United States Patent [19]

Hanson

[11] **3,731,068**

[45] **May 1, 1973**

[54] VALUE DISPENSING MECHANISMS

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[73] Assignee: **Pitney-Bowes, Inc.**, Stamford, Conn.

[22] Filed: **Nov. 23, 1970**

[21] Appl. No.: **91,800**

[52] **U.S. Cl.** .....**235/101**, 235/132 R

[51] **Int. Cl.** **G07g 1/00**, G06f 15/18

[58] **Field of Search** .....235/101, 132 R; 221/7; 101/91, 92

[56] **References Cited**

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2,306,499	12/1942	Rouan	235/101
2,321,425	6/1943	Rouan	235/101
3,526,358	9/1970	Reus et al.	235/101

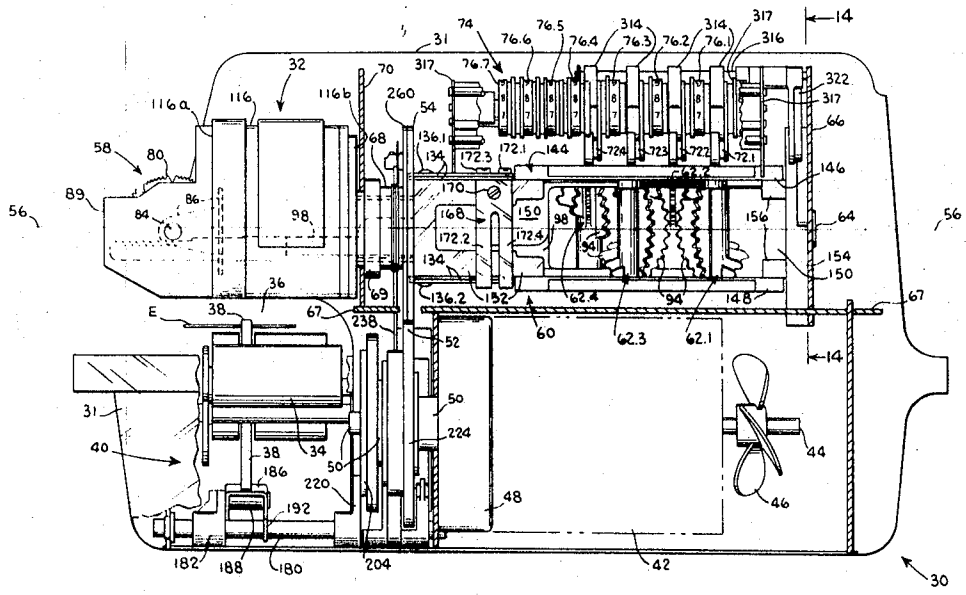
Primary Examiner—Stephen J. Tomsky

Attorney—William D. Soltow, Jr., Martin D. Wittstein, Albert W. Scribner and Louis A. Tirelli

[57] **ABSTRACT**

A postage meter having a mechanism which is rotatable to print a postage impression of a selected value. A mechanism for setting the postage value is provided, and is assembled with the printing mechanism for rotation therewith. This setting mechanism includes selector wheels which are coaxially rotatable, and setting bars which are longitudinally translatable in response to rotation of the selector wheels. Economic accountability is assured by postage registers having four drivable decimal orders, and input pinions for each such order. The setting mechanism has four adjustable register-driving gear clusters which are normally disengaged from the register pinions, but engage them during printing. Mechanisms are provided for choking the register, and for clamping the choke devices to provide positive register locking when the driving gear clusters are disengaged from the pinions. The setting bars comprise an assembly of individual bar members, pairs of which are connected together for joint translation. The bars are nested in a unique way, and are formed with respective gear tooth racks which adjust the register-driving gear clusters and set the numerical value of the postage printing wheels. Rectification is accomplished by pawls which engage the setting bar racks, and have a mutually interlocking relationship with a shutter disk. This interlock operates either to disable the meter trip mechanism, and thus prevent postage printing operation, when the setting bars are not in rectified position; or to lock the setting bars during a postage printing cycle. A deadlock latch, which acts as an intermediate link between the shutter disk and trip mechanism, also blocks the trip mechanism when the descending postage balance is low, or the register compartment access door is open.

30 Claims, 24 Drawing Figures



14 Sheets-Sheet 1

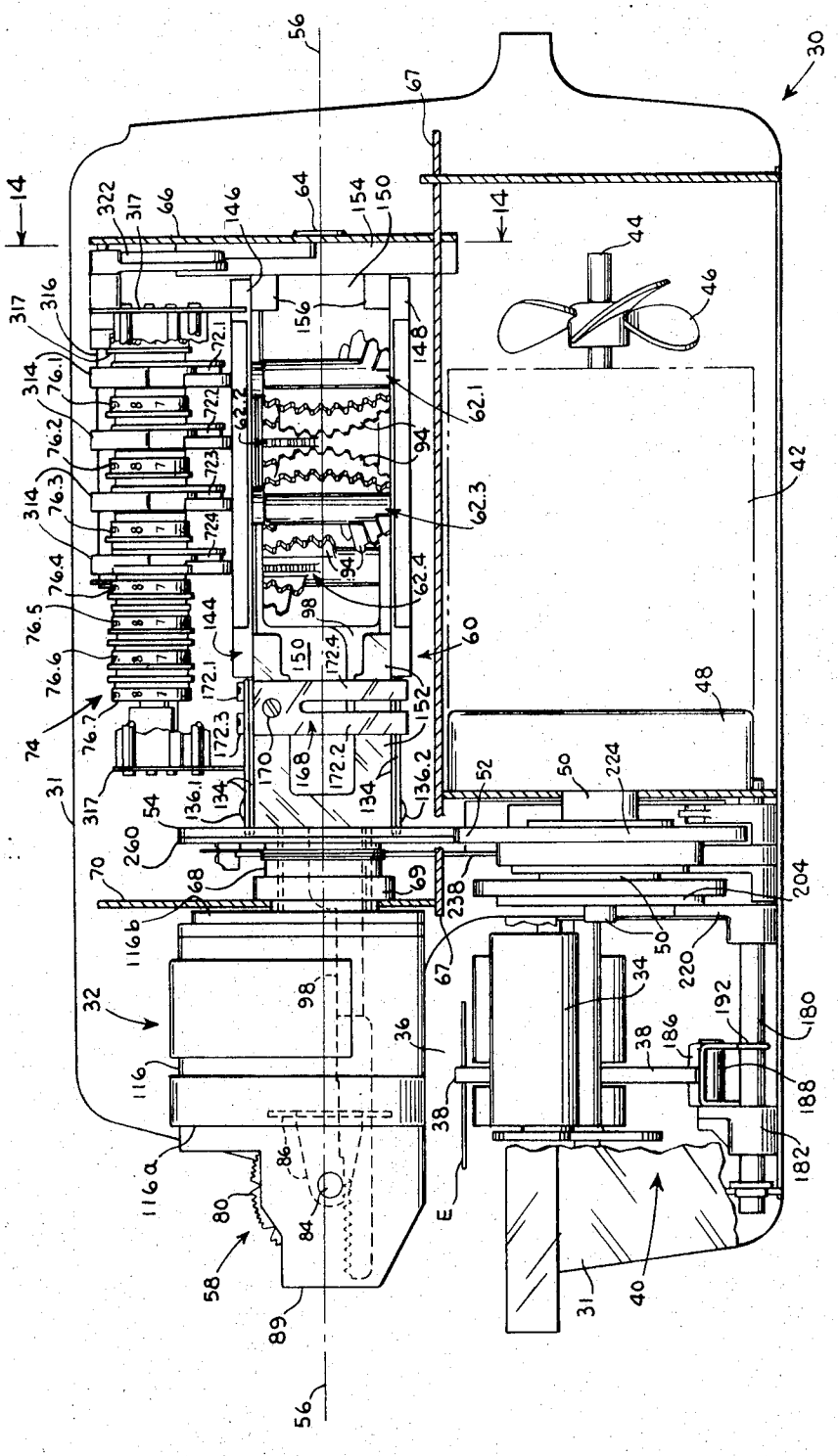


FIG. 1

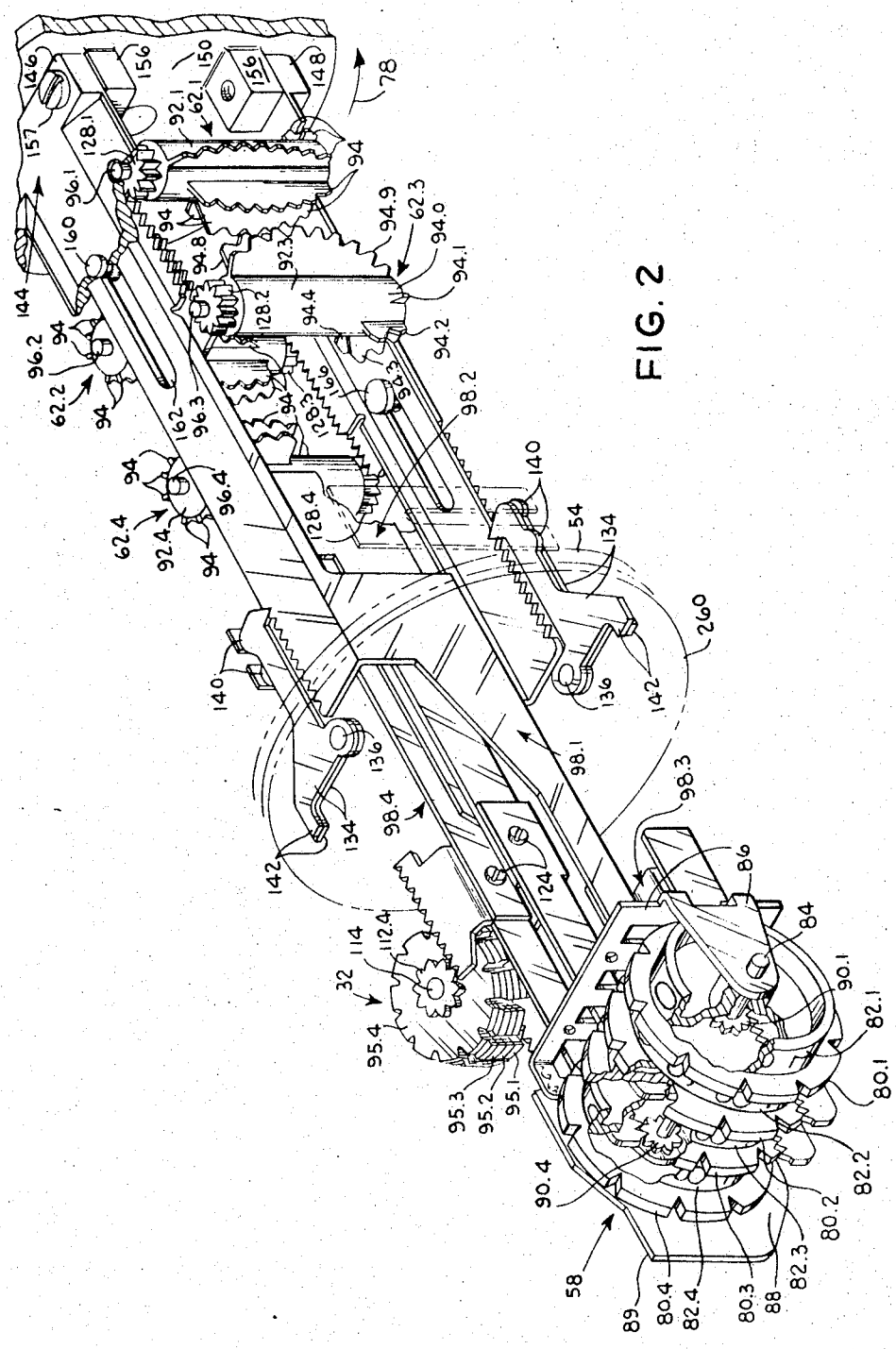


FIG. 2

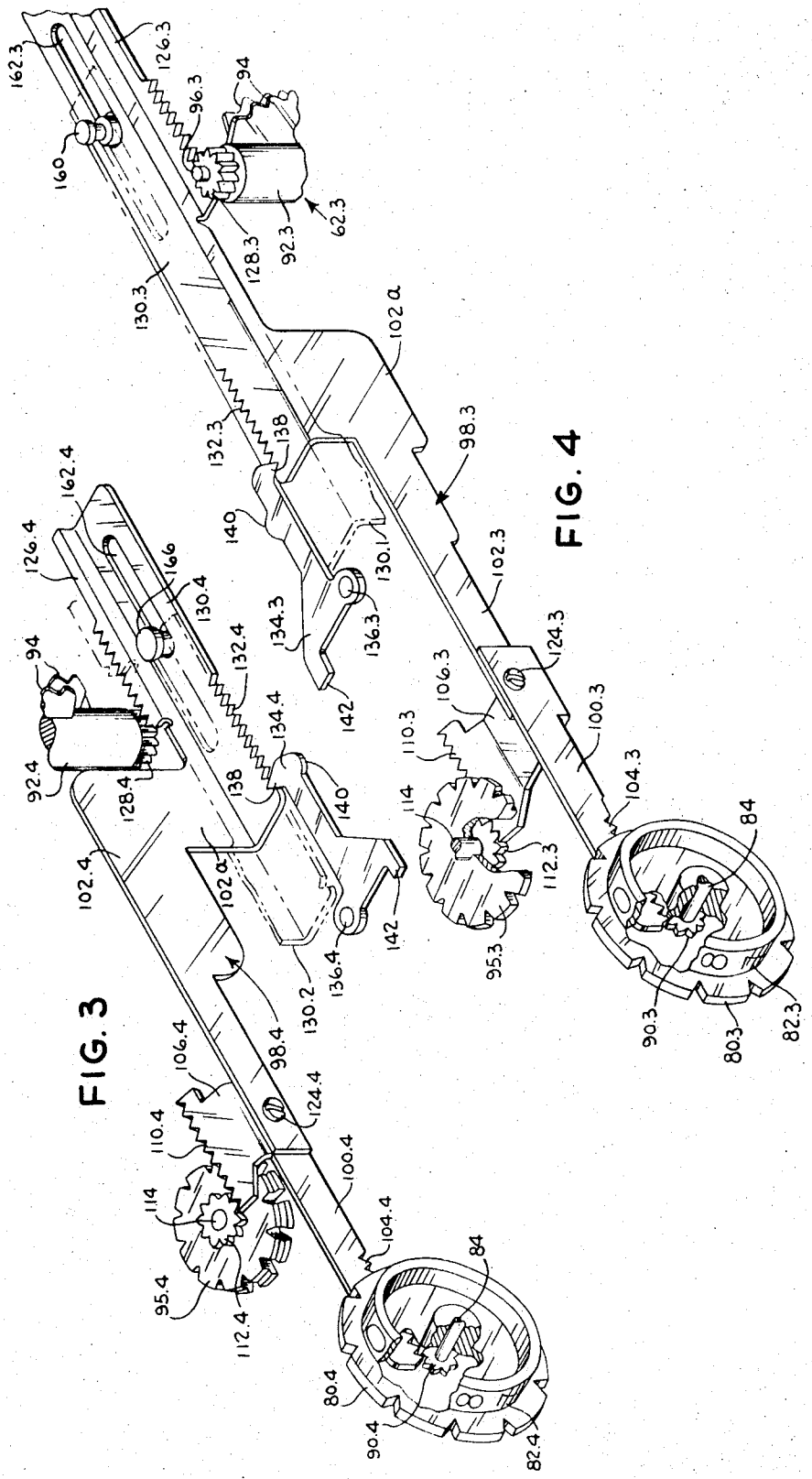

162.3
126.3
96.3
94
160
62.3
92.3
128.3
130.3
102a
132.3
138
98.3
140
130.1
102.3
162.4
126.4
166
130.4
134.3
136.3
124.3
94
132.4
142
106.3
134.4
110.3
100.3
92.4
128.4
138
140
114
104.3
84
102.4
102a
112.3
142
95.3
136.4
130.2
90.3
80.3
82.3
98.4
106.4
124.4
110.4
100.4
114
104.4
84
95.4
112.4
80.4
90.4
82.4

