

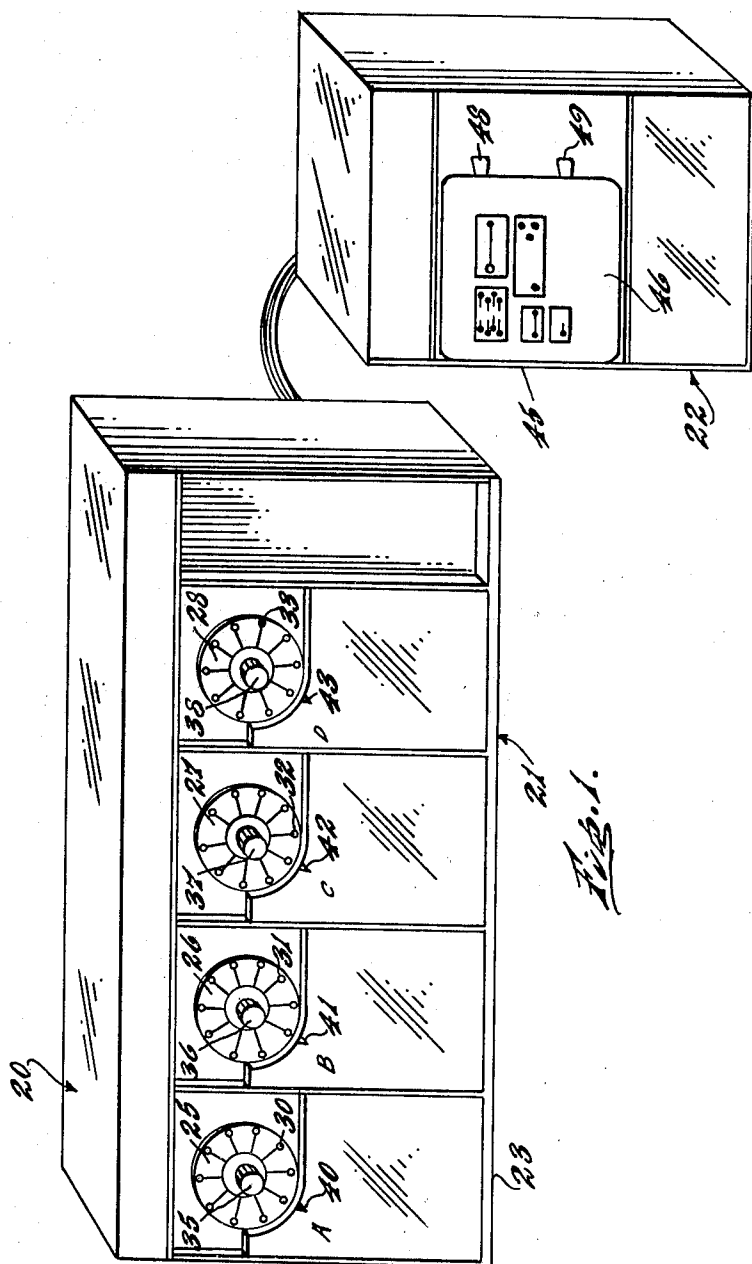
March 3, 1970

W. G. FORD
TOY COMPUTER

3,498,534

Filed Jan. 22, 1968

7 Sheets-Sheet 1



INVENTOR.
Willie G. Ford
BY *Robert K. Koutie*
ATTORNEY

March 3, 1970

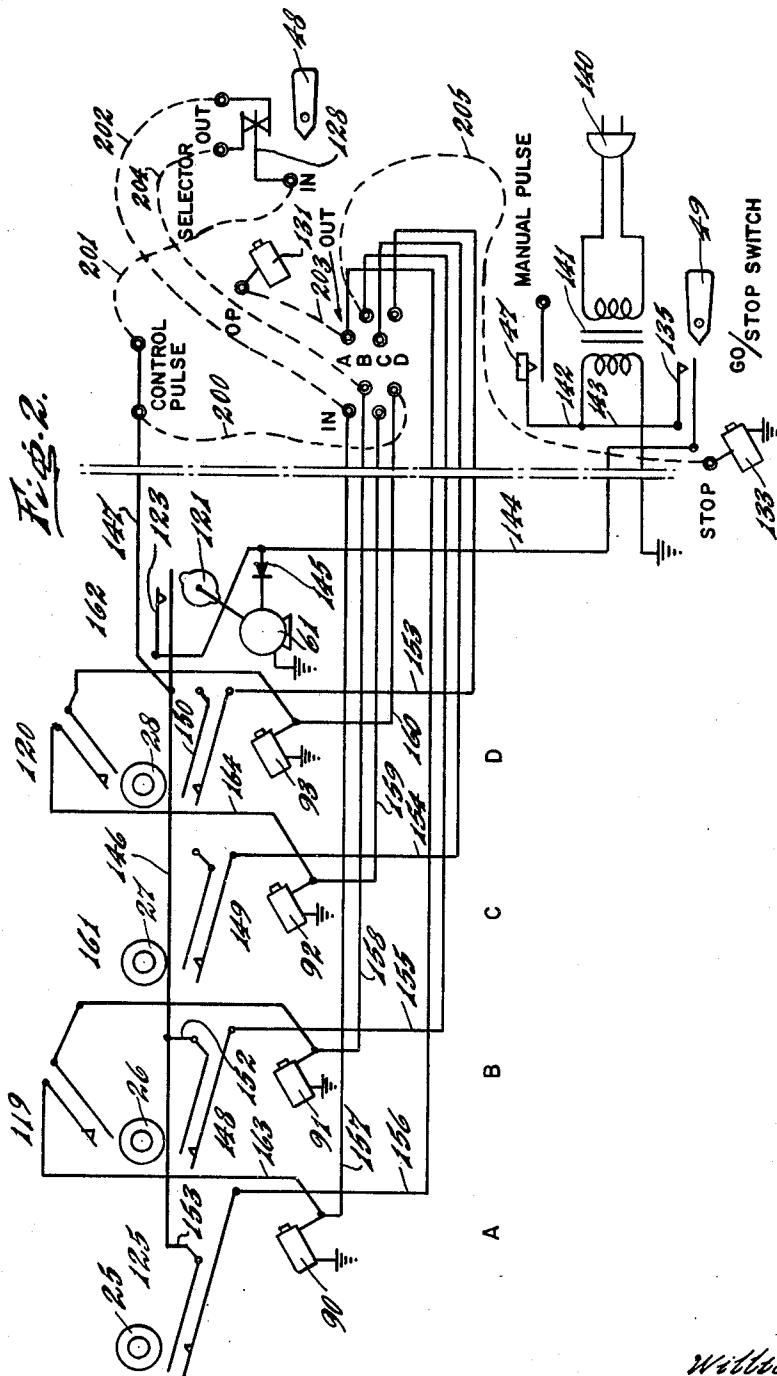
W. G. FORD

3,498,534

TOY COMPUTER

Filed Jan. 22, 1968

