June 4, 1940. D. Y. READ 2,203,306

ACCUMULATING MECHANISM

Filed July 1, 1937 7 Sheets-Sheet 1

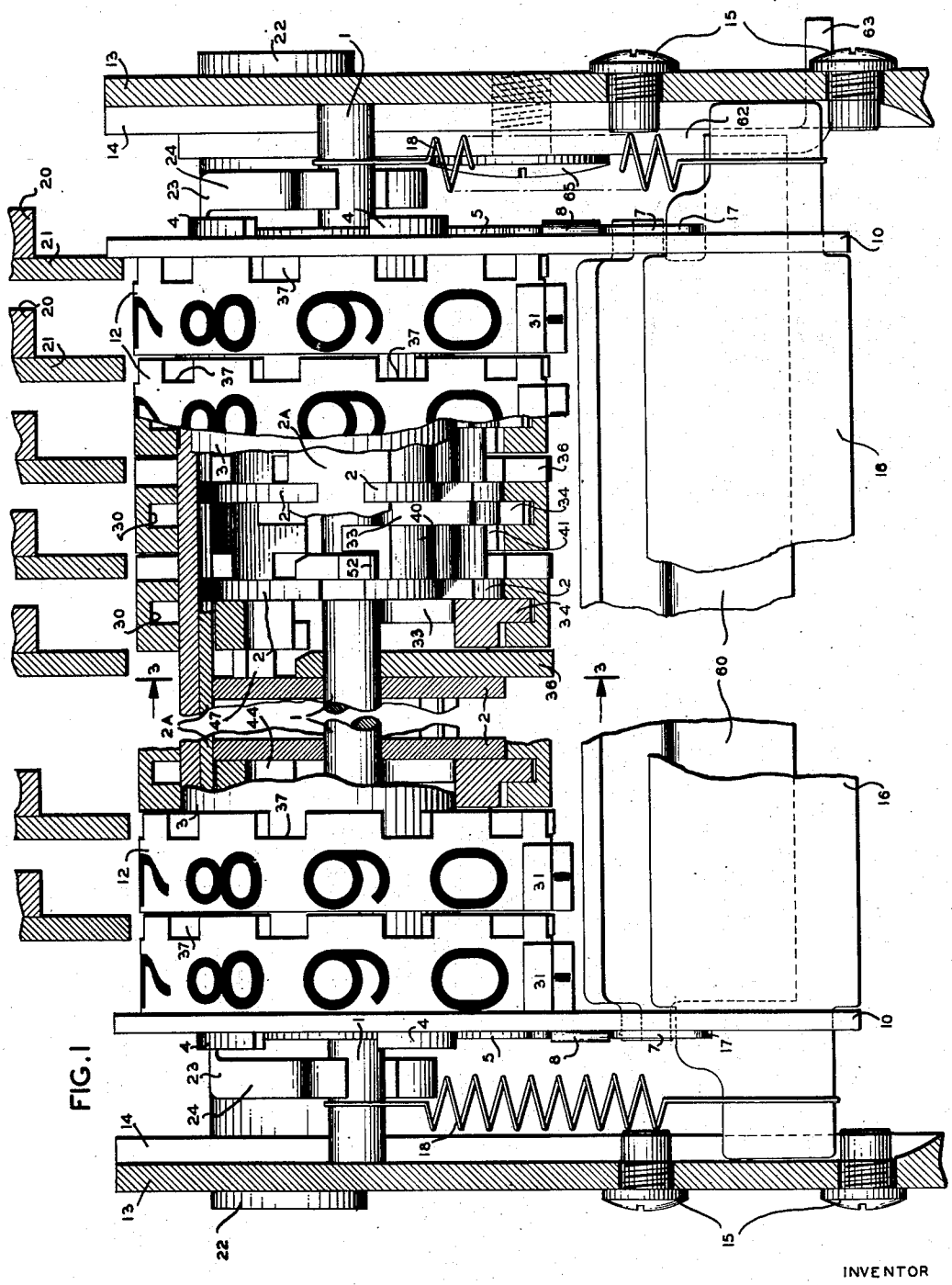


FIG. 1

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ACCUMULATING MECHANISM

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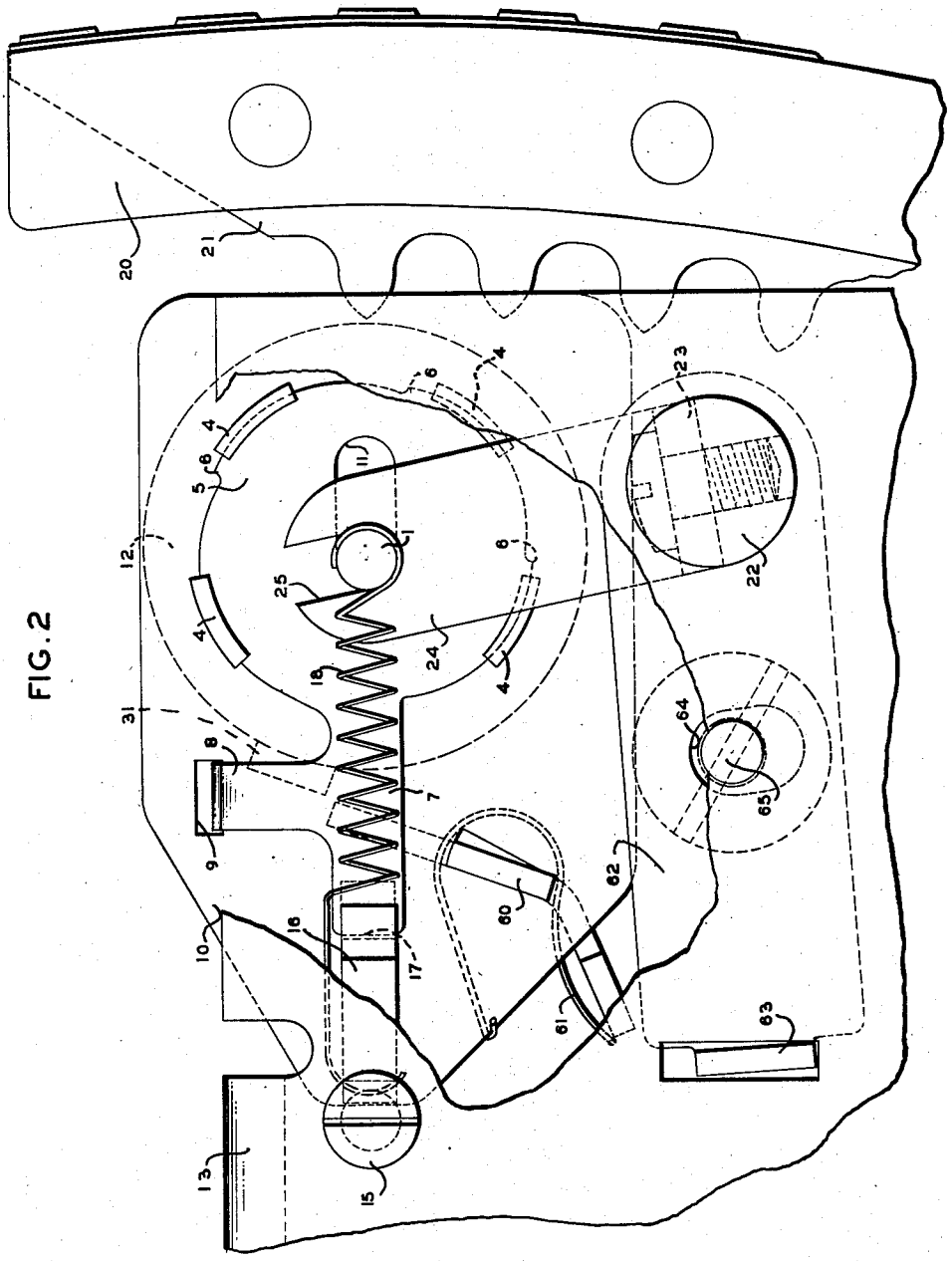