FIG. 3

FIG. 4

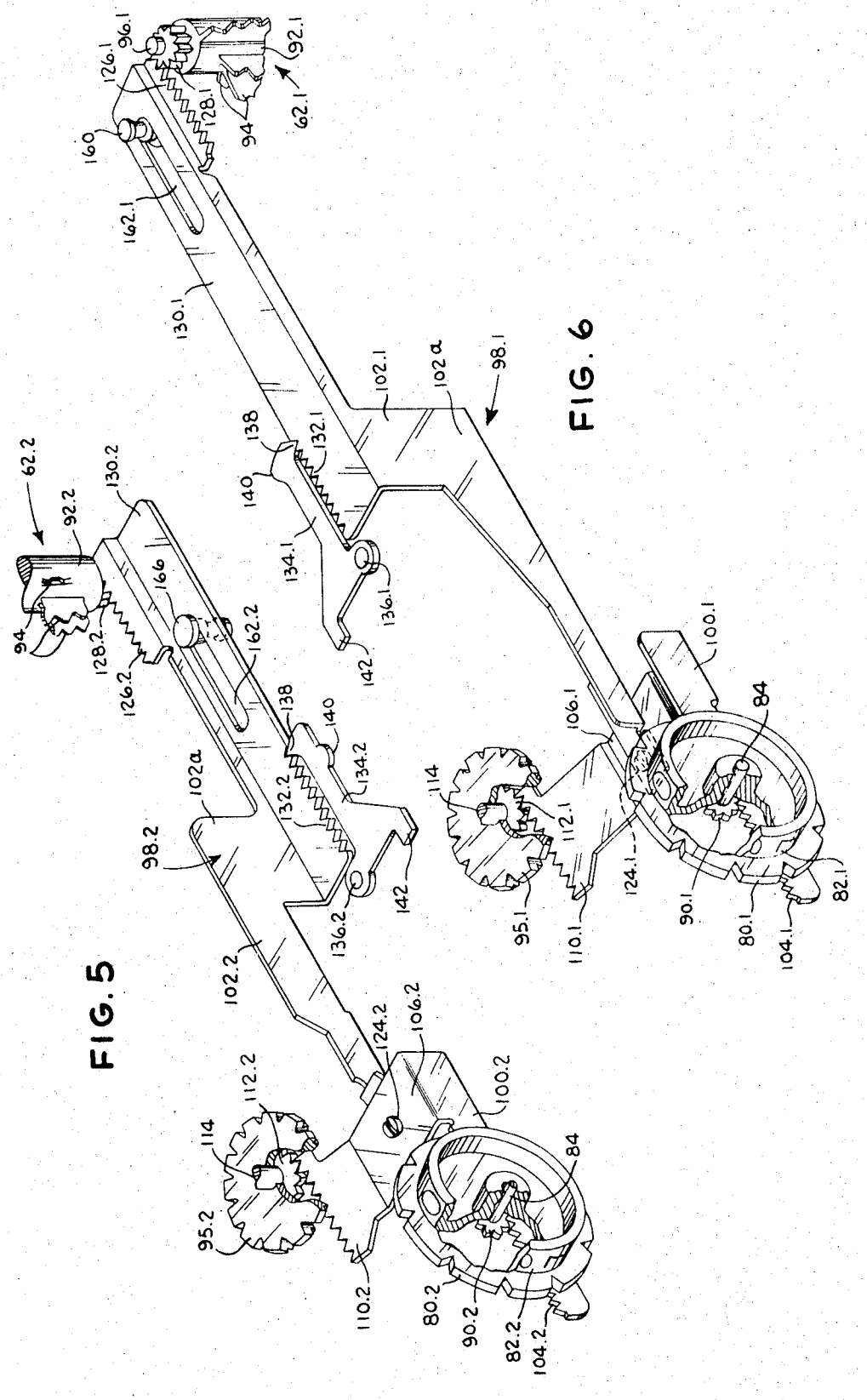

62.2
92.2
130.2
94
128.2
126.2
166
162.2
138
140
134.2
132.2
102a
98.2
142
136.2
102.2
124.2
106.2
100.2
112.2
114
95.2
110.2
80.2
90.2
82.2
104.2
84
62.1
92.1
90.1
126.1
128.1
94
160
162.1
130.1
102.1
102a
98.1
138
132.1
140
134.1
136.1
142
106.1
100.1
84
114
112.1
124.1
95.1
110.1
90.1
80.1
104.1
82.1

FIG. 5

FIG. 6

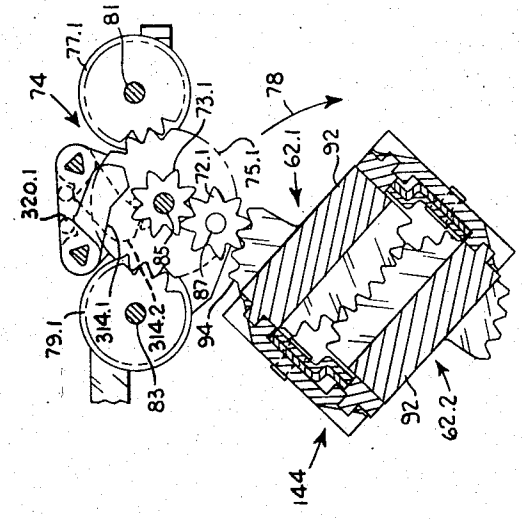

81
77.1
74
73.1
78
72.1
75.1
62.1
92
320.1
85
87
314.1
314.2
79.1
83
94
92
62.2
144

FIG. 8

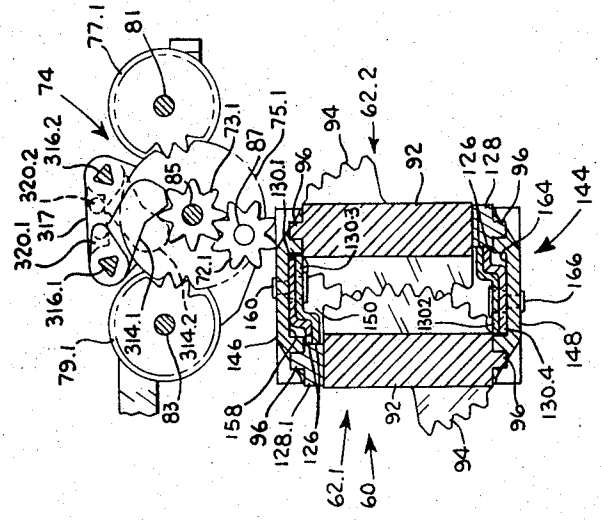

77.1
81
74
316.2
320.2
73.1
75.1
87
94
62.2
85
130.1
96
92
126
128
96
164
144
320.1
317
130.3
72.1
166
316.1
160
150
130.2
314.1
314.2
146
148
79.1
83
130.4
158
96
128.1
126
92
96
62.1
60
94

FIG. 7

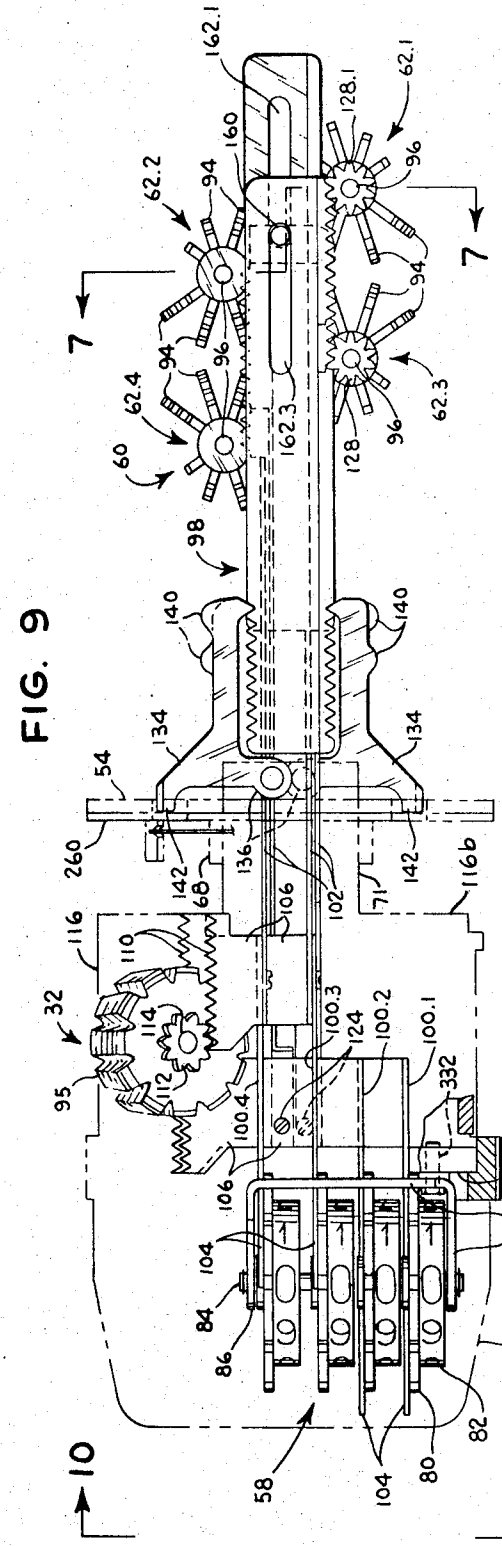


FIG. 9
162.1
128.1
62.1
160
62.2
94
96
7
7
62.4
60
162.3
128
62.3
98
140
134
54
260
142
136
68
106
102
71
116b
116
110
32
114
112
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100.1
332
116a
104
84
86
89
58
80
82
10
10

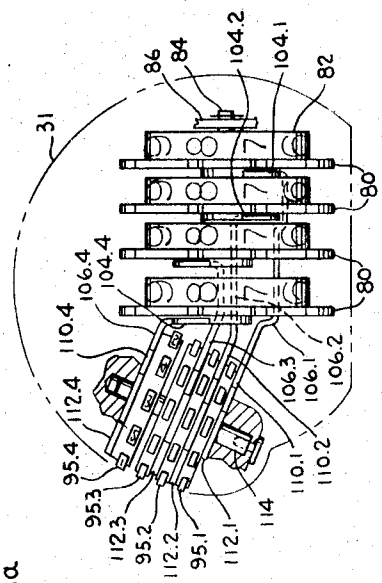


FIG. 10
31
86
84
104.2
104.1
82
80
106.4
104.4
110.4
112.4
95.4
95.3
112.3
95.2
112.2
95.1
112.1
114
106.3
106.1
106.2
110.1
110.2

FIG. 11A

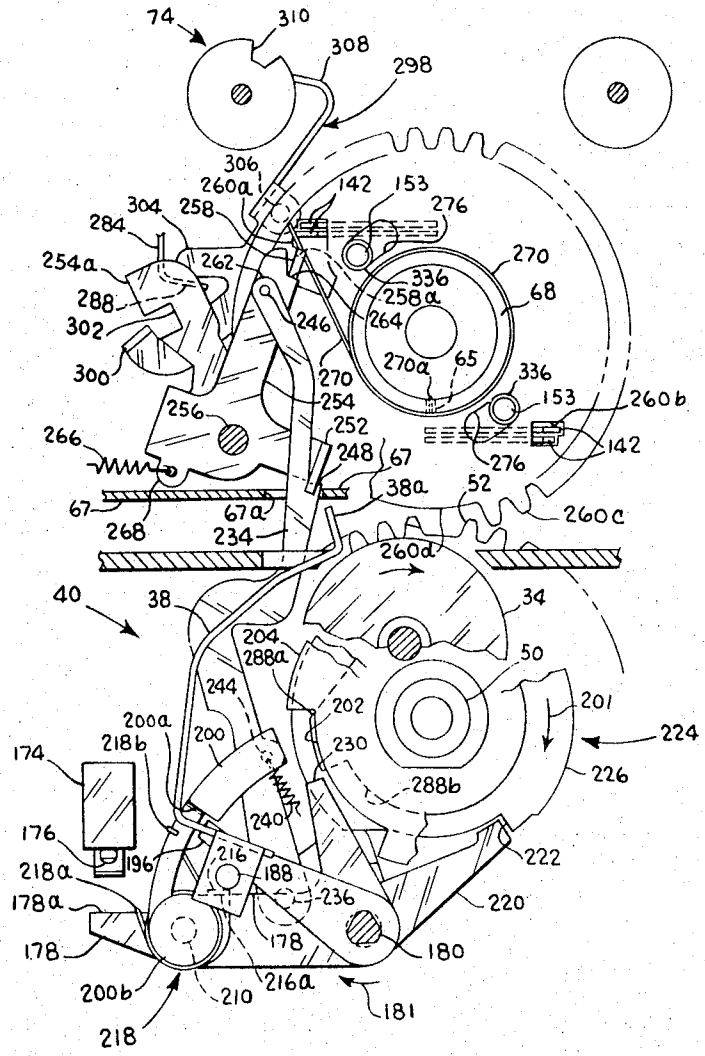

74
310
308
298
306
260a
142
153
276
304
258
284
254a
262
270
336
258a
68
288
302
246
264
270a
65
300
270
254
336
153
260b
256
252
142
266
248
67
276
38a
52
67
67a
260c
268
234
260d
40
38
34
204
288a
50
244
202
201
224
200a
200
230
218b
174
288b
226
240
176
216
222
218a
196
188
236
220
178a
178
180
200b
210
216a
181
218