7 Sheets-Sheet 2



INVENTOR.
Willie G. Ford
BY *Robert K. Voutie*
ATTORNEY

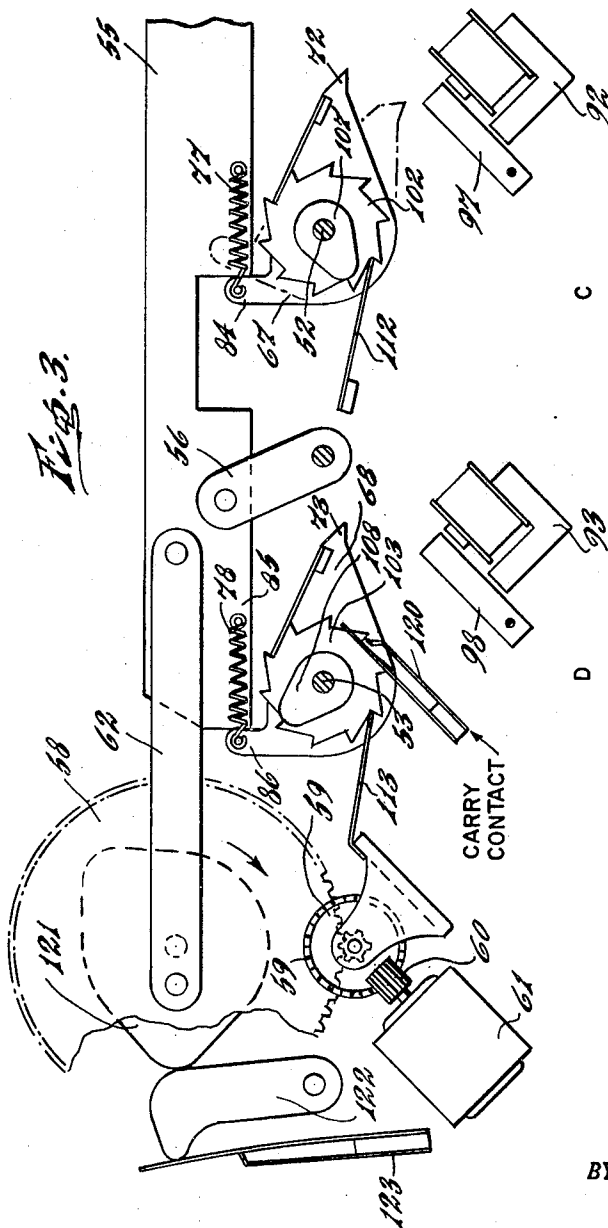
March 3, 1970

W. G. FORD
TOY COMPUTER

3,498,534

Filed Jan. 22, 1968

7 Sheets-Sheet 3



INVENTOR.
Willie G. Ford
BY *Robert K. Youtie*
ATTORNEY

March 3, 1970