FIG. 2

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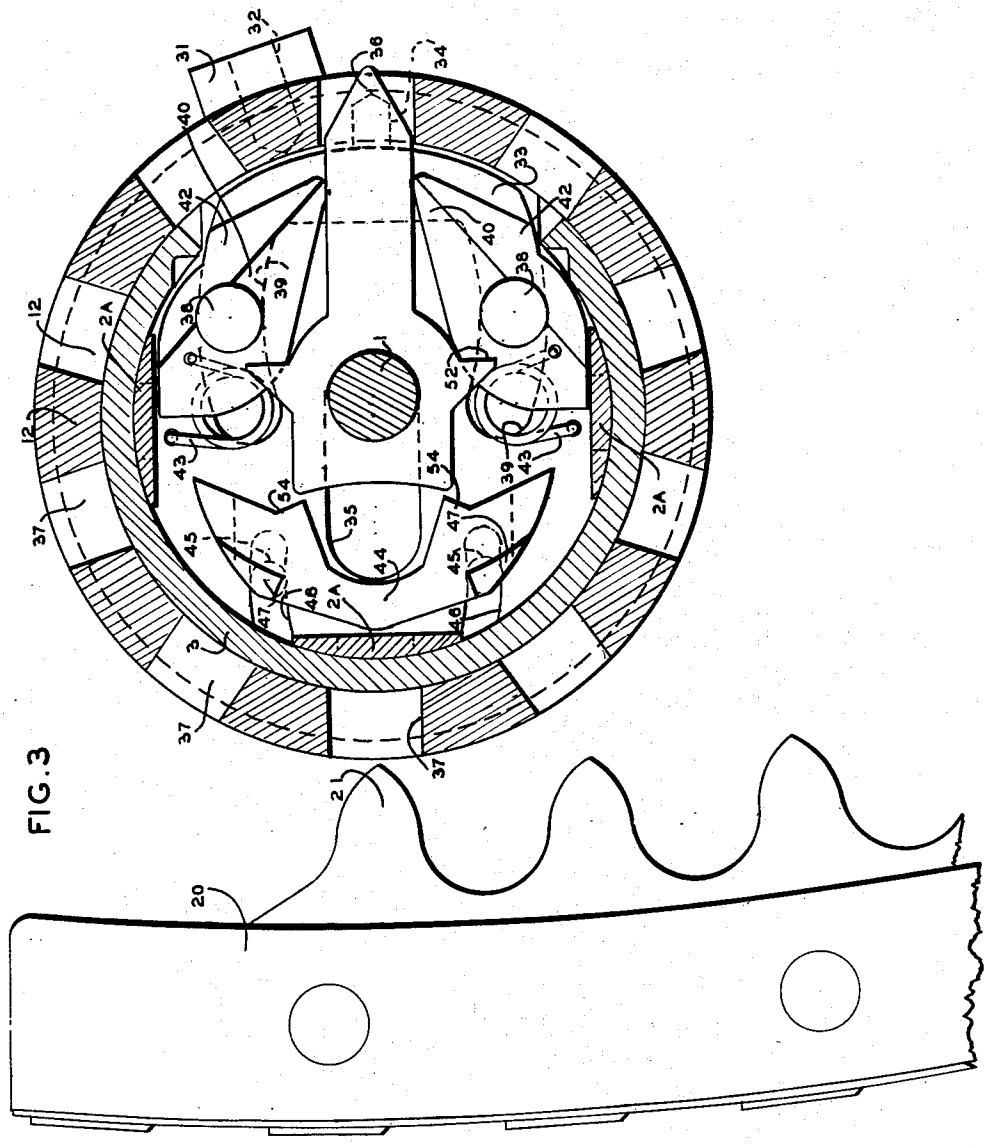


