

June 7, 1955

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AUTOMATIC SUB-TOTAL CONTROL MECHANISM

Filed July 19, 1951

2 Sheets-Sheet 1

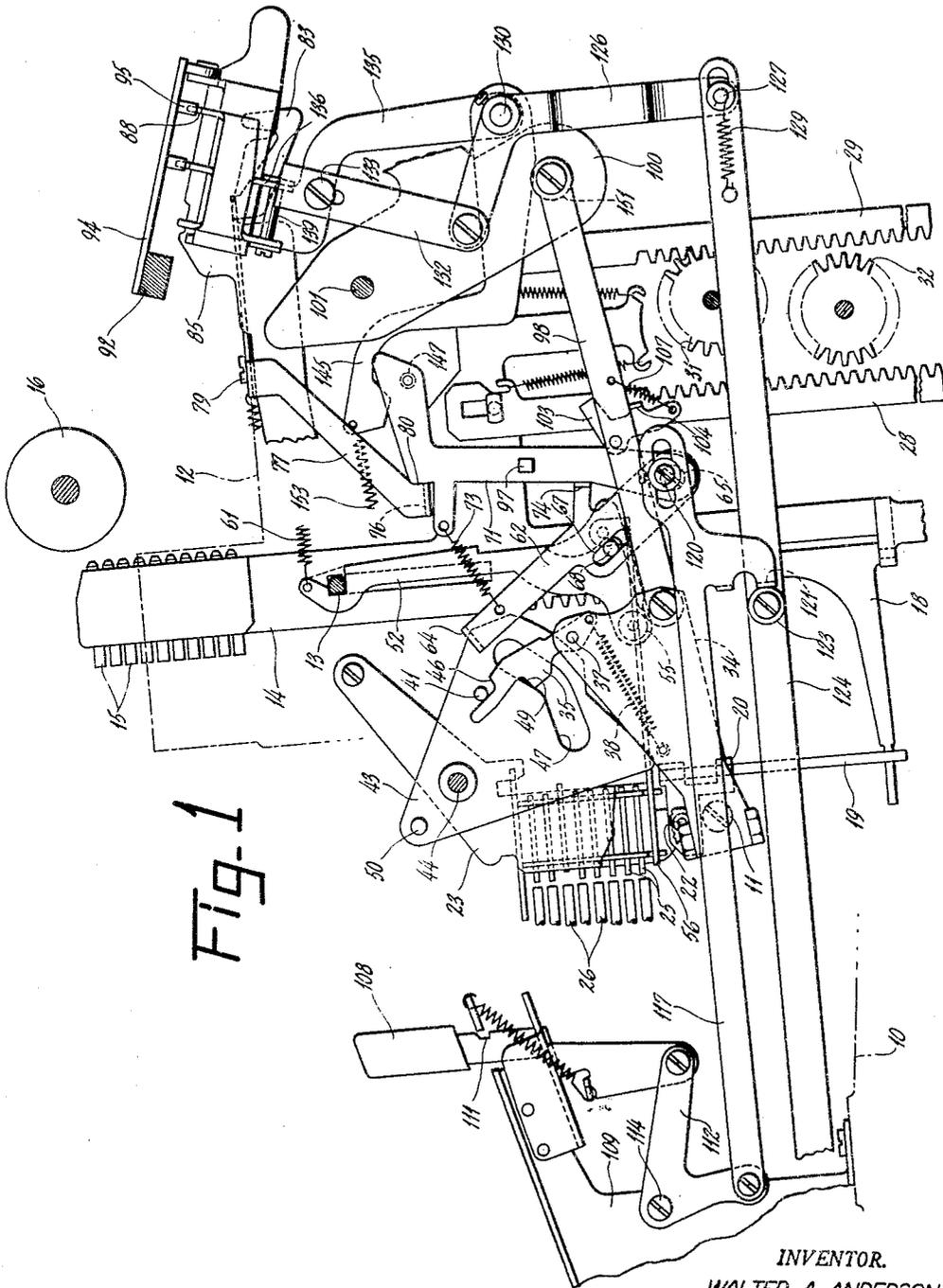


Fig. 1

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Fig. 2

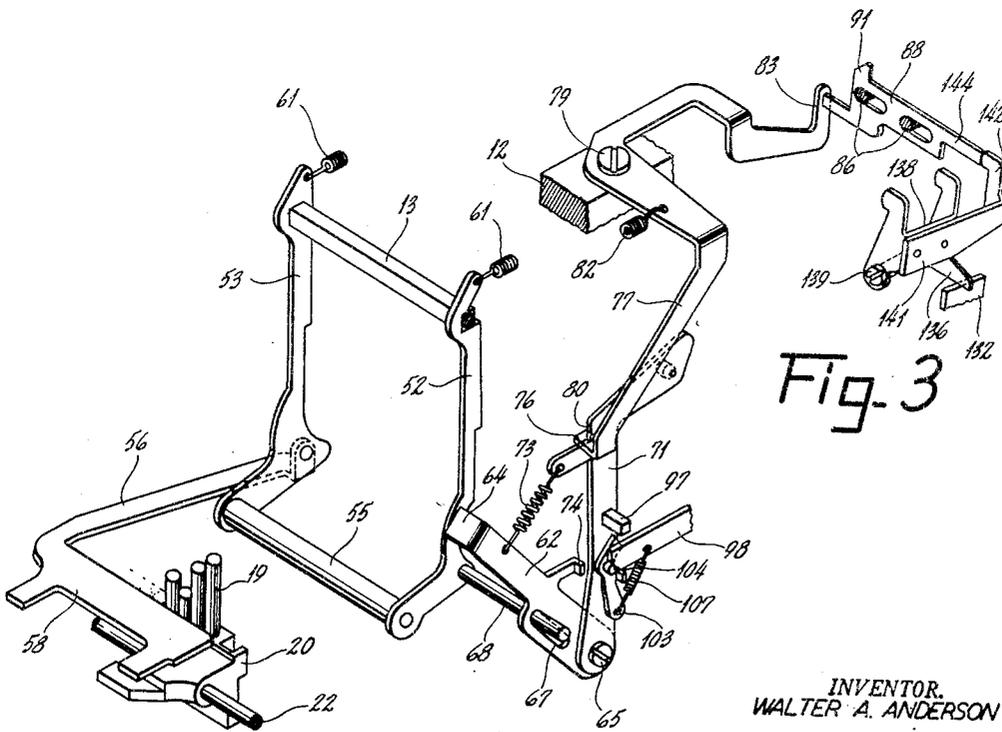
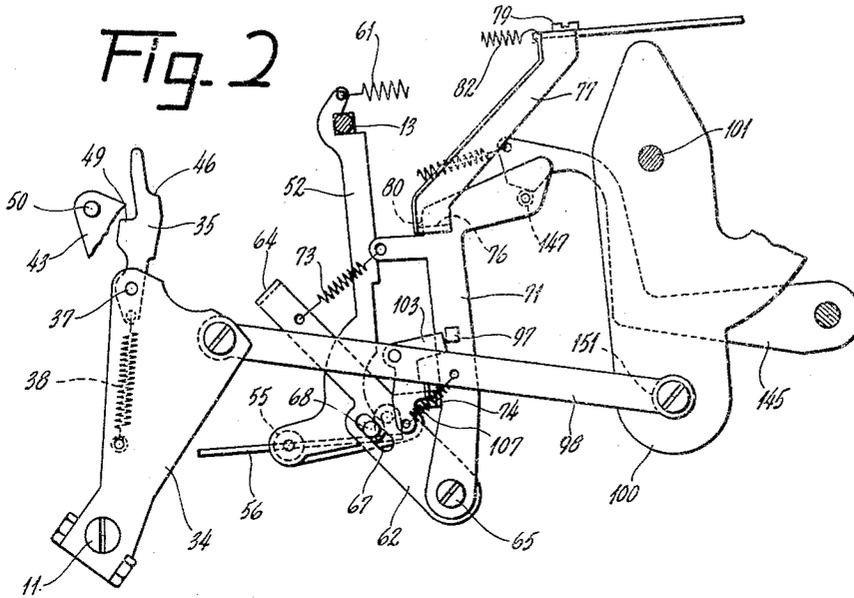


Fig. 3

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AUTOMATIC SUB-TOTAL CONTROL MECHANISM

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4 Claims. (Cl. 235—60.49)

This invention relates to an accounting machine having a traveling paper carriage and one or more totalizers, and more particularly to selectively controlled sub-totaling mechanism for said totalizers.