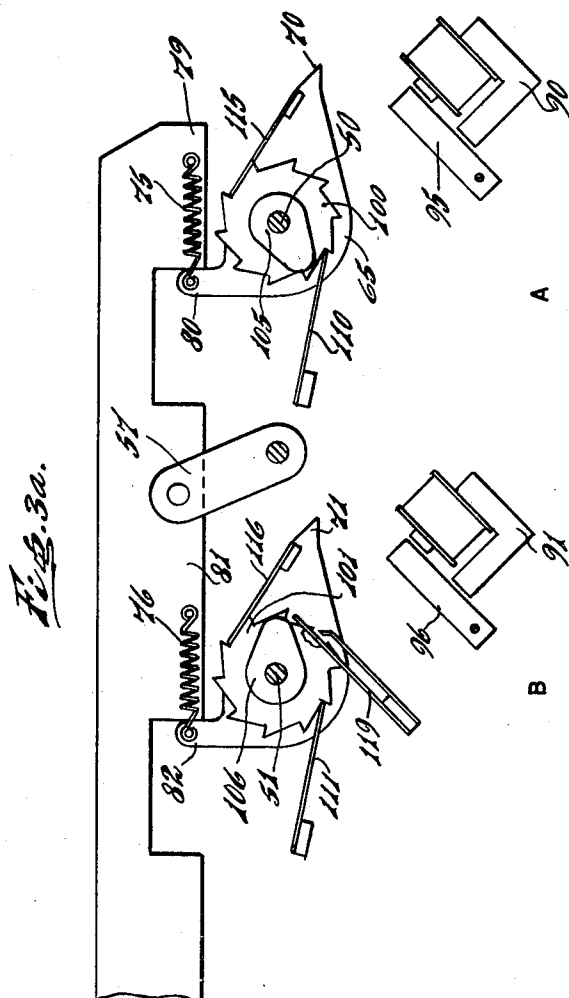
W. G. FORD

3,498,534

Filed Jan. 22, 1968

TOY COMPUTER

7 Sheets-Sheet 4



INVENTOR.
Willie G. Ford
BY *Robert K. Koutie*
ATTORNEY

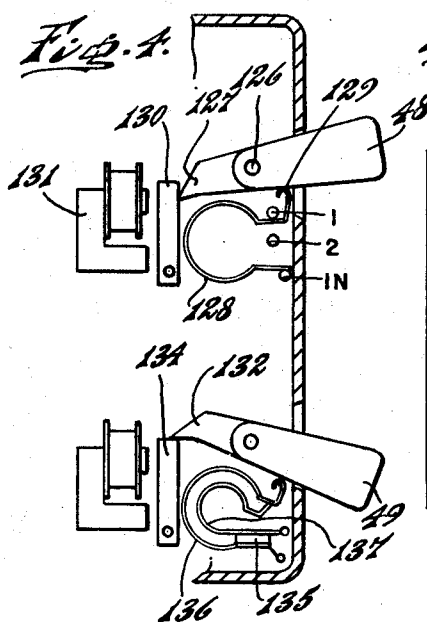
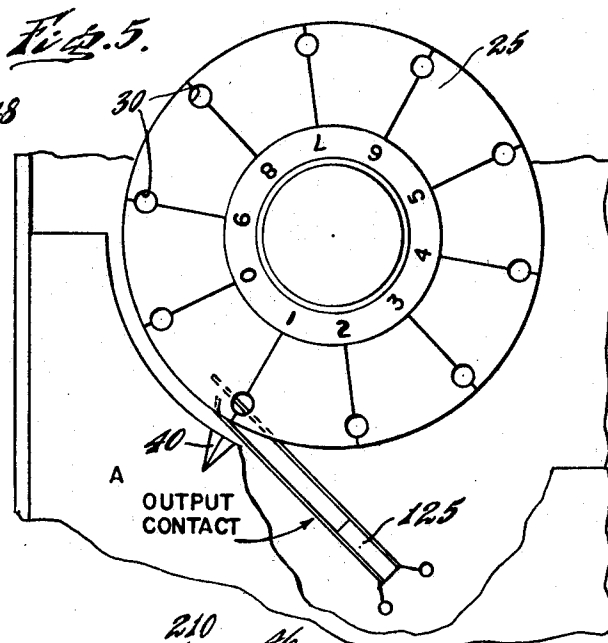
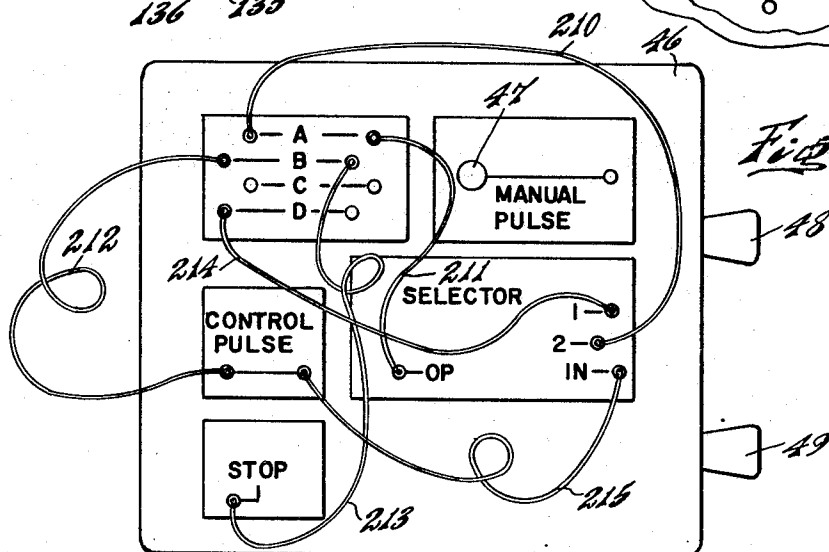
March 3, 1970