FIG. 3

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ACCUMULATING MECHANISM

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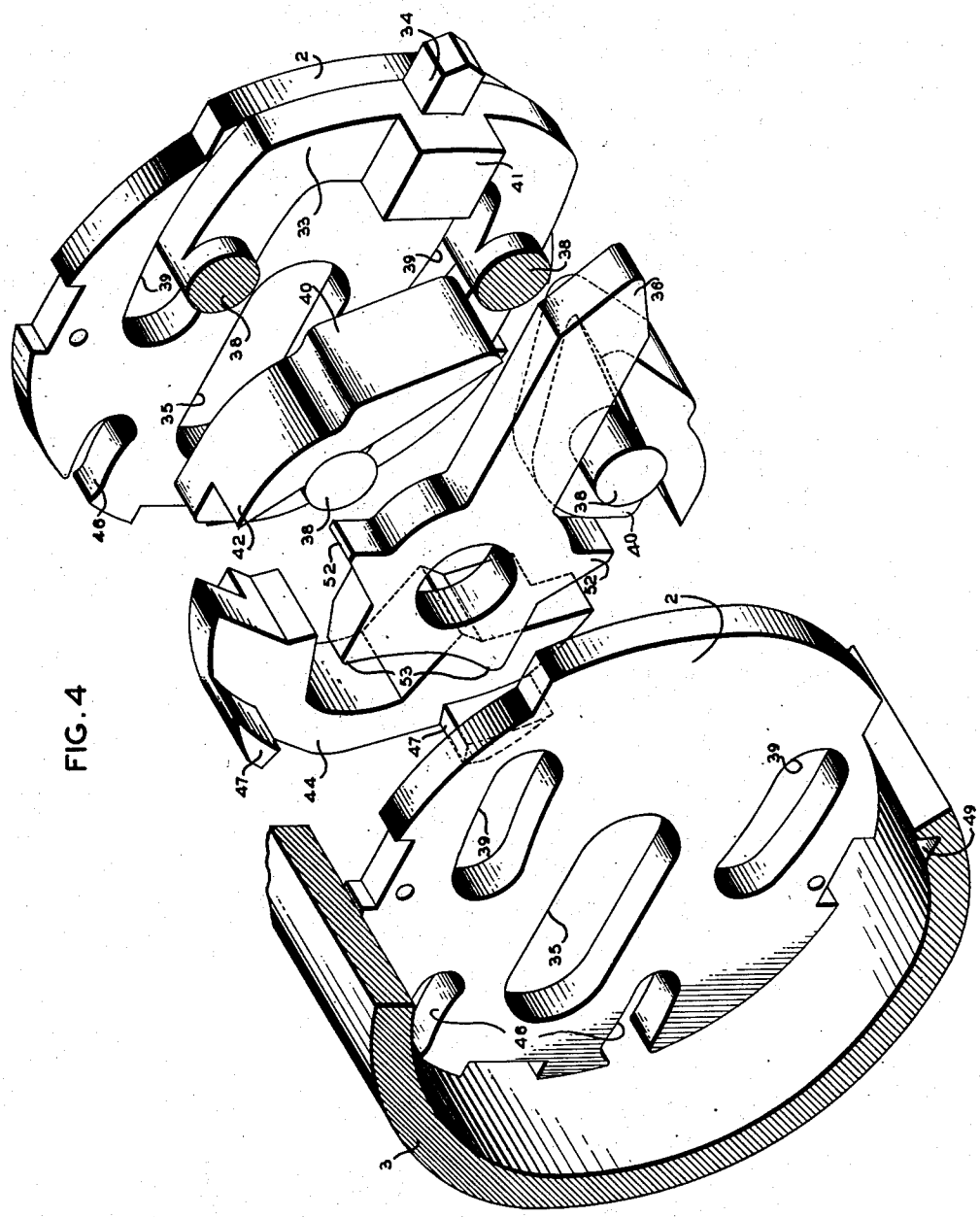


FIG. 4

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ACCUMULATING MECHANISM

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FIG. 6

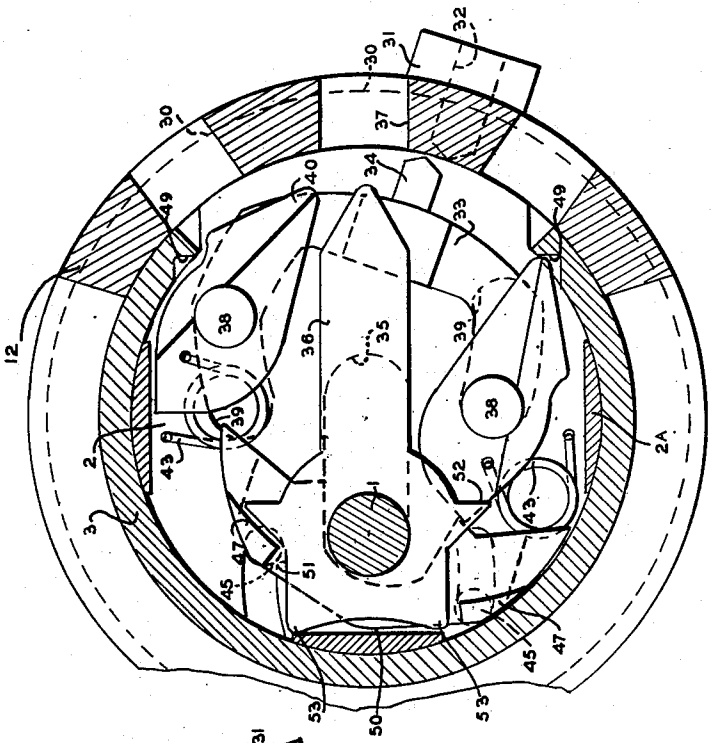
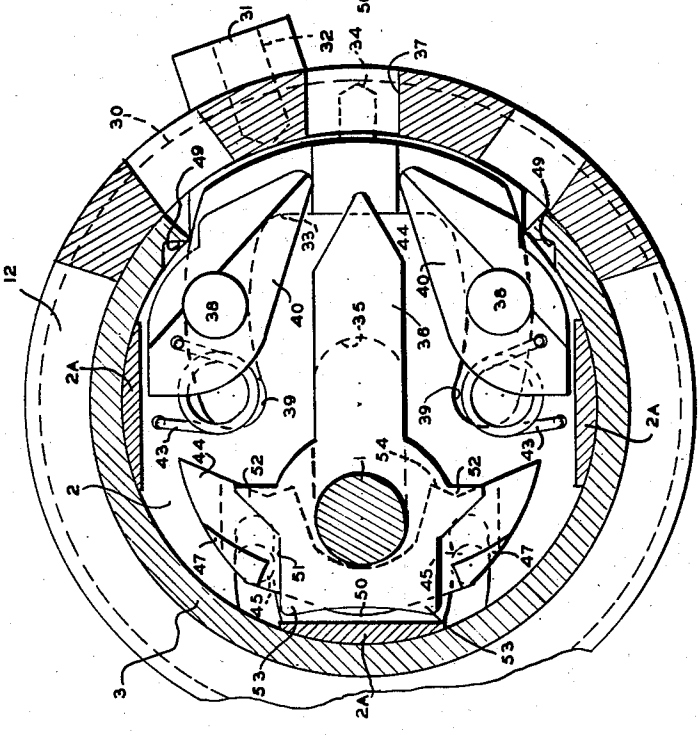


