on bar 20 contacts the lever 36 and frees the pin 18' from dog 38'. Spring 17 then acts to move slide 15 and slide-member 18 to the left to initial position. In its leftward movement slide 15 contacts and shifts rod 43 which, in turn, moves latch 41 back to original non-locking position. Lateral extension 40' on rod 40 may then slip into place to hold latch 41. Spring 45 acts on lever 46 to return lever 46, pinion 29, lever 44 and rod 40 back from the position shown in Fig. 6 to the initial position of Fig. 1. When latch 41 is released from wheel 11, the wheel is free to turn the remainder of the distance from the fifteenth projection to the first. This turning is effected when follower-roller 39 rides down from cam 38 by the action of spring 45 and also by the unbalancing effect of cam 38 on wheel 11. Further movement is prevented by detent 13 contacting a projection 12, detent 13 being already in the proper position for such engagement. Other suitable means may be utilized to effect the final movement of wheel 11 and drum 1.

The motor shaft M rotates continuously and the totalizer drum rotates whenever the pawl 13 is brought out of engagement with one of the radial projections 12. When the pawl 13 is moved to release position by the shaft 23, the shaft M is simultaneously clutched with the drum shaft 1 by the engagement of the clutch 27 through the movement of rod 26. If the pawl 13 again falls in, the clutch 27 is simultaneously disengaged, so that the shaft M no longer can rotate the totalizer drum 1 through the chain 28. The drum 1 is prevented from turning backward by the stop 49 on the catch 48, this stop falling in automatically to block the projections 12 that are present (see Fig. 2). During the return of the parts into the initial position, instead of the drum 1 being stopped by the pawl 13, the latch 41 serves to stop it by catching on the projections 12' when the rod 40 is actuated by the cam 38. In addition, the catch 48 is provided with the stop 50, against which will rest a projection 12 as soon as the projection 12' is held by the latch 41. Thus any return rotation of the totalizer drum 1 is prevented in all positions.

I claim:

1. In a multiple totalizer calculating machine of the type in which the totalizers are distributed on the circumference of a drum, a continuously operating power shaft, a drum and drum shaft, disengageable clutch means operably connecting said shafts, a slidable step rail to be shifted longitudinally on said machine, a step control bar slidable on said machine, driving means operably connecting said drum shaft and said control bar, a ratchet disc operably connected with said drum shaft, circumferentially spaced stops on said disc, a pawl for engaging said stops, control means for actuating said pawl to disengage the same and for simultaneously engaging said clutch, and means actuated by said step rail and controlled by said step bar for controlling said control means to effect movement of said drum shaft proportionate to movement of said step rail.

2. In a multiple totalizer calculating machine of the type in which the totalizers are distributed on the circumference of a drum, a continuously operating power shaft, a drum and drum shaft, disengageable clutch means operably connecting said shafts, a slidable step rail to be shifted longitudinally on said machine, a control bar

slidable on said machine and having steps formed thereon, driving means operably connecting said drum shaft and said control bar, whereby said bar is movable proportionately to the turning of said drum shaft, a locking wheel having projections radially spaced in conformity with the angular spacing of the totalizers on the drum, an operating shaft, a pawl on said operating shaft adapted to engage and disengage said projections, clutch engaging means operatively connected to said operating shaft, a detent on said operating shaft, and means operatively connected with said step rail, control bar, and detent whereby movement of said step rail releases said detent, to disengage said locking wheel, and engage said clutch thereby permitting momentary movement of said drum shaft and control bar.

3. In a multiple totalizer calculating machine, a totalizer drum having totalizers distributed on the circumference of a drum, a drum shaft, a continuously operating power shaft, disengageable clutch means operably connecting said shafts, a step rail to be shifted longitudinally, a slidable step control bar, driving means between said drum shaft and said control bar, a ratchet disc operably connected with said drum shaft, projections on said disc radially spaced in conformity with the angular spacing of the totalizers on said drum, a locking pawl for engaging said projections, control means for influencing said pawl to cause disengagement of the same from said projections and for simultaneously causing engagement of said clutch, means operatively connected to said step rail, control bar, and control means whereby said control means are responsive to movement of said step rail to permit movement of said locking disc and drum, means for restoring said driving means and control bar to their initial position, and means for disengaging said driving means from said drum shaft whereby said driving means and control bar may be restored to initial position.

4. In a multiple totalizer calculating machine, a totalizer drum having totalizers distributed on the circumference of the drum, a drum shaft, a continuously operating power shaft, disengageable clutch means operably connecting said shafts, a step rail to be shifted longitudinally, a slidable step control bar, driving means between said drum shaft and said control bar, a ratchet disc operably connected with said drum shaft, projections on said disc radially spaced in conformity with the angular spacing of the totalizers on said drum, a locking pawl for engaging said projections, control means for actuating said pawl to disengage the same from said projections and for simultaneously engaging said clutch, means operatively connected to said step rail, control bar, and control means whereby said control means are actuated by movement of said step rail to permit movement of said locking disc and drum, means for restoring said driving means and control bar to initial position and auxiliary locking means rendered effective by said disc in a predetermined position thereof for locking the disc when said driving means and control bar are being restored to initial position.

5. In a multiple totalizer calculating machine of the type in which the totalizers are distributed on the circumference of a drum, a power shaft, a drum shaft, disengageable clutch means operably connecting said shafts, a step rail to be shifted longitudinally in response to the movement of a paper carriage, a slidable step control bar, driving means between said drum shaft and

said control bar, a locking wheel operably connected with said drum shaft, circumferentially spaced stops on said disc, one for each totalizer, a pawl for engaging said stops, a control means for actuating said pawl to disengage the same and for simultaneously engaging said clutch comprising an operating rod on which said pawl is mounted, and a link connection between said clutch and said rod, spring means urging said rod to a position wherein said clutch is engaged and said pawl is not, means for maintaining said rod in an inoperative position with said clutch disengaged and said pawl engaged comprising a longitudinal member slidable transversely of itself in response to movement of said step rail and contacting at one end a member on said operating rod and at the other end one of a

series of step formations on said step control bar, said parts being arranged whereby movement of said step rail will shift said longitudinal member transversely and temporarily remove it from contact on a step of said step control bar whereby said spring means may act on said operating rod to disengage said pawl, engage said clutch and shift said drum and said step bar whereby said longitudinal member will again be contacted by a step on said step bar and shift said operating rod to an inoperative position and stop said drum, the movement of said drum being thereby proportional to the movement of said step rail and the transverse movement of said longitudinal member.

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