W. G. FORD
TOY COMPUTER

3,498,534

Filed Jan. 22, 1968

7 Sheets-Sheet 5



INVENTOR,
Willie G. Ford
BY
Robert H. Koutie
ATTORNEY

March 3, 1970

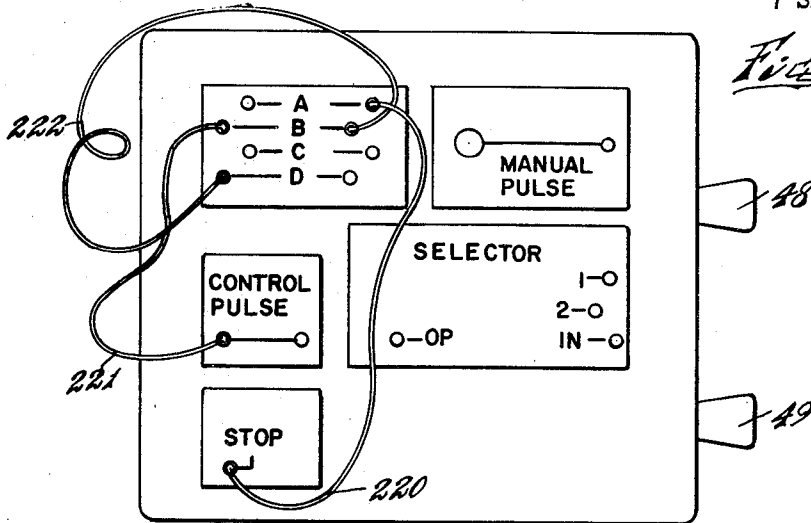
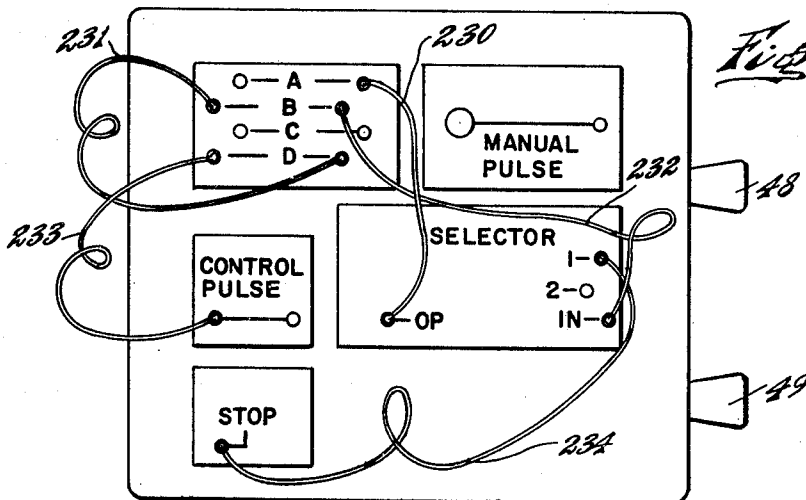
W. G. FORD

3,498,534

Filed Jan. 22, 1968

TOY COMPUTER

7 Sheets-Sheet 6



INVENTOR.

Willie G. Ford

BY

Robert K. Korte

ATTORNEY

March 3, 1970

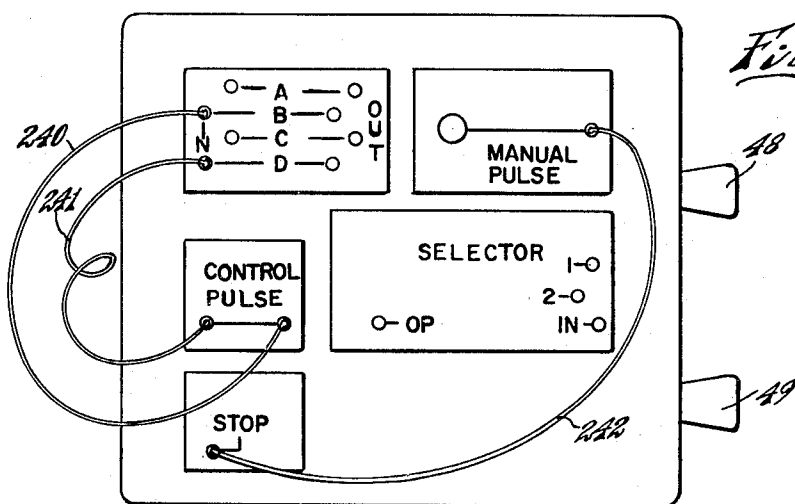
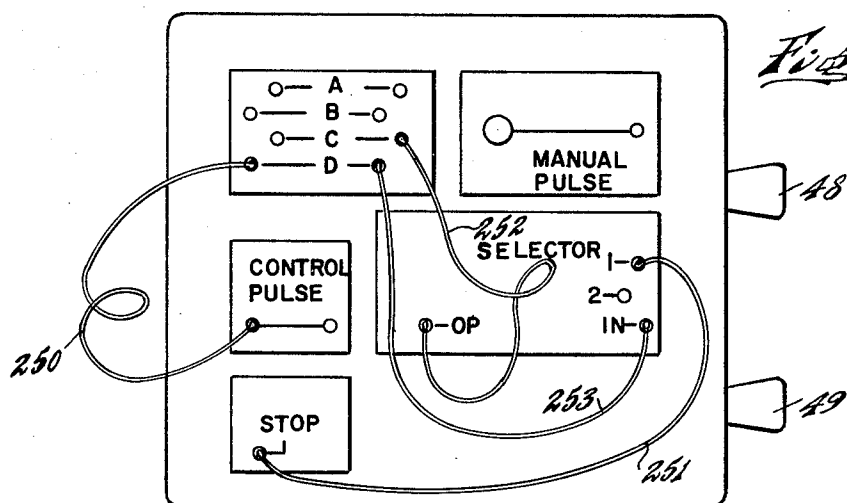
W. G. FORD

3,498,534

TOY COMPUTER

Filed Jan. 22, 1968

7 Sheets-Sheet 7



INVENTOR.
Willie G. Ford
BY Robert K. Youtie
ATTORNEY

1

3,498,534

TOY COMPUTER

Willie G. Ford, 155—20 134th Ave.,
Jamaica, N.Y. 11434

Filed Jan. 22, 1968, Ser. No. 699,539

Int. Cl. G06g 3/00

U.S. Cl. 235—61

7 Claims

ABSTRACT OF THE DISCLOSURE

This invention is concerned essentially with a computer device for educational and play purposes wherein at least a pair of separately rotatable number wheels are respectively associated with pawls and ratchet drive means to be driven by an operating member through yieldable connections, being controlled by electromagnetic actuation through selectively connected circuitry.

BACKGROUND OF THE INVENTION

While there are in the prior art computer-type devices for educational and play purposes, these devices are not entirely satisfactory as lacking capability in the several basic arithmetic operations, or in requiring structure of such complexity as to be prohibitive in cost and subject to excessive malfunction.