FIG. 5



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ACCUMULATING MECHANISM

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FIG. 8

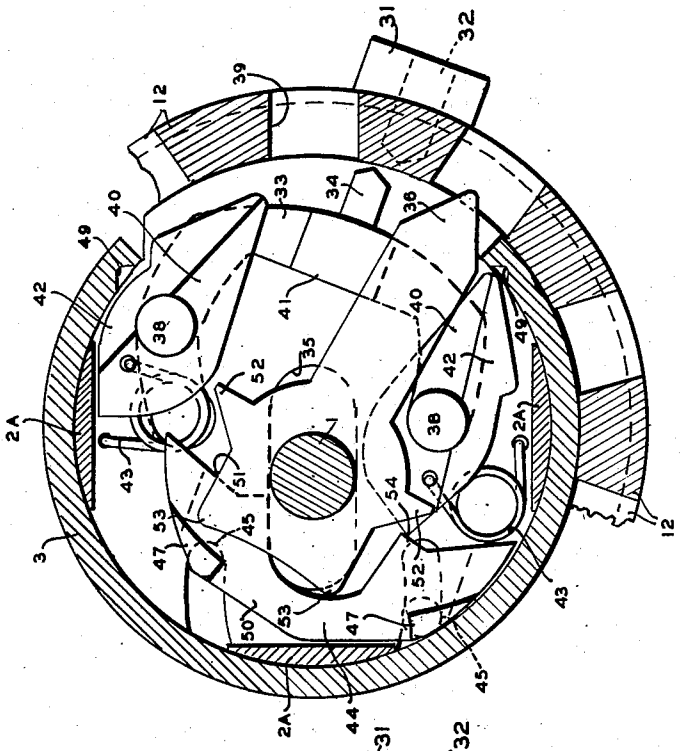
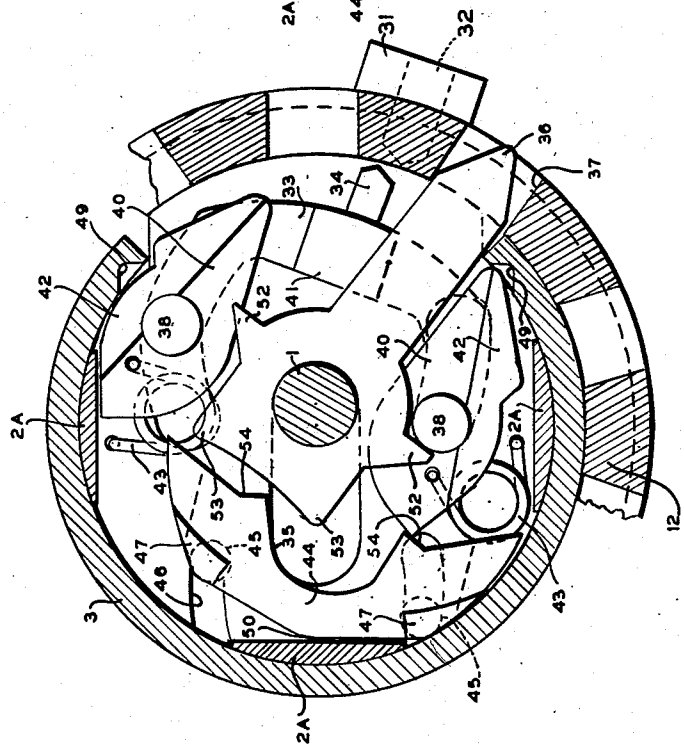


FIG. 7



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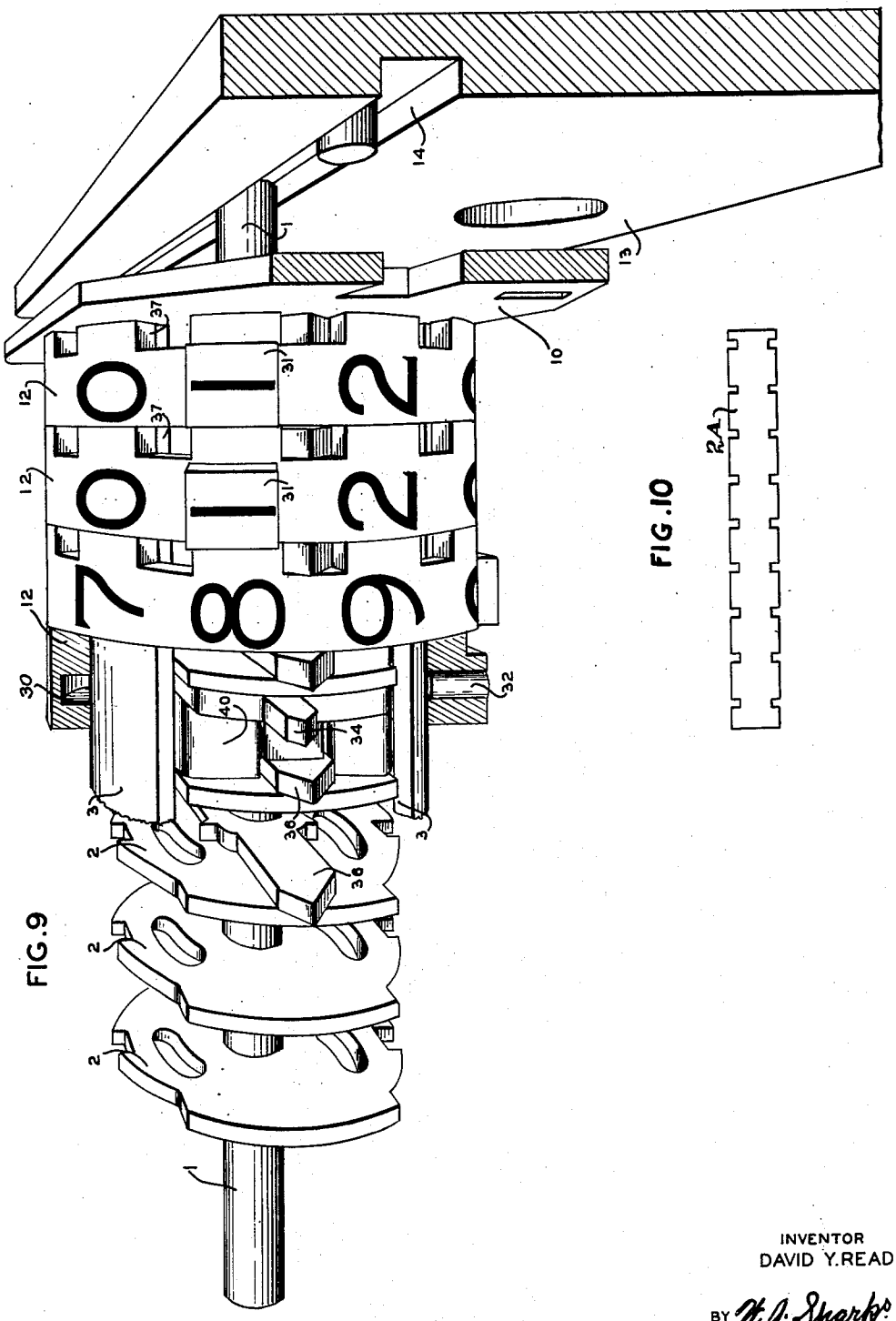