In modern accounting practice it is often desirable to print a sub-total of the amount in a totalizer in a plurality of columnar positions on a work sheet. Usually, in present day accounting machines, it is customary to take a blank cycle, after the printing of a last entry in the machine keyboard, to condition the machine for automatically sub-totaling a selected totalizer, and as a result thereof, during each successive non-entry machine cycle, the sub-total of the selected totalizer is printed. This is not always desirable, since, in certain operations of the machine, a blank machine cycle immediately follows the printing of a sub-total to enable tabulation of the traveling paper carriage past columnar positions on the work sheet wherein, during certain other operations of the machine, amounts entered in the keyboard are printed.

It is, accordingly, one object of the present invention to provide a mechanism to control sub-totaling of a selected totalizer, which mechanism is operable automatically under control of the traveling paper carriage.

Another object of the present invention is to provide a power restored sub-totaling mechanism which is normally inactive at the start of a machine cycle, is automatically released for operation under the control of the traveling paper carriage, and is restored by power to its normally inactive condition.

Still another object of the present invention is to provide a sub-totaling mechanism which is normally inactive at the start of the machine cycle, which is releasable for operation by a manually operated key for enabling successive printing of sub-totals, and which is restored by power to its normally inactive condition upon the release of the key.

A further object of the invention is to provide a power restored sub-totaling means, and selector controls therefor, that is simple in construction, economical to manufacture, assemble and maintain in the machine and dependable in operation.

With these and incidental objects in view the invention consists in certain novel features of construction and combinations of parts, the important elements of which are herein set forth in appended claims, and a preferred embodiment hereinafter described with reference to the drawings accompanying and forming part of the specification.

In the drawings:

Figure 1 is a side view in vertical elevation showing the parts in normal position,

Figure 2 is a view similar to a portion of Figure 1 showing the parts in the positions assumed during a sub-total cycle with the sub-total mechanism about to be power restored to its normally inactive position,

Figure 3 is a perspective view showing certain of the parts occupying the positions they assume after a sub-

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total has been taken and printed, and during the power restoration of the sub-totaling mechanism.

The invention is herein exemplified in a machine similar in character to the one disclosed in Patent No. 1,946,505, to Oscar J. Sundstrand, dated February 13, 1934, to which patent reference may be made for an understanding of features of construction and mode of operation not fully described or illustrated herein.

General description

In general the machine includes a numeral keyboard, and key set and automatic machine function controls. It also includes two totalizers, type bars carrying type for printing on a work sheet and printing mechanism therefor, the movement of the type bars for printing being controlled by means of the numeral keys during listing, and by means of the totalizers for totaling and sub-totaling. The machine has a traveling paper carriage carrying a platen for supporting a work sheet, and means on the carriage for actuating the automatic machine function controls in various columnar positions on said work sheet. The machine includes mechanism for sub-totaling the totalizer which mechanism is normally inactive during successive automatic cyclings of the machine, and is rendered active automatically in certain columnar positions under the control of the carriage. A key is provided in the machine for normalizing certain of the automatic machine function controls including the sub-total control which when normalized is operative during successive manual cyclings of the machine for listing successive sub-totals in any desired columnar position on the work sheet.

Referring to Figure 1 of the drawings, the machine base, designated generally at 10, has journalled thereon a main rock shaft 11, see also Figure 2, connected with a suitable drive means operated in any suitable manner. Mounted on the machine base is a frame 12 carrying a bar 13 on which type bars 14 are supported for vertical sliding movement to position type 15 for printing on a work sheet supported by a platen 16 mounted in a traveling paper carriage (not shown but substantially similar to that shown in the above patent). Each type bar 14 is provided with a swinging tail 18 slidably connected with a rod 19 supported for vertical movement in a block 20. The block 20 is supported for movement laterally on a shaft 22, fixed in a frame 23 on the frame 12, under the control of an indexing and restoring means as more fully described in the patent referred to. The type bars 14 are raised by means of springs and are differentially positioned for printing from type 15 by means of the abutting of rods 19 with key set stops 25, said stops being slidably supported in the frame 23, and settable by means of plungers 26 actuated by the depression of numeral keys in the conventional keyboard as shown in the above Sundstrand patent. Return of the type bars 14 to their lowered position is effected by a power operated means similar to that in the above patent. Each of the type bars 14 carries racks 28 and 29, for engagement with totalizers for addition and subtraction, each of said totalizers comprising a plurality of adding wheels 31 and 32.