FIG. 11B

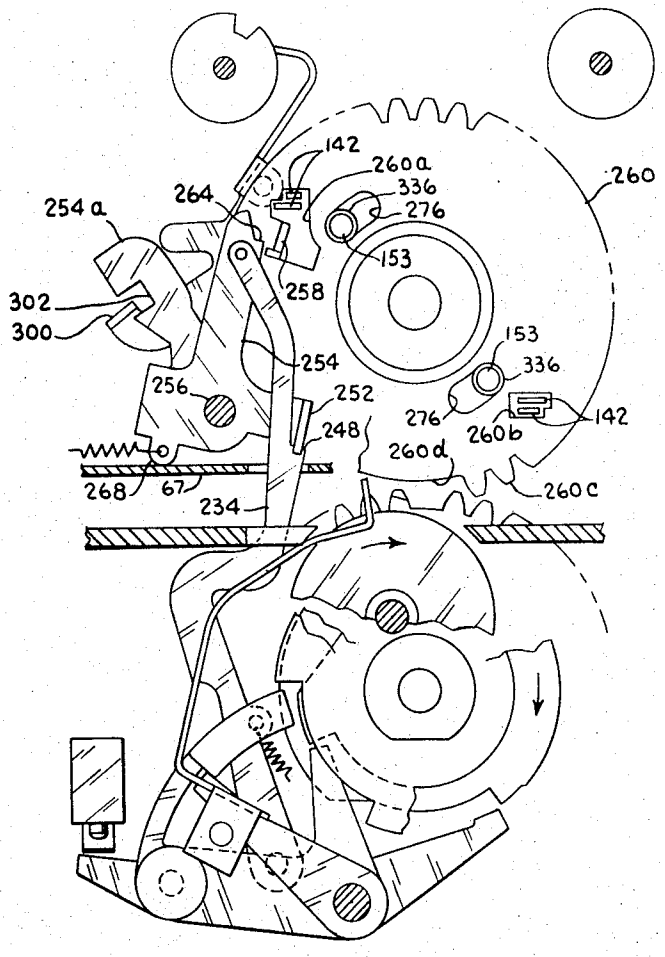
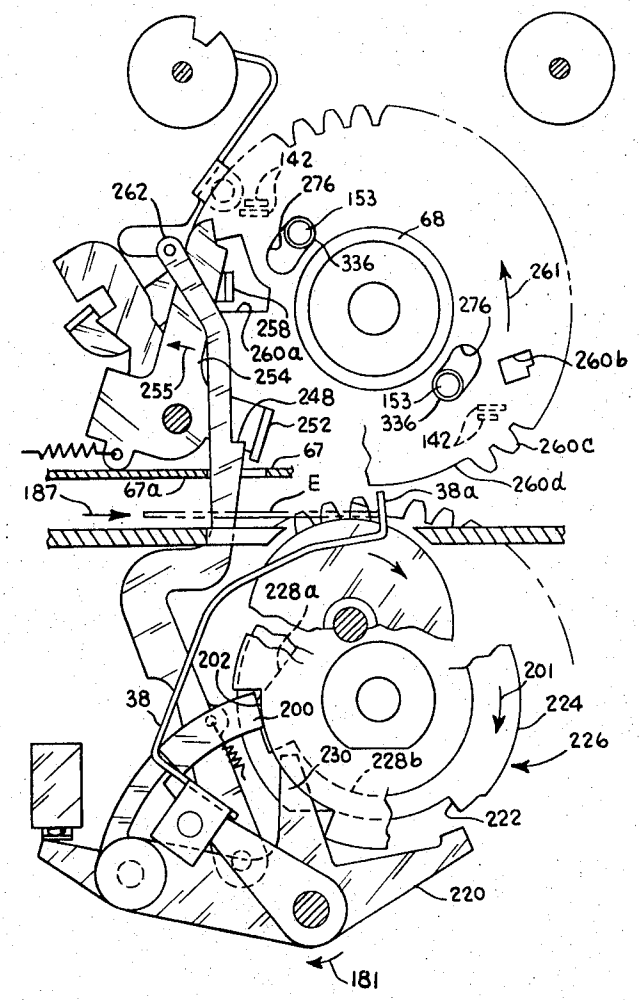

142
260a
260
264
336
254a
276
153
258
302
300
153
254
336
256
252
276
142
248
260b
260d
268
67
260c
234

FIG. 11C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276
153
68
262
336
261
276
258
260a
260b
254
255
248
153
336
142
260c
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201
38
200
224
226
230
228b
222
220
181

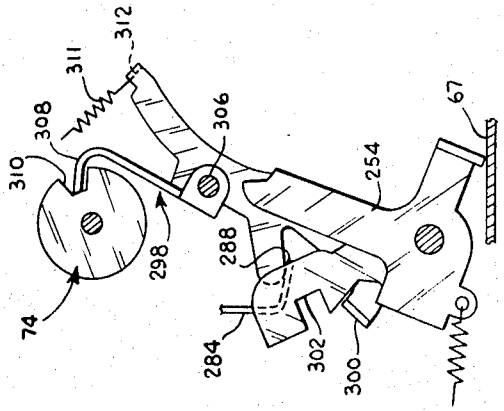


FIG. 11E

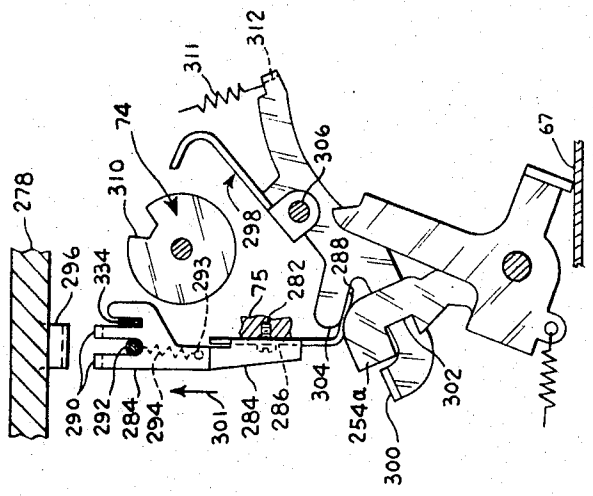


FIG. 11D

FIG. 12

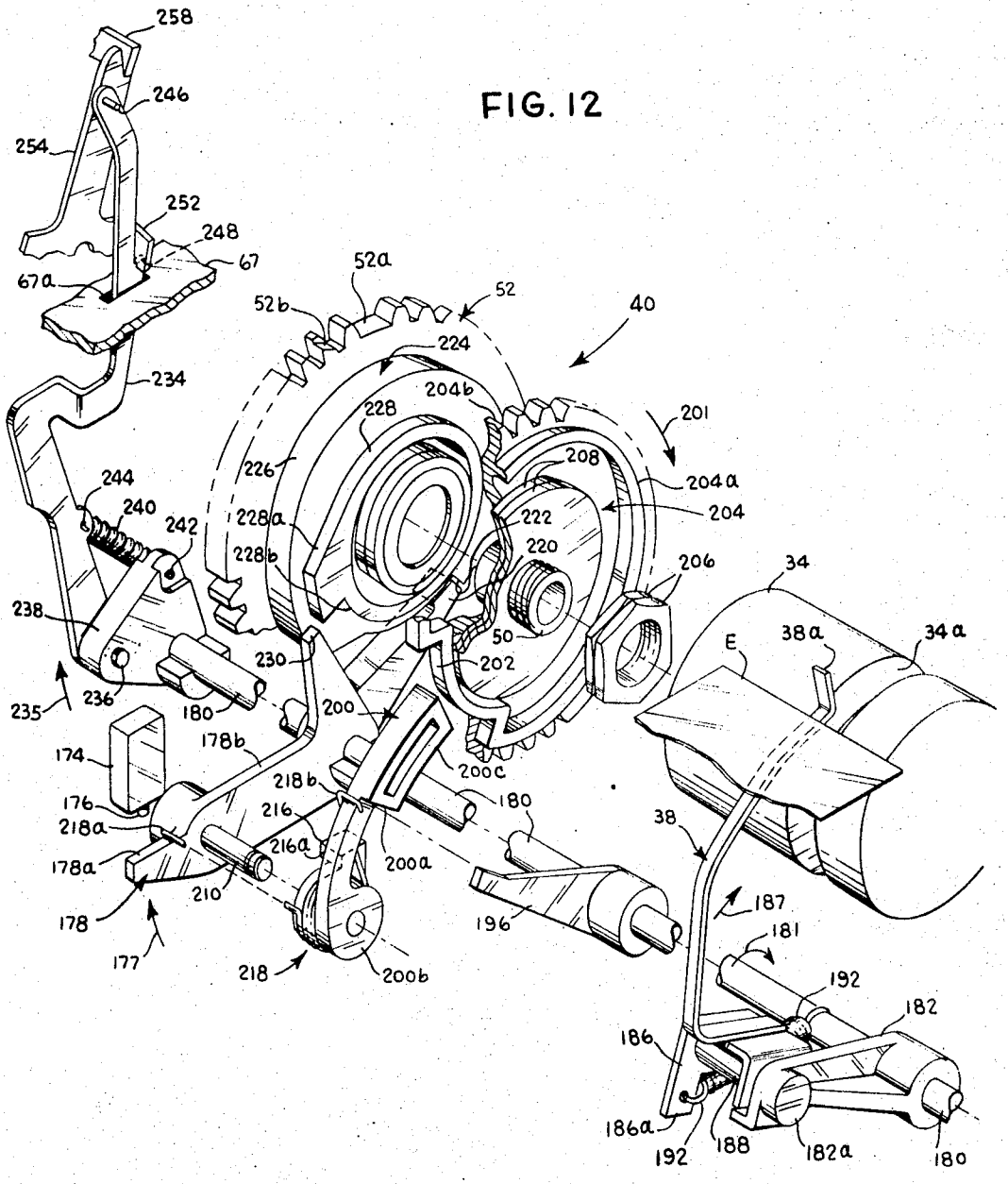
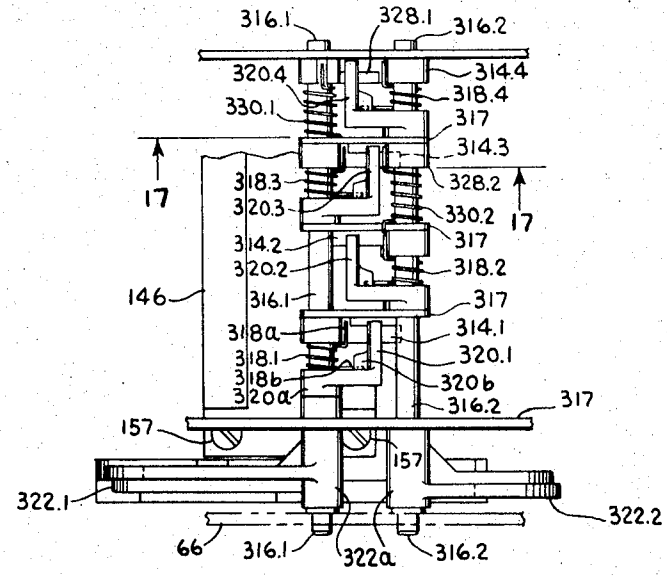

258
246
254
252
248
67
67a
52a
52b
52
40
224
204b
228
201
226
208
204a
204
228a
222
220
228b
206
34
238
50
E
38a
34a
230
202
235
236
180
200
178b
174
200c
218b
180
176
216
38
218a
216a
200a
178a
210
187
196
181
178
177
218
200b
192
182
186
186a
192
188
182a
180

FIG. 13



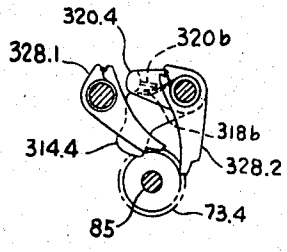
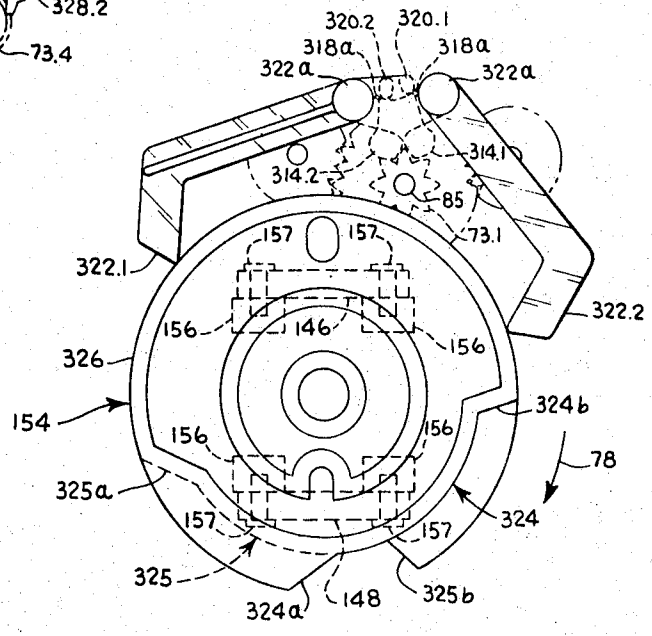