SUMMARY

Accordingly, it is an important object of the present invention to provide a toy computer of the type described which is relatively simple and fool-proof in operation, and highly versatile in function, being capable of all the arithmetic operations normally required.

It is another object of the present invention to provide a computer device for educational and play purposes, having the advantageous characteristics mentioned in the preceding paragraph, which is durable and reliable throughout a long useful life, capable of economic mass production, and capable of performing the operations of addition, subtraction, multiplication, division, counting and carrying, and locating.

Other objects of the present invention will become apparent upon reading the following specification and referring to the accompanying drawings, which form a material part of this disclosure.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts, which will be exemplified in the construction hereinafter described, and of which the scope will be indicated by the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a front perspective view showing the overall computer assembly of the present invention.

FIGURE 2 is a diagrammatic representation of the electrical circuitry of the instant device.

FIGURES 3 and 3a are a rear elevational view showing the operational structure of the counting unit.

FIGURE 4 is a front elevational view showing certain components of the control unit, with the front cover removed.

FIGURE 5 is a partial front elevational view of the counting unit, partly broken away, showing a number wheel in its operative association with an output switch.

FIGURE 6 is a front elevational view of the control unit illustrating selected electrical connections for performing subtraction.

FIGURE 7 is a front elevational view of the control unit showing certain electrical connections for multiplication.

2

FIGURE 8 is a front elevational view of the control unit showing certain electrical connections for division.

FIGURE 9 is a front elevational view of the control unit showing electrical connections for counting and carrying.

FIGURE 10 is a front elevational view of the control unit showing electrical connections for locating.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now more particularly to the drawings, and specifically to FIGURE 1 thereof, a computer of the present invention is there generally designated 20, and may for convenience be assembled as separate units, a counting unit 21, and a control unit 22. The counting unit 21 may be enclosed in a generally rectangular housing 23. Externally of the front wall of housing 23 are a horizontal series or row of rotary number wheels, being designated 25, 26, 27 and 28, from left to right. The respective number wheels are each associated with a channel or column of the computer, the channels being indicated on the front wall of the cabinet 23 as A, B, C and D.

Each number wheel 25—28, as best seen in FIGURE 1, is equally subdivided into ten circumferential parts and provided with corresponding numerical indicia. At each such numerical indicia, in a generally circular array, the number wheels 25—28 are formed with sockets or thru holes, as at 30, 31, 32 and 33, respectively. Centrally of each number wheel 25—28 there may be located a manual-turning knob, as at 35—38, respectively. It will thus be appreciated that the several number wheels 25—28 are mounted in generally coplanar side-by-side relation for independent rotation about their respective parallel axes.

On the forward side of the cabinet or housing 23, associated with each number wheel 25—28, may be a zero marking, as at 40, 41, 42 and 43, respectively. As will become more fully understood hereinafter, the zero markings 40—43 provide zero starting points for the respective number wheels 25—28, and indications of numerical readings of the respective number wheels at termination of an operation.

The control unit 22 may be housed in a generally rectangular cabinet 45, and may be entirely separate from the counting unit 21, being connected to the latter only by electrical conductors. On the front side of the control unit 22 is a control panel 46 carrying a plurality of forwardly opening sockets or jacks for electrical connection therebetween. In particular, see FIGURE 6, the control panel 46 is provided with a series of "IN" jacks each corresponding to a respective channel A, B, C and D. Also, the control panel 46 is provided with a series of "OUT" jacks corresponding to respective channels. Below the "IN" and "OUT" channel jacks are a pair of "CONTROL PULSE" jacks, and below the latter is a "STOP" jack. Also provided in the control panel 46 is a "MANUAL PULSE" jack, and a switch button 47 for effecting a manual pulse, as will appear more fully hereinafter. Below the "MANUAL PULSE" jack are located a plurality of "SELECTOR" jacks, being respectively designated "1," "2" and "IN." A selector "OPERATOR" jack is also provided in the control panel, while a pair of switch levers extend from the control panel, a selector-switch lever being designated 48, and a go-stop or on-off switch lever being designated 49.

The rear elevational view of FIGURE 3 illustrates the mechanism of the counting unit within the cabinet 23. It will there be seen that a series of substantially identical assemblies are respectively designated A, B, C and D, corresponding to the aforementioned channels. Each channel assembly includes a generally horizontal, forwardly and rearwardly extending rotary shaft, as at 50, 51, 52

and 53. The shafts 50-53 are disposed in a horizontal row or series, in substantial parallelism with each other, and respectively carry, keyed thereto, the number wheels 25, 26, 27 and 28. The shafts 50-53 are journaled by any suitable means, the particular journaling not being important to the invention.

An operating link 55 extends transversely across and over the several shafts 50-53, being mounted for longitudinal reciprocatory movement, or an approximation thereof, as by parallel supporting links 56 and 57. A rotary drive or crank wheel 58 may be connected in driven relation through reduction gears 59 and 60 to a motive source or motor 61. A connecting rod 62 has its opposite ends pivotally connected to the drive crank or wheel 58 and the main operating member 55 to effect longitudinal reciprocation of the latter.

Each of the several channel assemblies includes a counting pawl, as at 65, 66, 67 and 68, respectively freely rotatable about the shafts 50-53. The counting pawls 65-68 each include a pawl arm, as at 71, 72, 73 and 74 and are respectively connected to the main operating member 55, as by resiliently yieldable members or coil tension springs 75, 76, 77 and 78. The springs 75-78 are each connected between a lug depending from the operating member 55 and a lobe outstanding upwardly from the respective pawl. That is, the spring 75 is connected between a depending lug 79 of the operating member 55 and an outstanding lobe 80 of the pawl 70, while the spring 76 is connected between a depending lug 81 and outstanding lobe 82, the spring 77 being connected between a depending lug 83 and outstanding lobe 84, and the spring 78 being connected between a depending lug 85 and outstanding lobe 86. The several lobes 80, 82, 84 and 86 are located in the respective paths of movement of lugs 79, 81, 83 and 85, so that the pawls 65-68 are rotated counterclockwise, as seen in FIGURE 3, upon leftward movement of operating member 55. Upon rightward movement of operating member 55 the several counting pawls 65-68 are yieldably urged clockwise, as shown in phantom in channel C.