The adding wheels 31 and 32 are arranged for engagement either individually or jointly with the racks 28 and 29 for addition and subtraction, and for engagement therewith for sub-totaling individually by mechanism substantially similar to that disclosed in the above patent. Normally the adding wheels remain in engagement with their associated racks at the completion of an adding or subtracting operation of the machine, and are moved from engagement with the racks at the start of the machine cycle to enable free movement of type bars 14 to printing position. The wheels

are returned to engagement with the racks during the return stroke of the machine cycle to enable the addition or subtraction of the printed amount therein. The means provided for moving the adding wheels 31 and 32 from and into engagement with racks 28 or 29 is identical with that disclosed in the above patent and includes an arm 34, fixed on the main shaft 11, the arm carrying a positive dog 35, pivoted on a stud 37 fixed therein and tensioned by means of a spring 38. The dog 35 is provided with a tail and is normally tensioned by spring 38 to hold the tail against a pin 41 fixed in a plate 43 pivotally supported on a stud 44, Figure 1, in the frame 12. During the forward stroke of the machine cycle a shoulder 46 of dog 35 engages pin 41 and rocks plate 43 counterclockwise about stud 44. The plate 43 is provided with a cam slot 47, Figure 1, which acts upon a roller (not shown) to move the adding wheels 31 and 32 into and away from engagement with racks 28 and 29. During the return stroke of the machine cycle, a second shoulder 49 on dog 35 engages a second pin 50 in plate 43 to return plate 43 clockwise and thereby engage the adding wheels with the racks.

A spacing cycle mechanism is provided for restraining the type bars 14 from rising when a blank cycle is taken. This mechanism includes a pair of levers 52 and 53 pivoted on a rounded portion of bar 13 and tied together in spaced relation by means of a rod 55, Figure 3. Pivoted on lever 53 is a locking slide 56 which extends forwardly therefrom and has a laterally extending plate portion 58. The levers 52 and 53 are tensioned forwardly (clockwise, Figure 1) by means of springs 61 connected to their upper ends, but are normally restrained from movement by a latch (not shown herein but similar to part 387, Figure 40, of the above Sundstrand patent) which is released at about the midpoint of a blank cycle. In the normal position, the plate portion 58 overlies the upper ends of rods 19 and thus prevents rise of the type bars 14 during a blank cycle.

Automatic selector control of sub-totaling

When a selected totalizer is sub-totaled, the adding wheels 31 or 32 are retained in engagement with racks 28 or 29, and locking slide 56 is moved forwardly to a position where the plate portion 58 thereof is clear of rods 19, to enable type bars 14 to rise, under the control of the adding wheels, to printing position on the work sheet. In prior machines, the prevention of the disengaging movement of the adding wheels, and the movement of the locking slide forwardly, is effected at the completion of every blank machine cycle, and the parts remain in their respective positions, to enable the printing of the sub-total during each successive blank cycle of the machine. Certain of these blank cycles may be needed to effect tabulation of the traveling carriage column by column and during such blank cycle undesirable successive printings of the sub-total would be obtained on the work sheet. The present invention provides a sub-total initiating mechanism which is operative for printing sub-totals in certain columns on a work sheet, and is locked in an inactive position in other columns, under the control of the traveling paper carriage.