FIG. 17

FIG. 14



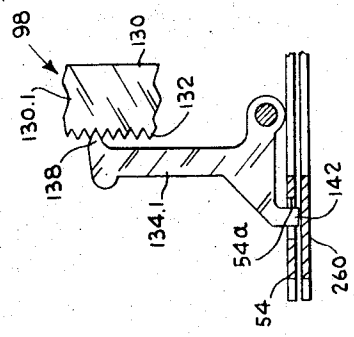


FIG. 15C

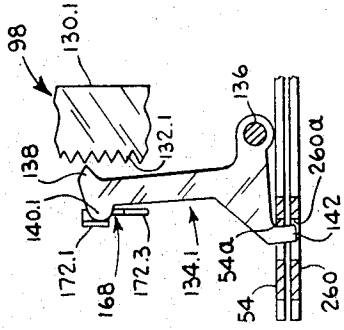


FIG. 15B

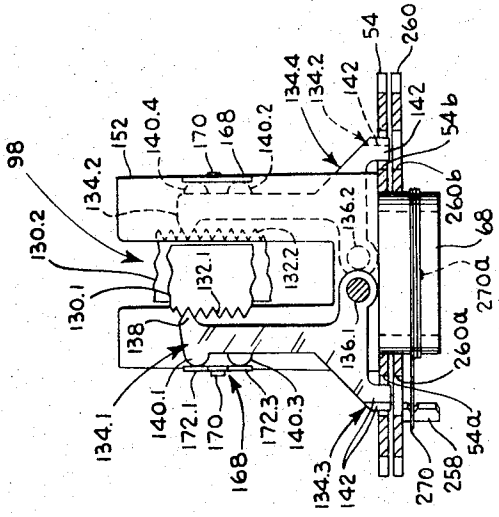


FIG. 15A

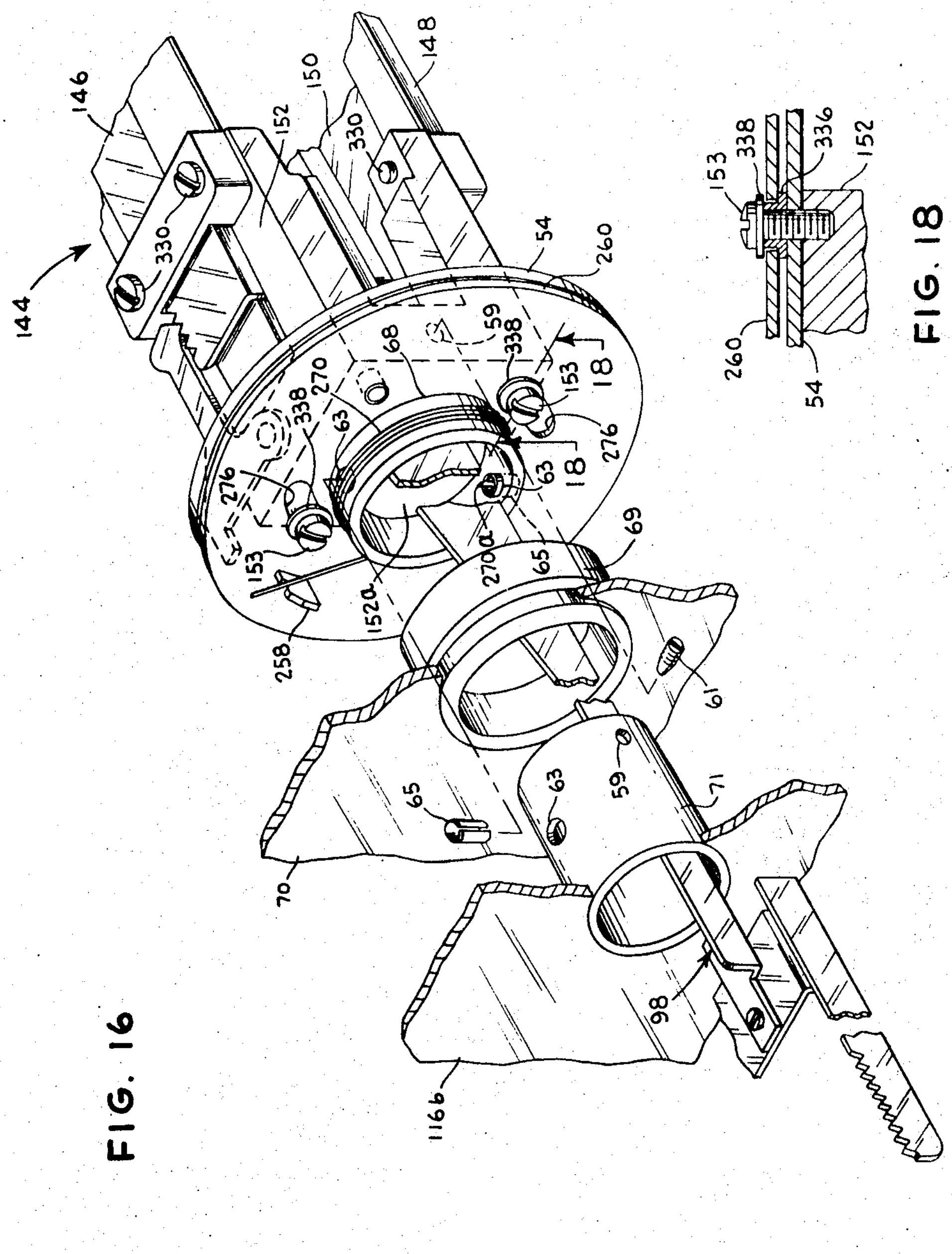

144
146
330
152
150
148
54
260
59
338
68
270
63
18
153
276
152a
270a
65
69
258
61
59
63
71
70
98
116b

FIG. 16

153
338
336
152
260
54

FIG. 18

VALUE DISPENSING MECHANISMS

FIELD OF THE INVENTION

This invention relates to value dispensing mechanisms generally, and in particular to postage meters.

THE PRIOR ART

Dispensing mechanisms usually include some means for dispensing a tangible article or printing an impression of some value, and a trip mechanism for triggering a cycle of dispensation. In addition, for dispensing mechanisms such as postage meters, which generally operate on a pre-paid rather than a coin-operated basis, there must also be a mechanism of economic accountability, usually a numerical register, to keep a cumulative record of value dispensed over many operating cycles. There must also be some means for selecting the value to be dispensed in each operating cycle, and setting means for guaranteeing that there will be a numerical input which depletes the register by an amount corresponding to the value dispensed.

In such a meter, it is quite a complicated task to design a suitable mechanism which will effect the proper setting of the postage printing wheels and guarantee that a corresponding input will be made to the register; and to design a trip mechanism which will insure that only a single cycle of postage printing can take place for each register input, and that operation is impossible except under conditions of numerical rectification. Finally, it is essential that the security of the register be guaranteed by suitable interlocks responsive to the register compartment access door, and that the postage printing mechanism be disabled when the register balance reaches a minimum numerical level equal to the maximum amount of postage that can be dispensed in a single operating cycle. The latter feature guarantees that the amount of postage dispensed can never exceed the remaining credit.

Previous postage meter designs which achieved all these objectives have tended to be complicated and expensive, while those which were simpler and less expensive all had one or more shortcomings. In particular, the "cluster gear" type of meter (described in detail below) is relatively economical; but the previous examples of this design left considerable room for additional design sophistication.

THE INVENTION

The present invention provides a postage meter which adopts the "cluster gear" approach, but carries it out more successfully than in the past. In particular, the present cluster gear meter provides improved solutions to the problems of register security, rectification, and trip interlocking, as well as specific improvements in the setting mechanism and rotating carriage therefor.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a postage meter embodying this invention, with the protective cover broken away for clarity of illustration.

FIG. 2 is a perspective view of a sub-assembly comprising the postage printing and setting mechanisms of that meter.

FIGS. 3 through 6 respectively are perspective views of the postage setting mechanisms for each of the four driveable numerical orders of the register of that meter.

FIGS. 7 and 8 comprise a series of sequential sectional views illustrating the operating progression of the register driving mechanism of that meter. These sections are both taken along lines 7—7 of FIG. 9, looking in the direction of the arrows.

FIG. 9 is a top plan view of the sub-assembly of FIG. 2.

FIG. 10 is a front elevational view of the same sub-assembly, seen from the plane indicated by lines 10—10 of FIG. 9, looking in the direction of the arrows.

FIGS. 11A through 11C are vertical sections, with parts broken away for clarity of illustration, showing the trip and lock-out mechanisms of this postage meter in consecutive and/or alternative operating conditions.

FIGS. 11D and 11E are views similar to FIGS. 11A through 11C, but limited to the regiSter lock-out mechanism.

FIG. 12 is an exploded perspective view, with parts broken away for clarity of illustration, of the trip mechanism of FIGS. 11A through 11C.

FIG. 13 is a top plan view of the register choking, clamping and antireverse mechanism of this postage meter.

FIG. 14 is a sectional view taken along the lines 14—14 of FIG. 1, looking in the direction of the arrows, and showing the same mechanism as FIG. 13.

FIGS. 15A through 15C are fragmentary top plan views, correlated with FIGS. 11A through 11C respectively, of the meter rectifier mechanism, illustrating its cooperation with the shutter disk.

FIG. 16 is an exploded perspective view of a portion of the setting mechanism carriage of this meter.

FIG. 17 is a sectional view taken along line 17—17 of FIG. 13, looking in the direction of the arrows.

And FIG. 18 is a sectional view taken along lines 18—8 of FIG. 16, looking in the direction of the arrows.

The same reference characters refer to the same elements throughout all the views of the drawing.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In General

FIG. 1 provides an overall view of a postage meter 30 embodying this invention. In general terms, it comprises a housing 31, a rotary postage printing mechanism 32, and a rotating impression roller 34 therebelow which cooperates therewith to imprint postage upon an envelope E or other postage-receiving object. The envelope is inserted into a printing slot 36 defined by the printing mechanism 32 above it and the impression roller 34 below. The motion of the envelope E engages a trip finger 38 which in turn operates a trip mechanism generally designated 40. The function of this trip mechanism is to switch on the power to an electric motor 42 having an output shaft 44 to which is affixed a cooling fan 46. When the power is switched on, the motor and shaft drive reduction gearing 48, an output shaft 50 and a drive gear 52 secured to the output shaft. The gear 52 drivingly engages a gear 54 which is secured to a carriage 144 supporting the postage printing mechanism 32 and a setting

mechanism **60**. The latter mechanism includes manual postage selection means **58** mounted at the front end of the carriage, and a plurality of register-driving gear clusters **62** mounted on the rear end of the carriage. The carriage **144** is mounted for rotation in response to gear **54** and about an axis **56**, by means of a rear shaft **64** journaled upon a rear frame plate **66**, and a forward shaft **68** journaled by means of a flanged bushing **69** upon a front frame plate **70**. Both frame plates **66** and **70** are upstanding from a meter floor **67**.

As is conventional in postage dispensing meters, the register **74** contains a numerical record of the descending postage credit balance, and also the ascending cumulative total of postage dispensed over the entire life of the meter **30**. The register comprises several numerical orders, which in the U.S. monetary system represent different decimal places, i.e., the register contains numerical display wheels **76.1** through **76.7** representing, for example, tenths of cents through thousands of dollars respectively. Through conventional Geneva gearing, each of these numerical orders is connected to those above it for decimal carries.

The rotation of carriage **144** about axis **56** drives printing mechanism **32** through its postage printing cycle. Such carriage rotation, which starts from the position of FIG. **7** and proceeds as indicated in FIG. **8** (see arrow **78**), also causes the register driving gear clusters **62** to engage register input pinions **72** and thus alter the contents of numerical register **74**. For example, a selected one of several gear segments **94** of cluster **62.1** moves into driving engagement with the input pinion **72.1** of the first register order **74.1**, as seen in FIG. **8**. That pinion **72.1**, which is rotatably mounted on a shaft **87**, drives another pinion **73.1** which turns on a stub shaft **85** and is integral with a gear **75.1**. The latter meshes with a pair of gears **77.1** and **79.1** which are rotatable on shafts **81** And **83** respectively, and which drive the ascending and descending portions of register **74** respectively. The stub shaft **85** is affixed to one of the register frame plate **317** (see FIG. **13**). In a similar manner, the other cluster gears **62.2** through **62.4** drive the other driveable register orders **74.2** through **74.4** by means of their respective input pinions **72.2** through **72.4**.

The Setting Mechanism

The cluster gear type of register driving mechanism, which is simpler and more economical than various other approaches, is seen in U.S. Pat. No. 2,306,499 of F. J. Rouan. In that design, and in the present one, the postage printing mechanism **32** is operable upon rotation about a horizontal axis; and the setting mechanism **60** is rotatable therewith and includes the cluster gears **62** which engage the register input pinions **72** during that rotation, to accomplish the register input function. It follows that the register driving clusters **62** are engaged with the register pinions **72** only during a portion of the postage dispensing cycle. At all other times the register **74** is disengaged therefrom, and in the prior art Rouan meter this left the register in a floating, insecure condition.

As in the prior art, each cluster **62** of the present meter comprises a plurality of the gear segments **94**, each having different numbers of teeth, and the value of the register input is selected, to correspond to the amount of postage dispensed, by rotating these clusters **62** about their respective shafts **96** to present different segments **94** to the register pinions **72**. In the cited Rouan patent, however, the setting mechanism responsible for rotating these clusters consisted of a direct gear sector and pinion connecting manual selector levers to the clusters. The geometry of that arrangement was such that only two numerical orders of the register could be set from manual selector members placed in side-by-side relationship. Since it is a highly desirable operator convenience feature to have the selector members for all decimal orders in side-by-side relationship, the prior art mechanism was effectively limited to two settable orders; and, as a result the postage meter could dispense no more than $0.99 per postage impression.

Another problem with the prior art meter just described is that it contained no provision for rectifying the setting mechanism; i.e., setting it precisely at some quantized numerical level corresponding to an allowed amount of postage, and not allowing it to slip into some indeterminate or intermediate position between allowed postage levels.