Mounted adjacent to each counting pawl 65-68, respectively, is an electromagnet, as at 90, 91, 92 and 93. The electromagnets are each provided with an armature 95, 96, 97 and 98, and are arranged with the armatures located in the paths, respectively, of the pawl arms to limit pawl rotation upon rightward operating-member movement. Thus, as seen in the phantom position in channel C, the arm 72 of pawl 67 is about to move into abutment with the armature 97. While rotary oscillation of the pawls 65-68 may be limited by engagement of the pawl arms with the respective electromagnet armatures 95-98, reciprocatory movement of the operating member 55 is not so limited, by reason of the yieldability of springs 75-78. However, upon energization of one or more of the electromagnets 90-93, to pull in their respective armatures, the associated pawls 65-68 will be free to swing past the adjacent magnet armature.

Fixedly circumposed about each shaft 50-53 is a one-way toothed, ratchet wheel 100, 101, 102 and 103, respectively. Also carried with each shaft 50-53 is a single lobe cam 105, 106, 107 and 108, respectively. Thus, the ratchet wheels 100-103 and the cams 105-108 are each rotatable with their respective shafts and number wheels.

Mounted adjacent to each sprocket wheel 100-103 is a resiliently deflectable stop member or pawl 110, 111, 112 and 113, respectively. The stop members or pawls 110-113 may each comprise a resilient strip or leaf spring engageable with the adjacent sprocket wheel to ride over the teeth thereof in one direction of sprocket-wheel rotation and engage the teeth to prevent sprocket-wheel rotation in the other direction. Thus, as seen in FIGURE 3, the sprocket wheels 100-103 are rotatable counterclockwise, but held against clockwise rotation by the stop members 110-113. Carried by each counting pawl 65-68 is a ratchet-wheel advancing pawl respectively designated 115, 75

116, 117 and 118. The advancing pawls 115-118 may each be constituted of a resilient strip or leaf spring having one end anchored to the respective counting pawl and having its other end engageable with the adjacent ratchet wheel. Hence, upon counting-pawl rotation in the clockwise direction the advancing pawls 115-118 ride over the teeth of their respective ratchet wheels, and upon counting-pawl rotation in the counterclockwise direction the advancing pawls engage with the ratchet teeth to effect ratchet-wheel rotation in stepped relation.

In addition, a pair of the cams 105-108, say the cams 106 and 108 may have associated therewith respective carry switches 119 and 120, said switches being normally open and closed upon engagement by their respective cams 106 and 108, once upon each rotation thereof.

A control-pulse cam 121 may be carried by the rotary-drive member 58. The control-pulse cam may be formed with a pair of lobes, and a pivoted follower 122 may ride on the control-pulse cam. A control-pulse switch 123 may be located adjacent to the follower 122, being normally open and cyclically closed upon rotation of the control-pulse cam.

Additional structure is shown in FIGURE 5 of channel A, the remaining channels all having identical structure. Adjacent to the number wheels 25 is mounted an output switch 125, being normally open and located in the path of movement of the circumferential sockets 30 of the number wheel. Hence, upon location of a plug in one of the sockets 30, the plug engages with the switch 125 upon number-wheel rotation to its index marking 40, to close the output switch.

In FIGURE 4 is shown structure of the control unit with the control panel removed. It is there seen that the selector-switch lever 48 is pivoted on a pin 126, having an inner end projection 127. The selector jacks are numbered as described hereinbefore, the "IN" jack having a resilient conductor 128 connected thereto and extending for interposition between the "1" and "2" jacks. The resilient conductor 128 includes an extension 129 resiliently bearing against the switch lever 48 and normally holding the latter in the illustrated position with the conductor in contact with jack "1." Upon manual depression of the lever 48, the conductor 128 engages jack "2," and an armature 130 of electromagnet 131 swings into the path of lever-arm projection 127 to prevent return of the lever arm. Upon energization of the electromagnet 131 to pull in the armature 130, the resiliency of conductor strip 128 returns selector-switch arm 148 upward to its illustrated position.

The on-off or stop-go switch arm 49 also includes an inward projection 132. A stop electromagnet 133 is provided with an armature 134 swingable into the path of movement of the lever-arm projection 132 to prevent return of the latter. A go-stop switch 135 includes a pair of resilient contact arms 136 and 137, the former being depressed in the illustrated condition to contact the latter and close the switch. In this condition, the armature 134 has fallen into the path of projection 132, so that the switch 135 is locked closed. Energization of the magnet 133 pulls in the armature 134 to release the projection 132, so that the contact 136 can yieldably displace the arm 49 upward to open the switch 135.

Considering now the schematic diagram of FIGURE 2, a plug 140 is provided for connection to a source of electrical supply and connected to a step-down transformer 141. The output coil of the transformer 141 has one side connected by a conductor 142 to the manual pulse button 47, which is selectively electrically connectable to the manual pulse jack. The output coil of the transformer 141 is further connected by a conductor 143 to one side of the go-stop switch 135. The other side of the transformer output coil is connected to ground.