To this end a lever 62 carrying a formed ear 64 is pivoted on a stud 65 fixed in frame 12. The lever 62 is provided with a slot 67 for receiving a pin 68, fixed in lever 52, which pin 68 and lever 52 during adding and subtracting operations of the machine, hold lever 62 in a position in which the ear 64 lies above and clear of the upper edge of dog 35, permitting the engagement of dog 35 and pin 41 to effect disengagement of adding wheels 31 and 32 from racks 28 and 29. A second lever 71, pivoted on stud 65, is yieldably connected by means of a spring 73 with lever 62, the levers 62 and 71 being held by said spring 73 in spaced

relation with a foot 74 forming a part of lever 62 in engagement with lever 71. In the normal position of levers 52, 53, 62 and 71, a lug 76 forming part of a locking lever 77 pivoted on a stud 79 fixed in frame 12 and tensioned by spring 82, Figure 3, rests in front of an upstanding edge 80 of lever 71 and arrests movement of the levers 52, 53, 62, and 71 during each normal cycle of the machine. The locking lever 77 includes a rearwardly extending arm carrying an upstanding lug 83.

Fixed in frame 12 at the upper rear corner is a control box frame 85 carrying control slides for actuating the automatic machine function controls in the manner disclosed in the patent referred to. Mounted for slidable movement on rods 86, Figure 3, in frame 85 is a sub-total control slide 88 having a leg extending leftwardly to abut lug 83 of locking member 77, and also upstanding lug 91. Mounted on a bar 92 in the paper carriage is a control plate 94 carrying, in the columnar positions wherein a sub-total is to be taken and printed on the work sheet, a pin 95.

Before a sub-total may be taken in machines of this general type, it is necessary to operate the machine through a blank cycle to properly condition the machine for sub-totaling. In the machine of the present application, during a blank cycle the latch, shown as 387 in the above noted patent, for slide 56 is rocked to its released position, where it will remain until an amount is entered in the numeral keys. Since levers 62 and 71 are held latched by the engagement of lug 76 of locking lever 77 and edge 80 of lever 71, levers 52 and 53 connected thereto by pin 68 are restrained from rocking forwardly and because locking slide 56 merely abuts the latch, the locking slide 56 is held in its rearward position overlying rods 19, to prevent the raising of type bars 14.

When the carriage enters a columnar position wherein a pin 95 is provided in control plate 94 to effect the taking and printing of a sub-total, control slide 88 is moved leftwardly, Figure 3, by pin 95, to rock locking lever 77 about its stud 79, and remove lug 76 from in front of edge 80 of lever 71. Levers 71, 62, 52 and 53 are thereby released, enabling springs 61 to rock levers 52 and 53 clockwise about bar 13 to position locking slide 56 forwardly and clear of rod 19, as shown in Figure 3, and to rock levers 62 and 71 counterclockwise about their pivot stud 65. With levers 62 and 71 in their counterclockwise position, ear 64 on lever 62 strikes the upper edge of dog 35, and depresses dog 35 against the tension of spring 38 to a position where shoulder 46 is below pin 41 in plate 43. With the parts in such position, adding wheels 31 or 32 remain engaged with racks 28 or 29 during the ensuing machine cycle. In such cycle, type bars 14 rise to print the sub-total under the control of adding wheels 31 or 32.

Immediately upon the completion of the printing operation, and before type bars 14 start their restoring movement, the carriage (not shown) is released to tabulate to its next columnar position, freeing control slide 88 from pin 95, spring 82 thereupon acting to rock locking member 77 until lug 76 bears against the face of lever 71. Lever 71 is normally latched by lug 76 in its rearward position for the purpose hereinbefore described, and it is positively restored to that position by means of power during the return stroke of the machine. For this purpose, a stud 97 is fixed in lever 71. Pivoted on a link 98 connecting lever 34 on main shaft 11 and a swinging lever 100 pivoted on a shaft 101 fixed in frame 12 is a dog 103 having a lug 104 tensioned against the lower edge of link 98 by means of a spring 107 to position the dog thereon in proper relation with stud 97 in lever 71. During the forward stroke of link 98, dog 103 is depressed idly by stud 97 but during return stroke of the machine, dog 103 engages the stud 97 and rocks lever 71 clockwise until lug 76 of locking lever 77 moves in front

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of edge 80 of lever 71 under the urge of spring 82 after which dog 103 moves below stud 97 freeing it. The restoration of lever 71 occurs before and during restoration of type bars 14 to the position where rods 19 are below locking slide 56, the rods 19 therefor restraining the returning of locking slide 56, levers 52 and 53, and lever 62 to their normal positions, spring 73 stretching during the restoring of lever 71. Upon the full restoration of type bars 14 and rods 19, spring 73, acting on lever 62 restores lever 62 and, by means of pin 68 camming in slot 67, restores levers 52 and 53 and locking slide 56 to their normal rearward positions.