In a U.S. patent application co-pending with this one, (Ser. No. 91,680, filed Nov. 23, 1970, now issued as U.S. Pat. No. 3,682,378) inventions are disclosed and claimed which represent improvements in several respects over the meter disclosed in the cited Rouan patent. One such feature of that application is the broad concept of using a translatable bar mechanism for connecting a set of coaxially rotatable postage selectors **80** to rotate the register driving clusters **62**, thus selecting the appropriate gear segment **94** to correspond with the amount of postage.

The present application discloses the same postage meter mechanism as the co-pending application just mentioned, but claims different aspects of that mechanism. So far as the tranSlatable bar type of setting mechanisms is concerned, for example, the present invention carries that approach significantly further, by designing each translatable bar **98** as an assembly of at least two separate bar members **100** and **102** connected together for joint translation, thus simplifying the manufacturing problems. In addition, separate rack means **104**, **110** and **126** are formed on the various bar members for engagement with pinions **128**, **112** and **90** of the cluster gears **62**, postage printing wheels **96** and manual postage selector wheels **80** respectively.

For a full appreciation of these aspects oF the invention, the reader's attention is directed first to FIG. **2**, which provides a detailed view of the printing and setting mechanisms mounted on the rotatable carriage **144**. (The direction of carriage rotation is indicated by arrow **78** in FIG. **2**). To select the desired amount of postage, the setting mechanism **60** comprises selection mechanism **58** which is partially enclosed in a housing **89** and includes notched finger disks **80.1** through **80.4** to which are secured postage read-out number wheels **82.1** through **82.4** respectively. Each finger disk **80** and its associated number wheel **82** are integrally molded of a plastic material, and rotatably mounted upon a horizontal selection mechanism shaft **84** journaled between the two arms of a U-shaped bracket **86** (see also FIG. **9**) on the carriage **144**. Each finger disk and number wheel assembly **80**, **82** has integrally molded

therewith a respective one of the selector pinions **90.1** through **90.4**, which drive the setting mechanism **60**, causing it to perform two related functions. The first of these functions is to set the type wheels **95** of printing mechanism **32** into position to print the selected amount of postage; and the second is to adjust the displacements which the register driving gear clusters **62** impart to their respective register input pinions **72**.

Each of these register driving gear clusters **62** comprises a hub **92** on which are formed nine different angularly spaced gear segments **94.1** through **94.9** containing one through nine gear teeth respectively, and corresponding to the numerical values one through nine which the selection mechanism **58** can assign to each of four decimal orders. In addition, there is a space **94.0** between each pair of gear segments **94.1** and **94.9**, which corresponds to the assignment of zero value to a particular decimal order.

The hubs **92** are mounted for rotation about vertical shafts **96** in response to the setting mechanism **60**. Such rotation determines which of the gear segments **94.1** through **94.9**, or the space **94.0**, is presented to the associated register input pinion **72**. When the space **94.0** is thus selected, there is a zero input to the associated register order; and when one of the segments **94.1** through **94.9** with progressively increasing numbers of gear teeth is selected, the input to the associated register order corresponds to selection of postage levels one through nine respectively.

The first four decimal orders **76.1** through **76.4** of register **74** are the ones which are driveable by respective gear clusters **62**; the remaining register orders **76.5** through **76.7** changing only in response to conventional Geneva gearing (not shown) upon receiving decimal carries from lower orders. As a result, the postage level may be manually set in four separate decimal orders, employing the selector members **80.1** through **80.4**, and the meter **30** is able to print four decimal orders of postage, for which the printing mechanism **32** comprises four decimal order print wheels **95.1** through **95.4** respectively.

The setting mechanism **60** comprises a connecting linkage including four bar assemblies **98.1** through **98.4** which are responsive to the four selector pinions **90.1** through **90.4** respectively. In FIGS. **3** through **6** it is seen that these bar assemblies comprise rather complicated shapes which are simplified for manufacturing purposes by dividing them into respective front and rear bar members **100** and **102**, and using respective fastening screws **124** to unite each pair of bars for translation as a unit.

The front bars **100.1** through **100.4** respond to the selector pinions **90** and set the type wheels **95** of postage printing mechanism **32**. They are formed with respective toothed racks **104.1** through **104.4** which engage the selector pinions **90.1** through **90.4** respectively. In addition, the front bars are formed with print wheel drive branches **106.1** through **106.4** respectively bent at an angle thereto. Branch **106.4** slants somewhat upwardly from bar **100.4**, while the other branches **106.1** through **106.3** extend sidewardly from bars **104.1** through **104.3** respectively at angles of about 90°, and have extensions which are slanted slightly upwardly.

The slanted branch **106.4** and each of the slanted extensions of branches **106.1** through **106.3** extend into interleaved relationship (see FIG. **10**) with the four decimal order postage printing wheels **95.1** through **95.4**, and broaden out to form toothed racks **110.1** through **110.4** respectively. The racks **110** drive pinions **112.1** through **112.4** respectively, each of which is formed integrally with an associated one of the postage printing wheels **95.1** through **95.4** respectively; all the print wheels and their pinions being rotatably mounted upon a common shaft **114** (FIG. **10**) which is non-rotatably affixed to a print mechanism housing **116** (see FIG. **1**) in a manner which is conventional in the postage meter art. Thus, as the operator of the postage meter manually rotates the disks **80** to select the amount of postage indicated by the numerals on the read-out wheels **82**, the selector pinions **90** and selector racks **104** translate the bar members **100** longitudinally, causing the print racks **110** to rotate the print pinions **112** and printing wheels **95** into printing positions which correspond to the postage selected.

The rear bar members **102** each perform three functions: setting the gear clusterS **62**; rectification of the setting mechanism **60**; and slidably mounting the bar assemblies **98** on the carriage **144**.

So far as setting the gear clusters **62** is concerned, the bars **102.1** through **102.4** are formed with toothed rack tabs **126.1** through **126.4** respectively bent at right angles thereto, which engage pinions **128.1** through **128.4** respectively, secured to gear cluster hubs **92.1** through **92.4** respectively. When any one of the bar assemblies **98** is longitudinally translated, such motion causes the rack tab **126** thereof to rotate the associated pinion **128** and gear cluster **62** about its shaft **96**, thus selecting the angular position of the cluster. This in turn presents a particular gear segment **94** of the cluster to its register input pinion **72**, i.e., the segment with the number of register-driving teeth which is appropriate to the particular postage level desired for the particular decimal order.

Rectification

The co-pending application mentioned above represented an improvement over the earlier Rouan cluster gear patent in that means were provided for rectifying the setting mechanism. One result was that the print wheels were set precisely in various positions each corresponding to an allowed quantum of postage, and were not allowed to assume intermediate, numerically indeterminate positions. But even more importantly in a cluster gear type of meter, it also rectified the angular positions of the cluster gears; otherwise it would have been possible for two consecutive gear segments of any one cluster to pass on opposite sides of their associated register input pinion, without engaging that pinion at all. In that patent application, the rectifying mechanism claimed was one in which rectifying pawls were resiliently biased into nested engagement with position-determining teeth formed on any appropriate member of the setting mechanism.

In accordance with the present invention rectification is accomplished specifically by providing a special toothed rectifying rack **132** on each of the translatable bar assemblies **98**, and the resiliently biased rectifying pawls (designated **134**) act directly on those racks. The advantage of this approach is that the rectifying action

takes place close to the register driving cluster gears **62**, and thus reduces backlash in the positioning of those gears.

The rear bar members **102.1** though **102.4** are formed with respective right angle dog-leg bends **102***a* from which are folded respective right angle flanges **130.1** through **130.4**. These bar flanges **130** have two functions, one of which is rectification. They are formed with toothed rectifying racks **132.1** through **132.4** respectively, which cooperate with respective rectifying pawls **134.1** through **134.4**. One pair of odd-numbered pawls **134.1** and **134.3** are in superposed relationship and are pivotally mounted on the upper surface of the carriage **144** (see FIGS. **1**, **2** and **16**) by a single fastener **136.1**, and the other pair of even-numbered pawls **134.2** and **134.4** are similarly superposed and mounted on the lower surface of the carriage by fastener **136.2**. Each of these pawls **134** is formed with a tooth **138** which nests between the teeth of the associated rectifying rack **132** when the associated bar assembly **98** is in one of its rectified positions, or rides over those teeth **132**, rotating the associated pawl **134** about its fastener **136**, when the associated bar assembly is between rectified positions.

The Rotating Carriage

The co-pending patent application mentioned above claims a carriage which is arranged to form an elongated cavity within which register-driving cluster gears are rotatably mounted, and bar means are mounted for translation whereby to rotate the cluster gears. The present invention carries that concept further, specifically providing a carriage **144** the rear of which comprises a pair of upper and lower confronting plates **146** and **148** respectively for rotatably mounting the cluster gears **62** and slidably mounting the bar means **98**, and the front of which comprises the housing **89** in which the postage selection mechanism **58** is rotatably supported on bracket **86**. The space between the plates **146** and **148** constitutes a rear cavity **150** within which the bar means **98** are housed, the interior of housing **89** constitutes a front cavity **88** in which the selection mechanism **58** is contained, and the bar means **98** extend longitudinally forward from rear cavity **150** into front cavity **88** to engage the postage selection mechanism **58**.

The carriage **144** also comprises a four-pronged forked frame member **152** (FIGS. **1**, **15A** and **16**) at the forward end of the cavity **150**, to which the upper and lower plates **146** and **148** are secured by fasteners **330**; and a disk **154** (FIGS. **1**, **2**, **13** and **14**) to which these plates are secured at the rear of cavity **150**, by means of tabs **156** and fasteners **157**. The carriage members **146**, **148**, **152** and **154** thus form a strong rectangular frame to support the bars **98** and cluster gears **62** within rear cavity **150**.

With reference to FIGS. **1** and **16**, the front wall of the four-pronged member **152** is formed with a circular passageway opening **152***a* surrounded by a hollow cylindrical shaft **68**, which is integral with the front wall of member **152** and projects forwardly therefrom. A smaller diameter sleeve **71** is secured to the rear wall **116***b* of print mechanism housing **116**, and projects rearwardly therefrom into the interior of the hollow shaft **68** to mount the housing **116** (and the print mechanism **32** therein) upon the pronged member **152**. Two hollow roll pins **65** (cylindrical pins rolled from sheet stock) pass through diametrically opposite radial openings **63** formed in the shaft **68** and sleeve **71**, to secure the shaft and sleeve together. These pins are squeezed prior to insertion in the holes **63**, and then expand for a friction fit therein. In addition, set screws **61** are threaded into tapped holes **59** which are formed on opposite sides of frame member **152** and sleeve **71** at 90° displacements from holes **63**, thus forming a more rigid assembly. The U-shaped bracket **86**, which supports the selection mechanism **58**, is secured by fasteners **332** to the front wall **116***a* of housing **116** (FIG. **9**), and its two arms project forwardly therefrom. The selector housing **89** is also mounted on the front wall of housing **116**. The entire carriage **144** is mounted for rotation about axis **56** by means of the shaft **64**, which protrudes rearwardly from disk **154** and is journalled on the rear frame plate **66**, and hollow shaft **68** which is journaled within shouldered bushing **69**. The bushing in turn is supported upon the front frame plate **70**. Opening **152***a* and the hollow interiors of shaft **68**, bushing **69**, sleeve **71** and housing **116** define a continuous axial passageway through which the bar assemblies **98** pass from the rear cavity **150** to the front cavity **88**.

Mounting of the Setting and Rectifying Mechanisms on the Carriage

The second function of the bar flanges **130** is to mount the bar assemblies **98** slidably on the carriage **144**. As best seen in FIG. **7**, but with reference to FIGS. **1** through **6** and **9** also, the underside of carriage plate **146** is formed with a wide, shallow channel **158** which is elongated in the direction parallel to axiS **56**, and slidably receives an upper pair of odd-numbered bar flanges **130.1** and **130.3** in superposed relationship. These flanges are retained within the channel **158** by means of a rivet **160** which is driven upwardly into the carriage plate **146** through a pair of slots **162.1** and **162.3** formed in both flanges **130.1** and **130.3** respectively. The rivet has an enlarged flanges overlapping the edges of the slots **162**, to prevent vertical escape of the flanges. Similarly, the upper surface of carriage plate **148** is formed with a wide, shallow channel **164** which slidably receives a lower pair of even-numbered bar flanges **130.2** and **130.4** in superposed relationship. These flanges are also retained within the channel **164** by means of another headed rivet **166** which is driven downwardly through respective slots **162.2** and **162.4** thereof into the lower carriage plate **148**. The heads of rivets **160** and **166** are not tight against the bar flanges **130**, so as to avoid binding their sliding movement; while the width of slots **162** is greater than the outside diameter of the rivet shafts for the same reason. The slots are sufficiently elongated to permit each bar assembly **98.1** through **98.4** to move through a full ten numerical setting positions in response to the postage selection mechanism **58**.

FIG. **7** reveals that the upper and lower carriage plates **146** and **148** are pRovided with sockets which receive the opposite ends of shafts **96** for rotatably mounting the cluster gears **62** within the cavity **150**, so that the selected one of the gear segments or spaces **94.0** through **94.9** can be brought into driving alignment with the associated register input pinion **72**. Pinions **128** are provided to rotate each gear cluster **62**

in this manner, each pinion being located at one end of its associated shaft **96** and hub **92**, adjacent to one of the carriage plates **146** or **148**, where it is conveniently engageable by the associated bar rack **126** for rotating the cluster gear in response to translation of the associated bar assembly **98**.

As best seen in FIG. **9**, odd-numbered alternate cluster gears **62.1** and **62.3** are located on one side of the carriage **144**, and drive their respective register input pinions **72.1** and **72.3** during a first half of the carriage rotation (as illustrated for cluster gear **62.1** in FIGS. **7** and **8**). Even-numbered alternate cluster gears **62.2** and **62.4**, on the other hand, are located on the opposite side of the carriage, and thus drive their respective pinions **72.2** and **72.4** during the second half of such rotation.