FIG. 9

FIG. 10

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Patented June 4, 1940 2,203,306

UNITED STATES PATENT OFFICE

2,203,306

ACCUMULATING MECHANISM

David Y. Read, New York, N. Y., assignor to Remington Rand Inc., Buffalo, N. Y., a corporation of Delaware

Application July 1, 1937, Serial No. 151,417

16 Claims. (Cl. 235—137)

This invention relates to adding and like machines and particularly to accumulating mechanism therefor.

The present invention consists of an accumulator unit mounted in a suitable framework so that it may conveniently be engaged with and disengaged from an actuating means. The accumulator unit consists of a plurality of combination accumulator-wheels and dials which are mounted for rotation upon a tubular casing. This casing encloses all the transfer mechanism for the accumulator and also encloses the detent mechanism for the accumulator wheels. The wheels may be rotated in one direction to add or accumulate positive amounts and may be rotated in the opposite direction to accumulate negative amounts. Thus, the accumulator may be classified in general as a "direct subtractor," in which no "fugitive one" mechanism is provided.

One object of this invention is to provide accumulator wheels in which the gear teeth are eliminated.

Another object is the provision of an accumulator which will function properly at high operating speeds.

A further object of the present invention is to enclose the entire transfer mechanism by the accumulator wheels.

Another object is the provision of a novel transfer mechanism which may be accurately operated at high speeds.

A further object of this invention is the provision of a positive detent for the accumulator wheels at all times except when they are in mesh with their respective actuating racks.

One of the features of the present invention is that it may be made in very small sizes.

Another feature is that the present invention may be used for subtraction as well as addition.

Another feature is that the present invention is exceptionally easy to assemble.

A further feature of this invention is that it may complete its transferring operations while the accumulator is being moved out of mesh from its actuating racks.

Other objects and structural details of this invention will be apparent from the following description when read in connection with the accompanying drawings wherein:

Fig. 1 is a fragmentary top plan view of the accumulator in normal position shown partly in section.

Fig. 2 is a right-hand side elevation of the accumulator in normal position showing the side wall in full and showing a portion of the right-hand supporting wall broken away.

Fig. 3 is a left-hand sectional elevation taken along the line 3—3 of Fig. 1.

Fig. 4 is an isometric view showing the transfer mechanism of one accumulator wheel and part of the tubular casing.

Figs. 5, 6, 7, and 8 are left-hand sectional elevations similar to Fig. 3 each showing the transfer mechanism in a diffierent position.

Fig. 9 is a view in perspective showing three of the accumulator wheels and certain parts of the framework of the transfer mechanism.

Fig. 10 is a detailed plan view of one of the spacing bars employed in the accumulator.

General structure

Referring particularly to Figs. 1 and 9, it is seen that the accumulator assembly is mounted upon a main accumulator shaft 1. Loosely mounted upon the shaft 1 is a series of internal frames 2, spaced apart, and held against movement in any direction by three spacing bars 2A (Fig. 1) one of which is shown in detail in Fig. 10. The frames support various parts of the transfer mechanism, which will later be described in detail, and also support a tubular casing 3. The casing 3 has its front portion cut away, as shown in Figs. 9 and 3, so that the forward portions of the internal frames 2 may project therethrough. The tubular casing 3 is formed (as is most clearly shown in Figs. 1 and 2) with four lugs 4 at each end thereof. These lugs have small grooves, cut in their inner edges, for cooperation with a pair of locking plates 5. There is one locking plate 5 at each end of the casing 3 and these plates are formed each with four high parts 6, a forwardly extending arm 7, and an upright arm 8. Each upright arm 8 is formed, at its top, with an offset lug which is adapted to engage in a slot 9, cut in the accumulator side plates 10. The side plates 10 and locking plates 5 have similar slots 11 cut therein to allow the accumulator shaft 1 to project at each end. The lugs 4, on casing 3, extend through slots in the side plates 10. In assembling, the side plates 10 are slipped over the lugs 4 and shaft 1 and the locking plates 5 are then placed against the side plates 10 at an angle of approximately forty five degrees variation from the position shown in Fig. 2 so that the high parts of the locking plates 5 are all aligned with the grooves in the lugs 4. The locking plates are then given an eighth of a turn clockwise, as seen in Fig. 2, to position them as shown.

Here the lugs on the upright arms 8 engage in the slots 9 and thus lock the accumulator side walls 10 to the casing 3. Loosely mounted upon the casing 3 are a plurality of accumulator wheels 12 which wheels combine the functions of visible dials and accumulator pinions as will later be described in detail. A pair of main supporting frame walls 13 are mounted upon any suitable base structure (not shown) and each wall 13 has cut, therein, a slot 14 which runs from front to rear in the wall. The slots 14 support and guide the movement of the main accumulator shaft 1.