The go-stop switch 135 is connected through a conductor 144 to a diode 145 which feeds the drive motor 61. The control-pulse cam 121 is schematically illustrated

as driven by the motor 61. The conductor 144 extends for connection to one side of the control-pulse switch 123, the other side of the control-pulse switch being connected to a conductor 146. The control-pulse jacks are connected to the conductor 146 by a conductor 147.

Associated with each number wheel 25-28 is an output switch, substantially identical to the output switch 125 associated with number wheel 25. In particular, output switches 148, 149 and 150 are respectively associated with number wheels 26, 27 and 28. The conductor 146 is connected to one side of each output switch 150, 148 and 125 by respective conductors 151, 152 and 153. The other side of each output switch 150, 149, 148 and 125 is connected by respective conductors 153, 154, 155 and 156 to the appropriate output jacks designated A, B, C and D. The respective electromagnets 90-93 are each connected by conductors 157, 158, 159 and 160 to the input jacks designated A, B, C and D. In addition, the carry switches 19 and 120 are each connected on one side, respectively, by conductors 161 and 162 to input conductors 158 and 160 of respective electromagnets 91 and 93. The other side of the carry switch 119 is connected by conductor 163 to input conductor 157, and the other side of carry switch 120 is connected by conductor 164 to input conductor 159.

In operation, selective connections are made between the various jacks, and programing achieved by the insertion of plugs into sockets 30 of number wheels 25. The dotted-line connections of FIGURE 2 illustrate the operative mode for addition. The number wheels 25-28 are all initially indexed to zero, and number wheels A and B are provided with plugs in the sockets corresponding to the augend and addend. With the selector-switch arm 49 pushed down to connect the selector "IN" jack to selector jack "2," the go-stop switch arm 49 is depressed to close the switch 135. This energizes the motor 61 to reciprocate the operating link 55 thereby urging all of the counting pawls 65-68 to effect a complete oscillatory cycle. However, only those pawls associated with an energized electromagnet 90-93 may execute a complete oscillation. The control-pulse switch 123 is cyclically closed in timed relation with operating-member reciprocation, and the control pulse is transmitted to both the solenoids 90 and 93 of channels A and D. In particular, conductor 200 communicates the control pulse to electromagnet 93 through input conductor 160, and the control pulse is communicated through conductor 201 to the "IN" jack of the selector switch, the latter being closed to jack "2," the control pulse is further communicated through conductor 202 to the input conductor 157 and electromagnet 90. In this way, the number wheels A and D are rotated until a plug in wheel A engages with and closes output switch 125. This communicates the control pulse through conductors 147, 146, 153, switch 125, conductor 156 and conductor 203 to operator electromagnet 131 which releases the selector switch for closure to jack "1." Number wheel A stops rotation and number wheel D continues rotating, the control pulses continuing to number wheel D and now communicating through conductor 201, selector switch 128, selector-switch output jack "1" and conductor 204 to input conductor 158 of number wheel B to electromagnet 91. Hence, number wheel B proceeds to rotate together with number wheel D. Number wheel B rotates until its plug engages with and closes output switch 48, thereby transmitting a control pulse through conductors 147, 146, and 152, switch 148 and output conductor 155, and thence through conductor 205 to operate the stop magnet 133 which opens stop-go switch 135.

Operation thereby ceases and the sum is read on the number wheel D. In the event that the sum is a two-digit number, rotation of the number wheel D past zero causes carry cam 108 to close carry switch 120, whereby the control pulse to electromagnet 93 of number wheel D is communicated through conductor 162, carry switch

120, and conductor 164 to electromagnet 92 of number wheel C, so that the latter number wheel rotates to indicate the tens digit.

The selected connections between jacks for the subtraction function are illustrated in FIGURE 6. It will there be seen that a conductor 210 is connected between the input jack A and selector-switch jack "2." A conductor 211 is connected between the output jack A and the selector-switch operator jack. A conductor 212 is connected between the input jack B and a control-pulse jack, and a conductor 213 is connected between the output jack B and the stop jack. A conductor 214 is connected between the input jack D and the selector-switch jack "1," and a conductor 215 is connected between a control-pulse jack and the "IN" jack of the selector switch.

The number wheels A and B are provided with plugs in their proper respective sockets corresponding to the subtrahend and minuend. With the selector-switch arm 48 down and the several number wheels at their zero positions, closure of the go-stop switch initiates rotation of number wheels A and B. Upon movement of the number wheel A to locate its plug at the index mark the output switch is closed which operates the selector switch to close the latter to jack "1." This effects rotation of number wheel D through the remaining rotation of number wheel B, so that the difference is read on number wheel D.

The function of multiplication is illustrated in FIGURE 7, wherein a conductor 220 is connected between output jack A and stop jack, a conductor 221 is connected between input jack B and a control-pulse jack, and a conductor 222 is connected between output jack B and input jack D. Number wheels A and B are programmed by inserting a plug in the socket 30 of number wheel A corresponding to the multiplier, and inserting a plurality of plugs in number wheel B corresponding in number to the multiplicand.

With the selector-switch arm 48 up, upon closure of the stop-go switch 135, number wheel B rotates, and each plug in number wheel B passing the output switch thereof effects rotation of number wheel D a single step. Thus, for each complete rotation of number wheel B, number wheel D is stepped a number of spaces equal to the multiplicand. Also, upon each complete rotation of number wheel B, number wheel A is stepped a single space, so that number wheel B makes a number of complete rotations equal to the multiplier, and upon movement of the plug in number wheel A to its index position, the output switch of number wheel A terminates the operation. The product is read on number wheel D, or on number wheels C and D if in two digits.