The carriage frame **152** serves many subsidiary functions. In order to keep the rectifying pawls **134** resiliently biased into engagement with their associated rectifier rack teeth **132**, a pair of leaf springs **168** (FIGS. **1** and **15**) are secured on opposite sides of the frame member **152** by machine screws **170**. Each leaf spring is fork-shaped pain to form pairs of independently flexing tines **172.1**, **172.3** (extending upwardly) and **172.2**, **172.4** (extending downwardly), which engage respective projections **140.1** through **140.4** of respective rectifying pawls **134.1** through **134.4**. Note that the upper and lower surfaces of frame member **152** receive the rectifying pawl fasteners **136.1** and **136.3**, respectively; and the side surfaces thereof receive the leaf spring fasteners **170**. In addition, the unique upper and lower pronged configuration of member **152** allows the right angle dog-leg bends **102***a* of bar members **102.1** and **102.3** to reach upwardly through the upper bifurcation thereof, and those of the other two bar members **102.2** and **102.4** to reach downwardly through the lower bifurcation; so that their flanges **130** engage respectively with rectifying pawls **134.1** and **134.3** atop the frame member **152**, and **134.2** and **134.4** below the frame member.

Interrelationship Among the Bar Assemblies

The shape of each bar assembly **98** is complicated by the requirement that it perform five functions simultaneously: driven engagement with one of the selector pinions **90**; driving engagement with one of the print wheel pinions **112**; rectifying engagement with one of the pawls **134**; driving engagement with one of the cluster pinions **128**; and slidable mounting of the bar assembly itself upon one of the rear carriage plates **146** or **148**. The design is further complicated by the fact that only the selector pinions **90** and cluster pinions **128** are located with the carriage cavities **88** and **150** respectively and are thereof adjacent to the path of translation of the main bar members **100** and **102** respectively; whereas the print wheel pinions **112** are displaced sidewardly therefrom, and the rectifying pawls **134** are located above and below the carriage frame member **152**. The problem of print wheel pinion engagement is solved by providing the forward bar members **100** with the sidewardly extending branches **106** which bring the toothed racks **110** into proximity with print wheel pinions **112**, while the problem of rectifying pawl engagement is solved by providing the vertically extending right angle dog-leg bends **102***a*, as previously described. Despite their intricately branched shapes, however, the bar assemblies **98** must be translatable independently of each other, without any interference between the various bends **102***a* and branches **106**, in order that the four register orders **74.1** through **74.4** be settable independently. For the same reason, moreover, the flanges **130** and racks **126** must avoid mutual interference while performing their respective functions of slidably mounting the bar assemblies **98** on the carriage plates **146** and **148**, and driving the luster pinions **128**. In order to avoid such mutual interference, the various parts of the bar assemblies **98.1** through **98.4** are folded, interleaved and slidably nested with each other in a unique way which is one of the novel features of this invention.

As seen in FIG. **9**, the forward bar members **100.1** through **100.4** of each assembly **98** are arranged in parallel, side-by-side (and therefore non-interfering) relationship within the selector cavity **88**. The two lower order bars **100.1** and **100.2** are positioned below, and the two higher order bars **100.3** and **100.4** above, the axis of rotation of the shaft **84**. Consequently, as seen in FIG. **10**, the two lower order selector racks **104.1** and **104.2** engage their respective pinions **90.1** and **90.2** from below, while the two higher order selector racks **104.3** and **104.4** engage their respective selection pinions **90.3** and **90.4** from above. As a result, the bar assemblies **98.1** and **98.2** are driven rearwardly by their respective pinions **90.1** and **90.2**, from the forward limiting positions of these bar assemblies illustrated in FIGS. **6** and **5** respectively. Similarly, the bar assemblies **98.3** and **98.4** are driven forwardly by their respective pinions **90.3** and **90.4**, from the rearward limiting positions of these bar assemblies illustrated in FIGS. **4** and **3** respectively. To accommodate these differing directions of bar assembly motion, slots **162.3** and **162.4** extend rearwardly from their respective rivets **160** and **166**, while slots **162.1** and **162.2** extend forwardly therefrom. Note also that the direction of rotation of the respective cluster gears **62** and print wheels **95** depends on the direction of translation of their bar assemblies **98**.

The described vertical displacement of bar members **100** from each other permits their respective sidewardly extending, print-wheel-driving branches **106** to overlie one another within the print wheel housing **116**, to avoid mutual interference. Thus, as seen in FIGS. **9** and **10**, the lowermost of these members is the lowest order branch **106.1**; which is bent from the lower edge of bar **100.1**, one of the two lower bars **100** (see also FIG. **6**). The next one above is the second order branch **106.2**, which achieves a spaced, overlying, non-interfering relationship to branch **106.1** by being bent from the upper edge of the other lower bar **100.2** (see also FIG. **5**). The next one above that is the third order branch **106.3** which achieves a spaced overlying, non-interfering relationship to branch **106.2** by being bent from the lower edge of the bar **100.3** (see also FIG. **4**), one of those positioned above bars **100.1** and **100.2**. Finally, the fourth order branch **106.4** achieves a spaced, overlying, non-interfering relationship with branch **106.3** by being bent from the top edge of the other upper bar **100.4** (see also FIG. **3**).

The rear bars **102.1** through **102.4** are connected to their respective front bars **100.1** through **100.4**, extending rearwardly therefrom in relatively closely

spaced, parallel, side-by-side (and therefore non-interferring) relationship, as seen in FIG. 9. Close spacing is necessary to permit these bars to pass through the interior openings of print housing 116, sleeve 71, bushing 69, shaft 68 and frame member 152 (see FIG. 16). Such spacing is achieved by securing the third and fourth order rear bar members 102.3 and 102.4 directly to their respective front bar members 100.3 and 100.4 (see FIGS. 4 and 3 respectively), so that the third and fourth order bar assemblies 100.3, 102.3 and 100.4, 102.4 are essentially co-linear. The first and second order rear bar members 102.1 and 102.2, in contrast, are laterally offset from their respective front bar members 100.1 and 100.2 (and thus brought into proximity with the third and fourth order bars 102.3 and 102.4) by being secured to their respective front bar branches 106.1 and 106.2 (see FIGS. 6 and 5 respectively), instead of directlY to their respective front bar members 100.1 and 100.2.

At the point where the rear bar members 102 are enclosed by the four prongs of frame member 152, they divide into a first group of two bars 102.1 and 102.3 formed with respective upwardly extending dog-leg bends 102*a* (see FIGS. 6 and 4 respectively), and a second group of two bars 102.2 and 102.4 formed with respective downwardly extending dog-leg bends 102*a* (see FIGS. 5 and 3 respectively). As previously noted, the upwardly extending dog-legs 102*a* pass through the upper bifurcation of the four-pronged frame 152, and the downwardly extending ones pass through the lower bifurcation thereof. The respective flanges 130.1, 130.3 and 130.2, 130.4 are formed at the upper and lower extremities of these dog-legs 102*a* respectively, above and below the frame member 152 respectively, so that their respective rectifying racks 132.1, 132.3 and 132.2, 132.4 are positioned to engage respective rectifying pawls 134.1 and 134.3 mounted on the upper surface of the frame member 152, and 134.2 and 134.4 mounted on the lower surface thereof.

A non-interfering relationship is preserved here by making the dog-leg 102*a* of bar 102.1 rise somewhat higher than that of its companion bar 102.3 in the upper group, and its flange 130.1 somewhat broader than flange 130.3. Then, as seen in FIG. 4, the angle formed by elements 130.3 and 102*a* of bar 102.3 is nested in the interior of the angle formed by elements 130.1 and 102*a* of bar 102.1; so that the two upwardly-reaching dog-legs 102*a* of these bars are in side-by-side relationship, and flange 130.1 overlies flange 130.3, all in non-interfering relationship. In addition, rectifying pawl 134.1 overlies rectifying pawl 134.3 atop the frame member 152, so that these pawls engage racks 132.1 and 132.3 of flanges 130.1 and 130.3 respectively.

Below the frame member 152 the same approach is employed, by making the downwardly extending dog-leg 102*a* of bar 102.4 extend somewhat lower than that of its companion bar 102.2 in the lower group, and its flange 130.4 somewhat broader than flange 130.20. Then, as seen in FIG. 3, the angle formed by elements 130.2 and 102*a* of bar 102.2 is nested in the interior of the angle formed by elements 130.4 and 102*a* of bar 102.4; so that their downwardly reaching dog-legs 102*a* are in side-by-side relationship, and flange 130.4 underlies flange 130.2, all in non-interfering relationship. In addition, the rectifying pawl 134.4 underlies rectifying pawl 134.2 beneath the frame member 152, so that these pawls engage racks 132.4 and 132.2 of flanges 130.4 and 130.2 respectively.

FIGS. 3 and 4 also reveal that at the very rear, the bars 102 are so proportioned that their cluster gear driving racks 126 are also paired in overlying relationship, with rack 126.1 over rack 126.3 at the top of the carriage 144 (see also FIG. 7), and rack 126.2 over rack 126.4 at the bottom, in non-interfering relationship.

The Register Control Mechanisms

As in the Rouan patent cited above, the register driving gear clusters 62 here are disengaged from the register pinions 72 except during the postage printing cycle. The device of the previously mentioned co-pending patent application represented an improvement over the Rouan patent in that it provided means for positively retaining the register in its current numerical condition whenever the gear clusters were disengaged. One example of such means is a plurality of special Geneva assemblies, one for each cluster gear segment 94 of each drivable register order, whIch are correlated with the position of the last tooth of that gear segment 94 in such fashion that a positive Geneva lock is imposed upon each numerical order of the register at all times, except when the segment 94 is performing its register input function. A quick calculation shows that such an approach requires 40 different precision-machined Geneva lock mechanisms, at prohibitive cost, crowded into a small space.

In accordance with the present invention, however, register control is accomplished far less expensively by resiliently biased choke pawls arranged to yield when register driving is in progress, and means arranged to clamp the choke pawls positively when register driving is not in progress, so as to provide positive register locking. Anti-reverse pawls are also provided, as are biasing springs and mounting shafts for the choke pawls, the latter serving various additional functions in connection with the clamping mechanism and the anti-reverse pawls.

The register driving gear clusters 62 are disengaged from their associated register input pinions 72 of register 74 (as seen in FIG. 7) at any time when a cycle of the trip mechanism 40 is not in progress. Any particular gear cluster 62 is also disengaged froM its particular register input pinion 72 during the portion of any trip cycle when that pinion has not yet been engaged by, or has already been disengaged from, the selected gear segment 94 of its respective cluster 62; or throughout the entire trip cycle in the event that the toothless region 94.0 of the particular gear cluster 62 is selected, for zero input to the associated register order.

In order to prevent free floating of the register drive train at such times, the pinions 73 of each register order are engaged (see FIG. 13 and 14) by choke pawls 314.1 through 314.4 which are rockably mounted upon respective shafts 316.1 and 316.2, and which nest between the teeth of the pinions 73 of register orders 74.1 through 74.4 respectively. Such engagement is illustrated, for the first order pawl 314.1 and pinion 73.1, in FIGS. 7 and 14. The chock pawls 314.1 through 314.4 are biased into nested engagement by means of respective coiled torsion springs 318.1

through 318.4 which surround the shafts 316. Springs 318 each have one end 318a bearing downwardly upon the associated chock pawl 314, and the opposite end 318b pressing upwardly against a special shelf extension 320*b* formed on each associated one of four clamping arms 320.1 through 320.4. The shafts 316 are journaled on meter frame plate 66 and register frame plates 317. The clamping arms 320 are all formed with respective hubs 320*a;* the hubs of arms 320.1 and 320.3 being secured to shaft 316.1, and those of arms 320.2 and 320.4 being secured to shaft 316.2, for rotation therewith. The springs 318 react against the arms 320 to bias the choke pawls 314 into nested engagement with the register pinions 73. When the gear clusters 62 and pinions 72 drive the register gear train, however, the springs 318 and pawls 314 yield resiliently. (Compare the position of pawl 314.1 in FIG. 7 with its position in FIG. 8). This allows the choke pawls 314 to ratchet over the pinions 73 so that register inputs can be accomplished.

During the time that the gear clusters 62 engage the register input pinions 72, a pair of cam followers 322.1 and 322.2, which are secured to respective shafts 316.1 and 316.2 for rotation therewith, ride within dwell recesses 325 and 324 respectively formed on separate cam tracks on the periphery of the disk 154 which comprises the rear element of carriage frame 144. When the cam followers 322 are in the dwell recesses, hubs 322*a* formed on the cam followers and secured to shafts 316.1 and 316.2 respectively rotate the shaft in the proper directions to lift the clamping arms 320, allowing the choke pawls 314 to yield and ratchet over pinions 73 as described.

At all other times, however, the cam followers 322 ride on the high cam surface 326 of carriage member 154, as seen in FIGS. 13 and 14. As a result, the cam followers 322 rotate their respective shafts 316 in the directions to cause their respective arms 320 to clamp downwardly against their respective choke pawls 314, thus keeping the pawls positively locked against their respective register pinions 73, and preventing any movement whatever of the associated order of register 74. Thus the arms 320 lock the register 74 and positively prevent drift at all times except during the register input portion of the operating cycle.

Springs 318, by reacting against the choke arms 320, serve a dual function: not only do they bias the pawls 314 resiliently into engagement with the pinions 73 as described; but they also act as return springs for the assemblies of the clamping arms 320, shafts 316, and cam followers 322, keeping the latter pressed against the cam surfaces 324, 325 and 326 of disk 154.

It was noted previously that one bank of register driving gear clusters 62.1 and 62.3 on one side of carriage 144 engages the register pinions 72 during a first half of the carriage rotation, and a second bank of gear clusters 62.2 and 62.4 on the other side of the carriage engages the register pinions during a second half of its rotation. With reference to FIGS. 14, in which arrow 78 indicates the direction of carriage rotation, it will be seen that the dwell recess 325 (reaching from ramp 325*a* to ramp 325*b*) and dwell recess 324 (ramps 324*a* to 324*b*) are so phased that a first one of the cam followers 322.1 engages the dwell recess 325 during the phase of carriage rotation when gear clusters 62.1 and 62.3 are effective, and the second cam follower 322.2 engages the dwell recess 325 during a subsequent phase of the rotation, when the gear clusters 62.2 and 62.4 are effective. Moreover, to prevent overdriving of the register 74, the shut-off ramps 324*b* and 325*b* are phased to relock the register the instant the last tooth of the driving segment 94 of the respective gear cluster 62 disengages from its respective register input pinion 72.