Manual control of sub-totalling selection

Frequently the occasion arises when it is desirable to utilize a machine of this type to list a plurality of amounts and to take a sub-total thereof in conjunction therewith, independently of the normal accounting or bookkeeping operations of the machine.

The present invention provides means whereby the machine may be readily converted from an automatically controlled accounting or bookkeeping machine to an adding and subtracting machine with the sub-totalling mechanism described herein operable during any machine cycle, and under the control of the numeral keys in the machine keyboard, in the manner described in the patent referred to. For such conversion, a normalizer key 108 is supported for vertical slidable movement in a frame 109 mounted on the machine base 10. The key 108 is provided with a notch 111 for engagement with the frame 109 to lock the key in its depressed position. When depressed, the key 108 operates certain of the carriage operable function controlling elements contained in the machine, including carriage tabulation disabling and the enabling of the paper feed mechanism. These mechanisms operated by the key are not part of the present invention, and are therefore not described herein, reference being had to the above noted patent for details of such mechanisms. In the present invention, depression of key 108 enables a sub-total to be taken in any columnar position. Key 108 is connected with a bell crank 112 pivoted on a stud 114 fixed in the frame 109. Connected to a lower arm of the bell crank 112 is a slide 117 slidable at its other end on a stud 120 and moved forwardly by the bell crank 112 when the key 108 is depressed. During the forward movement of the lever 117 a lug 121 thereon strikes a collar 123 fixed on a link 124, moving said link forwardly and rocking a bell crank 126 to which the link is yieldably connected by means of a stud 127 and spring 129. A plate 132 pivoted on bell crank 126, and slidably supported on a stud 133 in a bracket 135 fixed to frame 85, is raised by the bell crank 126 to strike a leg 136 forming part of a cradle 138 and pivot the cradle about shaft 139 in the bracket 135. Fixed on the cradle 138 is a plate 141 having a leg 142 abutting an extension 144 of the sub-total control slide 88, Figure 3, to move the slide 88 to the left to rotate rocking lever 77 and move lug 76 from its locking position in front of edge 80 of lever 71. The parts are held in this position so long as key 108 is held depressed.

During adding operations with key 108 depressed, the present machine operates in the same manner as the machine of the above patent. The levers 62 and 71 are held in their rearward position by means of the before-mentioned spacing stroke latch during amount entry, enabling the dog 35 to engage pins 41 and 50 in plate 43 and shift the totalizers 31 and/or 32 in the usual manner. When a blank cycle is taken and the spacing latch is released, the springs 61, acting on the levers 52 and 53, tend to move said levers and the locking plate 56 forwardly, since lug 76 is clear of lever 71. This is undesirable, since such movement of the locking plate 56 at this time would expose rods 19 to upward movement and cause the printing of nines. The means provided in the patent to prevent such an occurrence includes a locking lever 145, Figure 1, pivoted on a shaft 130 and

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extending forwardly to overlie a pin 147 fixed in the upper rear part of lever 71. The lever 145 is normally held in a raised position, as shown in Figure 1, by means of a roller 151 carried by the rear swinging lever 100, against which it is tensioned by means of a spring 153. During each item entry cycle and the blank cycle, the roller 151, swinging away from the lever 145, permits the spring 153 to rock the lever 145 downwardly and position an edge of lever 145 in front of pin 147 in lever 71 to hold lever 71 and its associated parts in their rearward position. At the completion of the blank cycle, the roller 151 returns the lever 145 to its raised position and releases lever 71 for movement to its forward position to enable the taking of the sub-total in the next succeeding operation of the machine.

The entering of an amount in the machine keyboard following a sub-totalling operation of the machine restores the spacing latch to its rearward position as described in the above patent, returning levers 62 and 71 and locking slide 56 to their rearward positions.