Considering now the divide function, as seen in FIGURE 8, a conductor 230 is connected between output jack A and selector-operator jack, and a conductor 231 is connected between input jack A and output jack D. A conductor 232 is connected between output jack B and selector jack "IN," while a conductor 233 is connected between input jack D and a control-pulse jack, and a conductor 234 is connected between stop jack and selector jack "1." The number wheels A and B are provided at appropriate locations with plugs indicating the dividend, and the number wheel D is provided with a number of plugs equal to the divisor. Upon closure of go-stop switch 135, the number wheel D is rotated from the control pulse and effects stepping action of number wheel B at each plug of number wheel D. Number wheel C carries from number wheel D and is stopped by movement of number wheel B plug to the index position. The foregoing relates to a single-digit dividend wherein the selector switch is up. In operation with a two-digit dividend, the selector-switch arm is down, and the plug in number wheel B effects operation of the selector switch to carry to number wheel A. In either case, the quotient may be read from number wheel C.

The counting and carrying function is shown in FIGURE 9, wherein a conductor 240 is connected between

input jack B and an output control-pulse jack, an additional conductor 241 being connected between input jack D and another control-pulse jack, while a remaining conductor 242 is connected between stop jack and manual pulse jack. In this operation, plugs are not required, the number wheels B and D rotating continuously, and upon each passage through zero position effecting closure of the corresponding carry switch to step the number wheels A and C one position. This operation continues until the stop switch is manually energized by depression of manual pulse button 47.

The locating function is illustrated in FIGURE 10, wherein a conductor 250 is connected between output jack D and a control-pulse jack, a conductor 251 being connected between stop jack and selector-switch jack "1," a conductor 252 being connected between output jack C and selector-switch-operator jack, and a conductor 253 being connected between output jack D and selector switch "IN" jack. Programming is by placement of a plug in a hole 32 and 33 of respective number wheels C and D, with location of these number wheels at their zero positions.

With the selector-switch arm down, operation is initiated by closure of the go-stop switch 135 which effects continuous stepping of the number wheel D. Each time the plug in number wheel D closes its output switch, the number wheel C is stepped one position, until the plugs in both number wheels C and D are located at their index positions, which energizes the stop relay 135 and operation ceases.

From the foregoing (it is seen that the present invention provides a toy computer of the type described which fully accomplishes its intended objects and is well adapted to meet practical conditions of manufacture and use.

Although the present invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it is understood that certain changes and modifications may be made within the spirit of the invention.

What is claimed is:

1. A toy computer comprising at least a pair of separately rotatable number wheels, a freely rotatable pawl associated with each number wheel, one-way-ratchet drive means operatively connected between each pawl and the associated number wheel for rotatably stepping the latter upon pawl rotation in one direction, a reciprocatory operating member, a yieldable connection between said operating member and each pawl for yieldably oscillating the latter upon operating-member reciprocation for effecting number-wheel stepping, an electromagnet normally located in the path of movement of each pawl to limit oscillation thereof and actuable to move out of said path, electric drive means connected in driving relation with said operating member, control-pulse means operatively connected to said drive means and selectively connectable to said electromagnets to actuate the latter for stepping action of said number wheels, an output switch connected to said control pulse means and associated with each number wheel for actuation thereby upon rotation to a selected position, and an on-off switch connected to said drive means for energizing the latter and selectively connectable to said output switches for deenergizing said drive means responsive to selected number-wheel rotation.

2. A toy computer according to claim 1, said control-pulse means comprising a control switch having one side

connected to said on-off switch and having its other side connected to said output switches, and cam means operated by said drive means to cyclically close said control switch in timed relation with said pawl oscillation.

3. A toy computer according to claim 1, in combination with at least a pair of additional separately rotatable number wheels, an additional freely rotatable pawl associated with each additional number wheel, additional one-way-ratchet means operatively connected between each additional pawl and associated number wheel for rotatably stepping the latter upon pawl rotation in one direction, an additional yieldable connection between said operating member and each additional pawl for yieldably oscillating the latter upon operating-member reciprocation for effecting number-wheel stepping, an additional electromagnet normally located in the path of movement of each additional pawl to limit oscillation thereof and actuable to move out of said path, said control-pulse means being selectively connectable to said additional electromagnets to actuate the latter for stepping action of said additional number wheels, an additional output switch connected to said control pulse means and associated with each additional number wheel for actuation thereby upon rotation to a selected position, a carry switch connected between the electromagnet of each first-mentioned electromagnet and an associated additional electromagnet, and a carry cam movable with each first-mentioned number wheel to actuate an associated carry switch.

4. A toy computer according to claim 3, in combination with a double-throw selector switch having its swingable arm and contacts selectively connectable to said control pulse means, electromagnets, output switches and on-off switch.

5. A toy computer according to claim 4, in combination with a selector electromagnet operable for effecting movement of said selector switch in one direction and selectively connectable to said output switch.

6. A toy computer according to claim 1, said operating member comprising a longitudinal reciprocable link extending transversely of the axes of number-wheel rotation, said pawls being rotatable about the axes of respective number wheels, and said yieldable connections each comprising a tension spring connected between said link and the respective pawl.

7. A toy computer according to claim 6, said ratchet drive means each comprising a ratchet wheel rotatable about the axis of and together with the respective number wheel, and a resiliently deflectable advance member carried by each pawl for riding engagement over the associated ratchet wheel in one direction of pawl rotation and rotating engagement with the ratchet wheel in the other direction of pawl rotation.

References Cited

UNITED STATES PATENTS

3,278,736	10/1966	Pastoriza	235—184
3,324,575	6/1967	Higgins	35—31
3,379,864	4/1968	Petersen	235—184

STEPHEN J. TOMSKY, Primary Examiner

STANLEY A. WAL, Assistant Examiner

U.S. Cl. X.R.

35—30; 235—60