In addition to mounting the choke pawls 314, clamping arms 320 and springs 318, shafts 316.1 and 316.2 also 200*a* respective register antireverse pawls 328.1 and 328.2 rotatably thereon (see FIGS. 13 and 17), and have respective coil springs 330.1 and 330.2 wrapped around the shafts. One end of each spring engages and reacts against a nearby frame member 317, and the other end engages and biases its associated pawl 328 into anti-reverse relationship with an associated register pinion 73, as shown for pawl 328.1 and pinion 73.4 in FIG. 17.

The Trip Interlocks

The postage meter of this invention employs the electric motor 42 (FIG. 1) to drive the carriage 144 through a rotary operating cycle and a switch 174 (FIG. 12) to turn the motor on and off. The trip mechanism 40 closes the switch in response to the insertion of the postage-receiving object E to start a postage printing cycle, and re-opens the switch at the conclusion of the cycle. Switch closing and re-opening trip mechanisms have been employed in postage meters in the past (as for example in U.S. Pat. No. 3,310,139 of C. W. Buckley), but never in conjunction with a rotatable, variable increment gear cluster mechanism for driving the register. The present invention not only brings together the rotating gear cluster concept of the Rouan patent with the switching trip mechanism concept of the Buckley patent; it also provides a unique and advantageous method of cooperation between the two, feature interaction between the rectifying pawls 134, a shutter disk 260, and the trip mechanism 40. This interaction is such that the rectifier pawls 134 have a double-acting mutually interlocking relationship with the shutter 260, which prevents the trip mechanism from operating the postage meter if rectification is not accomplished, and also locks the rectifier pawls 134 and setting mechanism 60 during operation of the meter. In addition, the shutter 260 is related to the trip mechanism 40 by means of a deadlock latch 254 which performs various register security functions. Specifically, that latch serves to lock up the trip mechanism 40 and prevent operation of the meter if the register goes below the minimum credit level or if the register compartment access door is open.

As seen in FIG. 11A, the output spindle 50 and driving gear 52 rotate the carriage 144 by means of the driven gear 54, which surrounds shaft 68 and is secured to the carriage frame 152 by machine screws 153 (see FIG. 16). This occurs when the trip mechanism 40 closes the electrical switch 174 in series with the motor power supply line. The switch has an operating button 176 which is engaged by upward motion (arrows 177, FIG. 12) of a switch actuator lever 178. That lever is integral with a cam follower 230 and a stop pawl 220 to form a three-armed crank which is mounted upon a trip mechanism shaft 180 and is rotatable relative thereto.

When this three-armed crank **178, 220, 230** is rotated clockwise relative to the shaft (as seen from the viewpoint of FIG. **12**), it causes actuator **178** to close switch **174**.

Such crank rotation is induced by a trip pawl **196** which is secured to shaft **180** by a tri-lobing and therefore rotates with that shaft in response to motion of the trip finger **38** (arrow **187**) when the hooked upper tip **38***a* thereof is engaged by the envelope E or other postage-receiving object. The trip finger is rockably mounted upon a trip driver **182** by means of a U-shaped supporting bracket **186** which is secured to a shaft **188** journaled upon a hub **182***a* formed upon the driver **182**. A spring **192** is tensed between the trip mechanism shaft **180** and a depending tab **186***a* of bracket **186** to maintain a driving coupling between the trip finger **38** and the shaft driver **182** under normal operating conditions. As a result, the force exerted on the trip finger **38** by the envelope E normally does not cause the finger **38** and bracket **186** to rotate about shaft **188**. Instead, finger **38**, bracket **186** and shaft **188** move the driver **182**, causing it to rotate shaft **180** in the direction indicated by arrow **181**.

As the shaft **180** rotates in that direction, trip pawl **196** rotates therewith and engages a surface **200***a* formed on a limiting pawl **200**. The pawl **200** is rotatably mounted, by means of a hub **200***b* formed integrally at the lower end thereof, on a stub shaft **210** extending from switch actuator **178**. A coiled torsion spring **218** is wrapped around the hub **200***b;* and one end **218***a* thereof engages an extension **178***a* of switch actuator **178**, while the other spring end **218***b* is hooked over the pawl **200** to bias it angularly about shaft **210** until actuator surface **178***b* is engaged by the undersurface **216***a* of a stop member **216** formed integrally upon the hub **200***b* of pawl **200**. When the pawl **200** is held in place by spring **218** and the three-armed crank **178, 220, 230** rotates in response to pawl **196**, the limit of that motion is achieved (as seen in FIG. **11**C) when limiting pawl **200** strikes the surface of a dwell recess **202**. That recess is part of a cam track **204***a* formed on a gear **204** secured to the output spindle **50** by means of threaded nuts **206** and washers **208**. Thereafter, the trip finger **38** cannot be driven any further by envelope E without tensing spring **192**. Consequently, in its displaced position, the curved tip **38***a* of the trip finger normally serves as a temporary stop element for the envelope E, defining the position thereof at which postage printing begins.

Before a trip cycle begins, stop pawl **220** of the three-armed crank **178, 220, 230**, is in position (see FIG. **11**A) to engage a stop surface **222** of a cam track **224** formed on the drive gear **52**. (In fact, this position of the stop pawl **220** stops the rotation of the gear **52** at the end of the previous trip cycle.) But during a trip cycle, as the three-armed crank **178, 220, 230** rotates in response to trip pawl **196**, the stop pawl **220** swings clear of stop surface **222** as seen in FIG. **11**C, and thus permits rotation of drive gear **52**, allowing the cycle to proceed. It is shortly after such pawl release occurs, and just before the envelope E reaches the printing position described above, that the switch actuator **178** strikes button **176** and closes the motor switch **174**. The motor then drives gears **52** and **204** in the direction indicated by arrows **201**, and the trip cycle proceeds.

Just prior to printing, recess **202** rotates past the limiting pawl **200**, after which that pawl is engaged instead by cam track **204***a*, to kick the pawl **200** angularly in the direction away from shaft **50**, and out of its operating position. In order to perform this motion, pawl **200** rotates about shaft **210** against the bias of coil spring **218**, and raises the stop member **216** from surface **178***b*. Once the pawl **200** is thus kicked out of operating position, it is no longer engaged by trip pawl **196**. In this way the three-armed crank **178, 220, 230** is decoupled from trip pawl **196** and shaft **180**, in preparation for the return of the three-armed crank to its initial position later on, when it is time to re-open the motor switch **174**.

Such crank release is postponed, however, so long as surface **226** of cam track **224** holds the stop pawl **220** radially outwardly. This retains the three-armed crank **178, 220, 230** in the angular position to keep switch actuator **178** raised, and thus the motor switch **174** closed, for one complete rotation of the gears **52** and **204**.

Gear **204**, it should be noted, is formed with teeth **204***b* to drive a conventional auxiliary train (not shown) leading to conventional envelope ejector rollers (not shown) and impression roller **34**. Gear **2**, moreover, is formed with a one-tooth gap **52***a* to facilitate timing during assembly.

The decoupling of pawls **196** and **200**, as described above, serves the additional purpose of permitting further rotation of shaft **180**. As postage printing takes place, the envelop E is fed forward by rotation of the print drum **32** (FIG. **1**) is cooperation with the impression roller **34**. This motion of the envelope causes the trip finger **38** and shaft **180** to rotate further in the direction of arrow **187**, beyond the position of FIG. **11**C. The trip finger **38** then enters a groove **34***a* formed in the impression roller **34**, releasing the envelope for additional printing advance and subsequent ejection. Thereafter trip finger **38** is held down in the groove **34***a*, keeping the trip shaft **180** and trip pawl **196** in tripped position, as long as the envelope E continues to pass over the impression roller **34** and the trip finger **38***a*.

When envelope ejection is complete, and the trailing edge of envelope E passes trip finger tip **38***a*, then the trip finger **38** and trip shaft **180** are released. The trip shaft is then restored to its initial position by a tension spring **240**, reacting against a sensing link **234**. As the shaft returns, the outer tip of trip pawl **196** strikes, and rides along, a curved surface **200***c* of limiting pawl **200**, rocking the limiting pawl counter-clockwise about shaft **210**, against the urging of spring **218**, until such displacement of pawl **220** permits pawl **196** to slip under surface **200***a*, thereby re-engaging pawls **196** and **200** for the next trip actuation. Once pawl **196** slips under surface **200***a*, spring **218** returns pawl **200** clockwise to its initial position. Only after pawls **196** and **200** have thus been re-engaged can the trip mechanism start a new cycle.

During the trip cycle, the angular displacement of the three-armed crank **178, 220, 230** causes cam follower **230** to be interposed within a dwell recess **228***b* of another cam track **228** formed on gear **52**. But at the end of the trip cycle the dwell recess **228***b* gives way to camming surface **228***a* of track **228**, striking cam fol-

lower 230 and rocking the entire three-armed crank back into its initial position to lower the switch actuator 178 and thereby re-open the motor switch 174, which terminates the trip cycle. After the switch opens, the motor spindle 50 and gear 52 coast until the gear 52 reaches a dead stop when stop pawl 220 re-engages surface 222, as seen in FIG. 11A. A conventional friction clutch (not shown) is included in the drive train to decouple the motor from this abrupt stop.

The sequence of events just described occurs only if there is no reason to prohibit the trip cycle from proceeding. There are, however, various conditions under which a postage meter must not print a postage impression; i.e., when the door to the compartment which houses register 74 is open; when the descending credit balance in the register 78 is less than the maximum amount of postage which can be dispensed in a single trip cycle ($9.99–9/10 in this specific example); and when the setting mechanism 60 is not rectified. Non-rectification has two serious consequences. First, it is possible for the postage printing wheels 95 to be in indeterminate, intermediate printing position; and second, the register driving gear clusters 62 can also be in indeterminate, intermediate positions, so that neither of two adjacent gear segments 94 is properly positioned to engage its associated register input pinion 72, resulting in no input to the register 74. Accordingly, means are provided for locking up the trip mechanism 40 upon the occurrence of any of the described conditions.

The trip mechanism 40 includes sensing link 234 which is pivotally mounted by means of a shaft 236 upon a mounting block 238 which is secured to the trip mechanism shaft 180 by tri-lobing, for rotation therewith. Tension spring 240 is anchored at one end to an opening 242 formed in the mounting block 238, and at the other end is hooked through an opening 244 formed in the sensing link 234. As a result, the sensing link 234 is biased clockwise (as seen in FIGS. 11A and 12) about the shaft 236 by the spring 240. Its motion in that direction is limited, however, because the sensing link extends upwardly through a slot 67*a* formed in the meter floor 67, and is pulled against one edge of the slot by the spring 240. A pin 246 projects from the upper end of the sensing link 234, and the slot 67*a* is too narrow to permit downward withdrawal of the pin 246. As a result, the sensing link must remain in position to block the slot 67*a*, preventing the insertion of a tool therethrough for tampering with the meter.

The location of the sensing link mounting shaft 236 is eccentric relative to the trip mechanism shaft 180. Therefore, as the shaft 180 rotates (arrow 181) in response to the envelope E and trip finger 38, the sensing link 234 must rise, as indicated by arrow 235 in FIG. 12. That link, however, is formed with an upwardly facing shoulder 248 which engages a lug 252 bent from a deadlock latch member 254. The deadlock latch 254 is rotatably mounted upon a shaft 256 journaled in the upstanding frame plate 70 (FIG. 1); and is biased thereabout in the clockwise direction (as seen in FIG. 11) by a tension spring 266, one end of which is anchored by any conventional means (not shown) to the frame plate 70, and the other end of which is hooked into a depending ear 268 of the deadlock latch. As the link 234 is driven upwardly in response to the cycle-starting rotation of the trip mechanism shaft 180, the shoulder 248 pushes upwardly against the lug 252, rotating the deadlock latch 254 counterclockwise about its shaft 256 (as seen in FIG. 11) and against the urging of spring 266. But the latch 254 can only move from the initial position seen in FIG. 11A to the position seen in FIGS. 11B and 11C, in which the depending ear 268 strikes the meter floor 67, preventing further deadlock latch displacement. This small amount of deadlock latch motion does not permit enough upward motion of the sensing link, and concomitant rotation of shaft 180, to initiate an operating cycle of the trip mechanism 40.

If nothing occurs to release the sensing link 234 from the deadlock latch 254, the pressure of the envelope E against the trip finger 38 is ineffective to initiate a trip cycle, because the trip pawl 196 never rises high enough to engages pawl 200 and move the motor switch actuator 178. If the user nevertheless forces the envelope E against the trip finger 38, the only result will be to stretch the spring 192 and rock the trip finger 38 and its supporting bracket 186 about the shaft 188, without displacing the trip mechanism shaft 180 beyond the point permitted by deadlock latch 254.

The only way in which the sensing link 234 can be disengaged from the deadlock latch 254 is for it to be cammed in the direction of arrow 255 in FIG. 11C by a lug 258 which is struck at right angles from shutter disk 260. The shutter disk is a substantially circular sheet metal member which is situated in front of, and in confronting relationship to, the driven gear 54, and is rotatably mounted upon the shaft 68. Counterclockwise rotation of the shutter disk, as seen in FIG. 11C (arrow 261), causes the lug 258 to strike slanted surface 262 of the link 234, thus rotating the link about its shaft 236 against the urging of spring 240, until the link surface 248 is released from the lug 252 of deadlock latch 254. The slot 67*a* formed in the meter floor 67 is sufficiently elongated to permit such movement of the sensing link.

In order to perform the described sensing link releasing movement, the shutter disk 260 is biased by a torsion spring 270 which is coiled around the shaft 68, and has one end 270*a* hooked into the interior of one of the roll pins 65 (see FIG. 11A and 16) and the other end captured within a notch 258*a* formed in the shutter disk lug 258. Angular motion of the shutter disk 260 in response to the spring 270 is limited by spacers 336 surrounding the machine screws 153 which project through the driven gear 54 and are threaded to the frame member 152 (see FIG. 18). The spacers 336 pass loosely through arcuately elongated slots 276 formed in the shutter disk 260, forming a lost motion coupling between the disk 260 and gear 54. Washers 338 retain the disk 260 on the spacers 336, and also clamp spacers 336 and gear 54 in place upon frame member 152.