A pair of screws 15 extend through the frame walls 13 and directly into the slots 14. These screws 15 limit the forward and rearward sliding motion of a bar 16 which runs laterally across the entire accumulator unit. The bar 16 extends through slots in the accumulator side plates 10 and, as is best seen in Fig. 2, it has small notches 17 cut in its rear edge to receive the arms 7 of the locking plates. A pair of springs 18 tend, constantly, to urge the accumulator shaft 1 toward the bar 16. It is thus seen that, if the accumulator is moved forward or rearward in the frame walls 13, the bar 16 must move with it and that the movement of the accumulator will be limited by the screws 15.

Addition and subtraction

As is best shown in Figs. 1 and 2, the actuating mechanism for the accumulator wheels consists of a series of swinging sectors 20 to which are riveted a plurality of type bearing rack segments 21. The accumulator is pushed into and out of engagement with the segments 21 and, although no specific mechanism is herein shown for this accomplishment, it is to be understood that the present accumulator can be used in many types of machines each of which will have its own particular actuating mechanism. However, two means for manually moving the adding wheels into and out of engagement with their respective racks are shown. One is the aforementioned bar 16 and the second is a shaft 22. Shaft 22 extends through both frame walls 13 and is milled out along its middle portion. Screwed to this milled face is a U-shaped bar 23 (see Figs. 1 and 2) which bar is bent up at each end into a pair of arms 24. These arms are formed with slots 25 cut therein and these slots receive opposite ends of the accumulator shaft 1. Thus, if the shaft 22 is turned it will function to move the accumulator into and out of mesh.

To accumulate positive amounts, the actuating racks 21 are swung up to various positions by any mechanism which is suitable and the wheels are then thrown into mesh. The racks are now moved down to their normal positions thus turning the accumulator wheels in a clockwise direction (Fig. 2) as is old and well known.

In order to subtract, the racks 21 are left at normal and the accumulator is thrown into mesh. Subsequent raising of the racks will then turn wheels 12 in a counter-clockwise direction, as seen in Fig. 2.

Transfer mechanism

With particular reference to Figs. 1 and 5, it is seen that each accumulator wheel 12 has cut therein, an annular groove 30. Each wheel 12 has a raised block 31 upon its periphery which block has, inscribed thereon, the numeral "1". Through this block 31 there extends inwardly a pin 32 and this pin lies directly within the annular groove 30. In the adding and subtracting position of the accumulator, which is shown in Fig. 5, a transfer-trip member 33, having a nose 34 thereon, lies in such a position that the nose 34 protrudes toward the front of the accumulator and lies within the annular groove 30 of the accumulator wheel of the next lower order. That is to say, the transfer-trip 33, for a tens order accumulator wheel, lies with its nose 34 in the groove 30 of an accumulator wheel of the units order.

From the foregoing, it is evident that as the pin 32, on any accumulator wheel, passes its associated nose 34, in either direction, it will cam the nose out of the groove 30 and push the transfer-trip 33 toward the accumulator shaft 1.

As was previously mentioned, a series of internal frame walls 2 supports the transfer mechanisms and the relation of these walls to the accumulator wheels 12 may be easily seen from Figs. 1 and 9. With particular reference to Figs. 3 and 4, it is seen that, in the normal position (Fig. 3) or the position of rest of the accumulator, the shaft 1 lies in its foremost position in slots 35 which slots are formed in the frames 2. Loosely mounted upon shaft 1, is a plurality of detents 36 which engage in openings 37 in the accumulator wheels 12. Each transfer trip 33 is formed with a pair of pins 38 thereon. These pins 38 extend both rightwardly and leftwardly from the trips 33. The rightwardly extending portions are supported and guided by a pair of slots 39 in the frames 2. The leftward portions of pins 38 extend through a pair of detent guides 40 and form pivots for these guides. Extending from the left-hand side of the trip 33 is a lug 41 which lies adjacent the detent 36 and holds it flush against the frame 2.

The guides 40 are formed with raised portions 42 which lie flush against an internal frame 2. The guides 40 are each equipped with a coiled spring 43 as is shown in Fig. 3. The springs 43 normally hold the guides 40 and the trip members 33, upon which the guides are mounted, in the Fig. 3 position.

A restoring member 44 is made with two rightwardly extending pins 45 therein. These pins 45 are shown dotted in Fig. 3 and they extend into guide slots 46 in the frames 2. Extending leftwardly (Fig. 2) from each restoring member 44 is a pair of lugs 47 whose functions will be later described in detail.

Transfer operation

In actuating the accumulator during adding or subtracting operations, the entire accumulator unit is moved rearward by shaft 22 (see Figs. 1 and 2) until the bar 16 rests against the rear studs 15. At this time the teeth of the segments 21 are in proper mesh with the openings 37 in the wheels 12. The shaft 22 is rotated slightly farther and this brings the accumulator shaft 1 from its normal position, shown in Fig. 3 to the position shown in Fig. 5 wherein, the shaft 1 lies in the extreme rear ends of the slots 35. This releases the accumulator wheels from the detents 36 and leaves the wheels free to be turned by the segments 21. Preparatory to moving the accumulator wheels out of mesh with the segments 21 the shaft 1 is moved toward the front of the accumulator until the detents 36 engage in their respective slots 37. At this time the wheels 12 are still in mesh but, as the shaft 1 continues to move forward, the wheels are pulled out of mesh

and continue forward until the bar 16 (see Fig. 1) comes to rest against the forward studs 15 as shown.

Referring particularly to Figs. 5 to 8 inclusive, Fig. 5 shows the parts as they normally stand with the wheels 12 in mesh with their actuating racks. In this position, it will be seen that the rear part of the detent 36 lies midway between the lugs 47 on the restoring member 44.

Assume, for example, that in Fig. 5 all the wheels 12 are standing in their cleared position. Assume further that "1" is now subtracted from the wheel of units order. This moves the wheel of units order to the Fig. 6 position. As the wheel moves from the Fig. 5 position to the Fig. 6 position, the inwardly extending pin 32 thereon cams the nose 34 of the tens order wheel clockwise about the upper pin 38. This moves the lower pin 38 rearward in its slot and snaps over the lower spring 43 which then forces the nose of the lower guide 40 into a groove 49 which groove is cut along the entire length of the tubular casing 3. There is also an upper groove 49 for the upper guide 40. The rearward movement of the lower guide 40 causes its rear part to push against the restoring member 44 and swing this member clockwise about a point 50. This brings the upper lug 47, thereon, to a place where it is almost contacting a rear edge 51 on the detent 36. The upper lug 47 now acts upon the edge 51 to support the detent 36.