Summarizing, the present invention provides a machine wherein normal automatic operations may be performed and wherein sub-total printing occurs only in the desired columnar positions on the work sheet, that is in those columns wherein a pin 95 is provided in the control plate 94, levers 62 and 71 and locking slide 56 being locked rearwardly by the lever 77 at the completion of each machine cycle. The invention further provides a machine wherein listings may be made and their associated sub-totals taken with the traveling paper carriage normalized in any desired columnar position, and without detriment to or interference with the operation of the automatic controls usually provided in the machine.

What is claimed is:

1. In an accounting machine of the class described having amount indexing means, a register, register actuators controlled by said amount indexing means, engaging and disengaging mechanism to control engagement of said register with said actuators, said mechanism normally acting to disengage said register from said actuators at the start of an operation of said machine, power means to operate said mechanism and to move said register actuators, a spring urged member for partially disabling said mechanism to retain said register in engagement with said actuators and thereby control a sub-total taking machine cycle, said member being released only during a machine cycle in which no amount is indexed on said indexing means, an arm yieldingly connected to said spring urged member, a latch to retain said member and said arm in an ineffective position and thereby prevent an ensuing sub-total taking cycle of said machine after said member is released during a blank machine cycle, a function control member operable to release said latch and a one way connection between said arm and said power means to cyclically restore said arm to a latch position.

2. In an accounting machine of the class described having amount indexing means, a register, register actuators controlled by said amount indexing means, engaging and disengaging mechanism to control engagement of said register with said actuators, said mechanism normally acting to disengage said register from said actuators at the start of an operation of said machine, power means to operate said mechanism and to move said register actuators, a spring urged member for partially disabling said mechanism to retain said register in engagement with said actuators and thereby control a sub-total taking machine cycle, said member being released only during a machine cycle in which no amount is indexed on said indexing means, an arm yieldingly connected to said spring urged member, a latch to retain said member and said arm in an ineffective position and thereby prevent an ensuing sub-total taking cycle of said machine after said member is released during a blank machine cycle, a function

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control member operable to release said latch, a one way connection between said arm and said power means to cyclically restore said arm to a latched position, a normalizing key, and a linkage operable thereby to move said function control member to the latch releasing position enabling said arm to control a sub-total taking cycle after a blank cycle.

3. In an accounting machine of the class described having cycling means, amount indexing means, actuating members normally controlled by said amount indexing means when indexed, a register, engaging means for said register, said engaging means retaining said register in engagement with said actuators at the end of a cycle of said cycling means and normally effective to disengage said register from said actuators at the beginning of a machine cycle, and yieldingly driven mechanism released during a machine cycle in which no amount is indexed in said indexing means to free said actuators from control by said amount indexing means and to render said engaging means ineffective to disengage said register whereby succeeding non-entry cycles will be sub-total taking cycles, the combination of a latch arm flexibly connected to said yieldingly driven mechanism, a latch to hold said latch arm and thereby said mechanism from movement when released, and a travelling carriage having columnar positions and effective in predetermined positions to release said latch from said latch arm to determine that sub-total taking operations shall be performed only when said carriage is in said predetermined positions.

4. In an accounting machine of the class described

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having cycling means, amount indexing means, actuating members normally controlled by said amount indexing means when indexed, a register, engaging means for said register, said engaging means retaining said register in engagement with said actuators at the end of a cycle of said cycling means and normally effective to disengage said register from said actuators at the beginning of a machine cycle, and yieldingly driven mechanism released during a machine cycle in which no amount is indexed in said indexing means to free said actuators from control by said amount indexing means and to render said engaging means ineffective to disengage said register whereby succeeding non-entry cycles will be sub-total taking cycles, the combination of a latch arm flexibly connected to said yieldingly driven mechanism, a latch to hold said latch arm and thereby said mechanism from movement when released, a travelling carriage having columnar positions and effective in predetermined positions to release said latch from said latch arm to determine that sub-total taking operations shall be performed only when said carriage is in said predetermined positions, a manually operable key and connecting members from said key to said latch to release said latch upon depression of said key.

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