The description, given thus far, has covered the actions of the transfer parts of the tens wheel from the beginning to the middle of a carry or transfer cycle. In the second half of the transfer cycle, the accumulator shaft 1 moves forward in the accumulator until it assumes the position shown in Fig. 7. All the parts, when once moved to the Fig. 7 position remain there for the rest of the cycle. As the detent 36 moves forward (Fig. 6), in the second half of the transfer cycle, its point first enters the opening 37 which is directly in line with it and, as the shaft 1 and detent 36 continue their forward motion, an ear 52, on the detent 36 of tens order, contacts the lower pin 38. As the nose of the lower guide 40 is now being pressed by spring 43 into the lower groove 49, the pin 38 will not move. However, the shaft 1 still continues its forward motion, and ear 52 being held by pin 38, the result is that the detent 36 is cammed clockwise about the shaft 1. This rotates the tens order wheel 12 one tooth space clockwise. Rotation of the tens order wheel will, through its pin 32, operate the transfer trip 33 associated with the hundreds order accumulator wheel, etc. Thus, every accumulator wheel will move one space and the accumulator wheels will read 99999 etc., instead of 00000, etc.

As the accumulator wheels are still in mesh when the transfer operation attempts to rotate them, it is seen that the actual rotation of the wheels is started while they are still in mesh but is completed afterwards. Due to the fact that a transfer is completed while the accumulator is being drawn toward its normal position or position of rest, a great amount of speed is gained.

The various parts of the transfer mechanism are restored to normal position on the next cycle which follows a transfer cycle. In a restoring cycle, the shaft 1 moves toward the rear of the machine as it would at any time that the accumulator was being meshed with the actuating racks. As the shaft 1 moves rearward within the accumulator, the upper heel 53 of the detent 36 contacts the upper lug 47 on the restoring member 44 and swings the member 44 about its pivot point 50. In the first part of its counter-clockwise movement, a cam edge 54 on the member 44 acts upon the rear point of the lower guide 40 and cams this guide slightly counter-clockwise about its pivot pin 38 so that the forward nose of the guide no longer rests in the groove 49. Fig. 8 shows the parts just after the shaft 1 has started rearward in a restoring cycle. Continued motion of the restoring member 44 pushes the lower guide 40 to a place where the spring 43 takes effect to move the guide to its normal position with a snap. While I have called the above cycle a restoring cycle, it is to be understood that restoring occurs at the first part thereof and that regular addition or subtraction may be accomplished in this cycle as in any other.

While transferring was herein described in connection with subtraction, it is evident that the transfer in addition will be the same except that the wheels 12 will then be turned in the opposite direction.

Totaling

Referring to Figs. 1 and 2, a bent rocking-plate 60 extends laterally in front of the accumulator wheels 12 and is cradled iln the accumulator side plates 10. A spring 61 (Fig. 2) tends constantly to urge the rocking-plate 60 counter-clockwise. Loosely mounted upon the shaft 22, near its right-hand end, is a forwardly extending lever 62 which has a rightwardly bent over end 63. This end extends through a slot in the right-hand wall 13. The lever 62 has a slot 64 near its middle and a large headed screw 65 (see Fig. 1) extends through this slot and into the wall 13 thus holding the lever against lateral movement on the shaft 22.

To clear the machine, the accumulator is moved into mesh with the actuating racks. The lever 62 is then swung clockwise as seen in Fig. 2 thus moving the rocking plate 60 clockwise into the path of the lugs 31 on the accumulator wheels 12. The actuators 20 are then moved upward until all the lugs 31 contact and are stopped by the rocking plate 60. The accumulator is then moved out of mesh and is in cleared condition.

While I have described what I consider to be a highly desirable embodiment of my invention, it is obvious that many changes in form could be made without departing from the spirit of my invention, and I, therefore, do not limit myself to the exact form herein shown and described, nor to anything less than the whole of my invention as hereinbefore set forth, and as hereinafter claimed.

What I claim as new, and desire to secure by Letters Patent, is:

1. The combination of an accumulator including a tubular casing, and accumulator wheel mounted upon said tubular casing, a shaft movable within said tubular casing, an accumulator-wheel detent, mounted upon said shaft and normally engaged with said accumulator wheel; actuating mechanism for said accumulator wheel and means for moving said shaft to engage said accumulator wheel with said actuating mechanism and disengage said detent and to disengage said accumulator wheel from said actuating mechanism and engage said detent with said accumulator wheel.

2. An accumulator including a main accumulator shaft, which shaft is movable within said accumulator, a tubular casing mounted upon said

shaft, a pair of rotatable accumulator wheels of successive denominational order mounted upon said tubular casing; an accumulator-wheel detent, for said wheel of higher order, mounted upon and operable by said shaft; a transfer trip member operable by said accumulator wheel of lower order, a pair of spring-pressed detent-guides movable from a normal position to an abnormal position by said transfer trip-member, and a restoring member operable by said accumulator wheel detent for restoring said guides to normal position after they have been displaced.

3. An accumulator including a main accumulator shaft, a tubular casing mounted upon said shaft, transfer mechanism enclosed by said tubular casing and including accumulator-wheel detenting mechanism mounted upon said shaft, and an accumulator wheel mounted upon said tubular casing, said wheel being formed formed with an annular groove therein and a pin extending into said groove for conditioning said transfer mechanism for operation.

4. The combination of a main accumulator shaft, a tubular casing mounted upon said shaft, a pair of accumulator wheels of successive denominational orders mounted upon said tubular casing, actuating mechanism for said accumulator wheels, and mechanism contained within said tubular casing for effecting tens transferring said mechanism including a detent for said accumulator wheel of higher order, a pair of guides for said detent, and a transfer-trip member associated with said wheel of higher order and operable by said wheel of lower order for conditioning the transfer mechanism to effect tens transferring, said transfer-trip member being formed with a pair of pins, thereon, which pins guide the movements of said transfer-trip member and also support said detent guides.

5. The combination of a main accumulator shaft, a tubular casing mounted upon said shaft, a pair of accumulator wheels of successive denominational orders mounted upon said tubular casing, actuating mechanism for said accumulator wheels, tens transfer mechanism actuated by said accumulator wheel of lower order and contained within said tubular casing for effecting tens transferring said transfer mechanism including a detent for said accumulator wheel of higher order, and a restoring member having a pair of lugs upon one side thereof and adapted to be moved by said detent to restore said transfer mechanism.

6. An accumulator including a tubular casing, an accumulator wheel mounted upon said tubular casing, a shaft movable within said tubular casing, and a detent mounted upon said shaft and movable thereby into and out of engagement with said accumulator wheel.

7. An accumulator including a tubular casing, a pair of accumulator wheels of successive denominational orders mounted upon said tubular casing, a shaft movable within said tubular casing, tens transfer mechanism contained within said tubular casing and operable by said wheel of lower order to effect tens transferring to said wheel of higher order, said tens transfer mechanism including an accumulator wheel detent mounted upon said shaft and movable thereby into and out of engagement with said wheel of higher order, and a movable trip transfer element operable by said wheel of lower order.

8. An accumulator including a tubular casing, a pair of accumulator wheels of successive denominational orders mounted upon said casing and rotatable thereupon in one direction to accumulate positive amounts, and rotatable in the opposite direction to accumulate negative amounts, actuating mechanism for said accumulator wheels, a shaft movable within said tubular casing, means for moving said shaft to engage and disengage said accumulator wheels and said actuating mechanism, an accumulator wheel detent mounted upon said shaft, and a tens transfer trip element contained within said tubular casing and operable by said wheel of lower order to condition said detent to rotate said wheel of higher order.

9. An accumulator including a tubular casing, a pair of accumulator wheels of successive denominational order mounted upon said tubular casing, a shaft movable within said tubular casing, a detent mounted upon said shaft and movable thereby into and out of engagement with said accumulator wheel of higher order, a transfer trip member operable by said wheel of lower order, and a pair of spring pressed detent guides mounted upon said transfer trip member and serving normally to guide said detent.

10. The combination of an accumulator wheel made with a plurality of openings therein for cooperation with actuating mechanism, an annular groove cut in the inner periphery of said accumulator wheel, a pin in said accumulator wheel and extending into said annular groove, tens transfer mechanism encircled by said accumulator wheel, said transfer mechanism including a trip element operable by said pin, zeroizing mechanism and a block formed on the outer periphery of said accumulator wheel for cooperation with said zeroizing mechanism.

11. An accumulator including a tubular casing, a pair of accumulator wheels of successive denominational order mounted upon said tubular casing, a shaft movable within said tubular casing, an accumulator wheel detent for each of said accumulator wheels and mounted upon said shaft, acuating mechanism for said accumulator wheels, means for engaging and disengaging said accumulator wheels and said actuating mechanism, and means operable by said wheel of lower order for conditioning the detent associated with said wheel of higher order to turn said wheel of higher order one digit space to effect tens transferring, while the detent associated with said wheel of lower order holds its wheel against rotation.

12. An accumulator including a tubular casing, a pair of accumulator wheels of successive denominational order mounted upon said tubular casing, a shaft movable within said tubular casing, an accumulator wheel detent for each of said accumulator wheels and mounted upon said shaft, actuating a mechanism for said accumulator wheels, means for engaging and disengaging said accumulator wheels and said acutating mechanism, and means operable by said wheel of lower order for conditioning the detent associated with said wheel of higher order to turn said wheel one digit space in one direction for effecting tens transferring, when positive amounts are being accumulated and for conditioning said detent to turn said accumulator wheel one digit space in the opposite direction for effecting tens transferring when negative amounts are being accumulated, while the detent associated with said wheel of lower order holds its wheel against rotation in either direction.

13. An accumulator including a tubular casing, a pair of accumulator wheels of successive de-

nominational order mounted upon said tubular casing, a shaft movable within said tubular casing, an accumulator wheel detent mounted upon said shaft and movable thereby into and out of engagement with said accumulator wheel of higher order, actuating mechanism for said accumulator wheels, means for moving said shaft to engage and disengage said accumulator wheels and said actuating mechanism, means operable by said accumulator wheel of lower order for conditioning said detent to turn said accumulator wheel of higher order one digit space to effect a tens transfer, and means for causing said conditioned detent to effect the tens transfer upon movement of said shaft.

14. An accumulator including a tubular casing, a shaft movable within said tubular casing, a pair of rotatable accumulator wheels of successive denominational order mounted upon said tubular casing, an accumulator wheel detent mounted upon said shaft and movable thereby into and out of engagement with said wheel of higher order, a transfer trip member operable by said accumulator wheel of lower order, and a pair of spring pressed detent guides mounted upon said transfer trip member and operable by said transfer trip member to enforce turning of said accumulator wheel of higher order by said detent.

15. An accumulator including a tubular casing, a pair of accumulator wheels of successive denominational order mounted upon said tubular casing, a shaft within said tubular casing and movable transversely of its axis, an accumulator wheel detent mounted upon said shaft and movable thereby into and out of engagement with said wheel of higher order, said detent moving out of engagement with said wheel as said shaft moves out of its normal position and into engagement with said wheel as said shaft returns to normal, a guide for said detent, said guide tending normally to cause said detent to move along the same transverse line as said shaft, a notch cut in the inner periphery of said tubular casing, and means operable by said wheel of lower order for moving said guide out of its normal position and into engagement with said notch whereby said detent is caused near the end of its return movement to pivot about said guide and rotate said wheel of higher order one digit space.

16. An accumulator including a tubular casing, a pair of accumulator wheels of successive denominational order mounted upon said tubular casing, a shaft within said tubular casing and movable transversely of its axis, an accumulator wheel detent mounted upon said shaft and movable thereby into and out of engagement with said wheel of higher order, said detent moving out of engagement with said wheel as said shaft moves out of its normal position and into engagement with said wheel as said shaft returns to normal, a guide for said detent, said guide tending normally to cause said detent to move along the same transverse line as said shaft, a notch cut in the inner periphery of said tubular casing, means operable by said wheel of lower order for moving said guide out of its normal position and into engagement with said notch whereby said detent is caused near the end of its return movement to pivot about said guide and rotate said wheel of higher order one digit space, and means operable by said detent when it is next moved to disengaged position for restoring said guide to its normal position.

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