There are, however, three conditions, any one of which can prevent the shutter disk 260 from responding to spring 270, and thus rotating to release the sensing link 234 from deadlock latch 254. For one ting, as seen in FIG. 11A, the deadlock latch 254 itself is formed with a shoulder 264 which initially engages the lug 258, to prevent counter-clockwise rotation of the shutter disk 260. The effect of spring 266, moreover, is to urge the deadlock latch into engagement with lug

258. Consequently, the only way that the shutter disk can be released is to rotate the deadlock latch 254 to the limit of its counter-clockwise motion about shaft 256, and against the urging of the spring 266. As seen in FIG. 11C, such motion of the deadlock latch, although insufficient to release the sensing link 234 directly does cause the shoulder 264 to move out from under the lug 258, until it no longer blocks counter-clockwise rotation of shutter disk 260. The shutter disk then escapes angularly to the position illustrated in FIG. 11C, and in doing so releases the sensing link 234 from deadlock latch 254.

Of the three blocking conditions referred to above, two interfere with shutter disk releAse by blocking this releasing movement of the deadlock latch, and the third does so by restraining the escape of the shutter disk itself. Specifically the "counter door open" and "low register" conditions are the ones which block the deadlock latch 254, holding it in position to prevent release of the shutter disk 260.

A lockout comb 298 is normally in the position illustrated in FIG. 11A, wherein a lug 300 formed thereon lines up with a slot 302 in an arm 254*a* of the deadlock latch 254. Such alignment of the lug 300 and slot 302 permits the lug to enter the slot as seen in FIGS. 11B and 11C whenever the sensing link 234 rises and thus rotates the deadlock latch 254 counter-clockwise about its shaft 256.

The register 74 is housed in a compartment provided with an access door 278 (FIG. 11D) mounted on a conventional hinge mechanism (not shown) for opening and closing motion to control access to the register compartment. On the side of the register 74 is mounted a vertically floating door link 284 which is formed with a depending foot 288 and a pair of upstanding tabs 290. A machine screw 282 extends loosely through a vertically elongated slot (not shown) cut through the link 284, and is threaded to a portion 75 of the frame of the register 74. The screw 282, together with a rod 292 which is mounted on the register frame and extends between the tabs 290, serves to mount the link 284 for vertical motion. A tension spring 294, which is anchored at its upper end to the rod 292 and connected at its lower end to a pin 293 on the link 284, biases the link upwardly to the upper limit of its movement, reached when rod 292 engages the crotch between tabs 290. But when the door 278 is closed, a link operator abutment 296 strikes the tabs 290 and drives the link 284 downwardly against the urging of spring 294.

When the register compartment door 278 is open, on the other hand, the abutment 296 no longer clamps down the link 284. Instead, the biasing spring 294 raises that link as indicated by arrow 301, causing a lever 334 to actuate a conventional register locking mechanism (not shown), and also causing the foot 288 to engage a finger 304 formed on the lockout comb 298, and pull upwardly thereon. The lockout comb is rotatably mounted upon a shaft 306 journaled in one of the upstanding register frame plates 317 (FIGS. 1 and 13), permitting the comb to rotate clockwise (from the viewpoint of FIG. 11D) in response to the force exerted by the foot 288. Accordingly, when the register compartment door 278 is open, the lug 300 of lockout comb 298 lines up, as illustrated in FIG. 11D, with a surface of deadlock latch arm 254*a* above the slot 302. Consequently lug 300 interferes with arm 254*a*, preventing the counter-clockwise rotation of deadlock latch 254 which is required to release the shutter disk 260. This constitutes the interlock which senses an open condition of the register compartment door 278.

Register sensing fingers 308 are formed at the upper end of the lockout comb 298, and normally ride on the circular outer surface of the wheels of register 74, as seen in FIG. 11A. When the register 74 is in a low credit balance condition, however, these fingers drop into a series of slots 310 formed in the register wheels, as seen in FIG. 11E. This permits the lockout comb 298 to rotate counter-clockwise about its shaft 306, under the influence of a tension spring 311, one end of which is anchored in a conventional manner to one of the upstanding register frame plates 317 and the other end of which is hooked into a lug 312 formed on the lockout comb 298. As a result, the lug 300 is now aligned with a surface of arm 254*a* below the slot 302, as seen in FIG. 11E. Thus the low credit balance condition of register 74 also blocks the arm 254*a*, again preventing the counter-clockwise rotation of deadlock latch 254 which is required for trip release.

To recapitulate briefly, the lockout comb 298 is biased by tension spring 311 toward a first extreme position (seen in FIG. 11E), in which the sensing fingers 308 fall into slots 310 upon the occurrence of a low credit balance condition in the register 74. When there in an adequate credit balance in the register, however, the fingers 308 ride on the external surface of the wheels of register 74, thus maintaining the comb 298 in an intermediate position (FIG. 11A) and tensing the spring 311. If the register compartment door 278 is open, the link 284 and foot 288 rotate the comb 298 to the opposite extreme (seen in FIG. 11D), producing further elongation of the spring 311. Either extreme position of the lockout comb 298 will block movement of the deadlock latch 254 and prevent escape of the shutter disk 260, thus precluding operation of the trip mechanism 40. Only the middle position of the lockout comb 298 (seen in FIG. 11A) will line up lug 300 with slot 302, permitting the rotation of deadlock latch 254 (seen in FIG. 11B) which is necessary to release shutter disk 260 (as seen in FIG. 11C). Then the shutter disk can escape to disengage the sensing link 234 from the deadlock latch lug 252, and permit operation of the trip mechanism 40.

As seen in FIG. 15A, which is correlated in time with FIG. 11A, the tabs 142 of all four rectifier pawls 134.1 through 134.4 project forwardly through respective windows 54*a* and 54*b* formed in the driven gear 54. The tabs 142 of the upper pawls 134.1 and 134.3 protrude through window 54a and those of the lower pawls 134.2 and 134.4 through window 54*b*. Similar windows 260*a* and 260*b* respectively aligned therewith are formed in the shutter disk 260. When the pawls 134 have their respective rectifier teeth 138 in nested engagement with their respective setting bar racks 132, as seen in FIGS. 15A and 15C, the tabs 142 thereof do not extend into the shutter disk windows 260*a* and 260*b*. This permits the angular movement of the shutter disk 260, relative to the driven gear 54 (see FIG. 15C), required for the shutter disk to escape and disengage the sensing link 234 from the deadlock latch 254. But when any one or more of the four rectifier pawls 134 is

rotated about its fastener 136 (as seen in FIG. 15B) by a nontnested relationship between its rectifying tooth 138 and the associated bar rectification rack 132, indicating an unrectified condition of the associated setting bar assembly 98, then the blocking tab 142 thereof extends forwardly into the associated shutter disk window 260*a* or 260*b*, and prevents the escaping movement of shutter disk 260. The result is seen in FIG. 11B, which is correlated in time with FIG. 15B; even though the rise of the sensing link 234 has removed the deadlock latch 254 and its shoulder 264 from blocking engagement with the shutter disk tab 258, the disk is unable to escape in the counterclockwise direction due to the engagement of one or more tabs 142 with an edge of one of the shutter disk windows 260*a* or 260*b*. It is only when the pawl teeth 138 of all the pawls 134 are in nested engagement with their associated rectifying teeth 132, and all the locking tabs 142 are therefore retracted from the shutter disk windows 260*a* and 260*b*, that the shutter disk 260 can escape as seen in FIGS. 11C and 15C.

The amplitude of escaping motion permitted the shutter disk 260 by screws 153, spacers 336 and the arcuately elongated slots 276 is sufficient to move windows 260*a* and 260*b* angularly out of alignment with all four rectifying pawl tabs 142. Once that happens, the rectifying pawls 134 can no longer rotate out of nested engagement with the rack teeth 132, because instead of the windows 260*a* and 260*b*, the body of the shutter 260 is then interposed in front of the tabs 142 as illustrated in FIGS. 11C and 15C. Thus there is a mutually blocking relationship between the rectifier pawls 134 and the shutter disk 260. Not only do the rectifier pawls 134 block escape of the shutter disk when the setting mechanism 60 is not rectified; but the disk also blocks movement of the rectifier pawls out of nested engagement with the rack teeth 132 once the disk has escaped to trigger a trip cycle, and so long as the rectifier pawls 134 are thus locked with their teeth 138 in nested engagement with racks 132, it is impossible to move the setting bars 98. The setting mechanism 60 is therefore ineffective to change the print wheel and gear cluster setting during a trip cycle.

In order to retain the shutter disk 260 in this pawl-blocking position relative to driven gear 54 a trip cycle, the disk is formed with gear teeth 260*c* around part of the periphery thereof which mesh with driving gear 52, and a toothless gap 260*d* occupies the remaining portion of the periphery. Before the escape of the shutter disk 20 (see FIG. 11A), the most closely approaching teeth of driving gear 52 are stored in the shutter disk gap 260*d*, and thus do not engage teeth 260*c* thereof. This permits the disk to perform its angular escape (arrow 261, FIG. 11C) free of interference from gear 52. But the escaping motion of disk 260 then causes the first tooth 260*c* thereof to slip past a notch 52*b* (see FIG. 12) on one tooth of gear 52, to establish a one-tooth mesh therebetween. Then, when the motor turns on and the driving gear 52 rotates, the direction of its rotation (see arrow 201) is such as to mesh successively more teeth until full engagement is achieved. Such engagement is then sustained until near the end of the trip cycle. Consequently driven gear 54 and shutter disk 260 both mesh with, and are driven by, the driving gear 52 during rotation of the carriage 144, with the result that disk 260 is angularly fixed in relation to gear 54 during that time. Thus the disk cannot change its position to free the rectifier pawls 134 and the setting mechanism 60.

After the postage dispensing operation has been concluded, however, the expulsion of the envelope E by the ejection rollers frees trip finger 38, allowing trip shaft 180 to rotate back to its initial position, lOwering sensing link 234, and allowing spring 266 to restore deadlock latch 254. Consequently, as driven gear 54 and shutter disk 260 conclude one full rotation together, and the teeth of drive gear 52 then disengage from the gear teeth 260*c* of the shutter disk by re-entering the toothless gap 260d, the deadlock latch 254 is again in blocking position, and the shutter disk tab 258 rotates into re-engagement therewith, causing the shutter disk 260 to be displaced angularly relative to the driven gear 54 and thus re-cocking the spring 270 and re-latching the shutter disk for the next trip release.

Conclusion

It will now be appreciated that the postage meter of this invention provides an improved setting bar assembly in which a complicated bar shape is achieved by connecting individual bar members together, and racks are distributed over the individual bar members for engaging various pinions and pawls, and in which complicated multifunction bar shapes are slidably nested in non-interfering fashion, plus specific improvements in a rotating carriage to mount the setting mechanism. The invention also provides a rectifying mechanism which acts directly on the setting bars, and therefore minimizes backlash relative to the cluster gears, and which also interacts with a switching type trip mechanism through various interlock members in a manner to block operation of either the trip mechanism or the setting mechanism. The trip mechanism is also blocked by these interlock members in response to certain insecure conditions involving the credit register; and the invention provides additional register security features in the form of resilient register choking, positive clamping, and anti-reverse mechanisms.

Since the foregoing description and drawings are merely illustrative, the scope of protection of the invention has been more broadly stated in the following claims; and these should be liberally interpreted so as to obtain the benefit of all equivalents to which the invention is fairly entitled.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a numerical value dispensing device of the type having a numerical register including driven means rotatable to change the numerical content of said register; and an assembly rotatable about a first axis; said rotatable assembly including means operable in response to such rotation to dispense a numerical value, said dispensing means including variable numerical value output means; said rotatable assembly including means for selecting and setting variable output value; said setting means including variable input driving means operable upon said rotation about said first axis to rotate said driven means to alter the numerical content of said register by the amount of the selected numerical value, bar means extending substantially parallel to said first axis, means mounting said bar

means for translation substantially parallel to said first axis, first means connecting said bar means for translation in response to said selecting means, and second means connected to said variable input driving means to alter said register input thereof in response to said bar translation; the improvement wherein:

said bar means comprises at least one bar assembly including at least two separate bar members and means connecting said bar members for joint translation.

2. A device as in claim 1 wherein:

said bar assembly comprises first, second and third toothed rack means;

said first connecting means comprises first pinion means rotatable in response to said selecting means and engaging said first rack means to translate said bar means;

said second connecting means comprise second pinion means engaging said second rack means and responsive to said bar means translation to vary said register driving means input;

and said device further comprises third pinion means engaging said third rack means and responsive to said bar means translation to adjust said variable value output means to vary the numerical value dispensed;

two of said rack means being formed on one of said bar members, and one of said rack means being formed on the other of said bar members.

3. In a numerical value dispensing device of the type having: a numerical register including driven means rotatable to change the numerical content of said register; an assembly rotatable about a first axis and including means operable in responSe to such rotation to dispense a numerical value, said dispensing means including variable value output means; said rotatable assembly further including means for selecting and setting said variable output value: said setting means including variable input register driving means operable upon said rotation about said first axis to rotate said driven means to alter the numerical content of said register by the amount of the numerical value selected, and bar means extending substantially parallel to said first axial direction, said bar means being translatable in said first axial direction and connected for such translation thereof to vary the input to said register by said driving means; the improvement wherein said assembly comprises:

a pair of elongated plates;

frame means mounting said plates in spaced confronting relation to define an elongated bar cavity therebetween, the longitudinal axis of which extends generally parallel to said first axis;

and means on said plates mounting said bar means within said cavity for translation longitudinally thereof.

4. A device as in claim 3 wherein:

said frame means comprises a hollow frame member defining one end of said bar cavity and formed with a central passageway;

said carriage further comprises means secured to said frame member and arranged to define a number wheel cavity which is axially aligned with said bar cavity and said frame member passageway;

said selecting means comprises number wheel shaft means extending transversely through said number wheel cavity, number wheels rotatably mounted on said shaft means in said number wheel cavity, and first pinions rotatable in response to said number wheels;

and said bar means extend from said bar cavity through said frame member passageway into said number wheel cavity and are formed with rack means engaging said first pinions.

5. In a numerical value dispensing device of the type having a numerical register including register driven means rotatable to change the numerical content of said register, an assembly rotatable about a first axis and including means operable in response to such rotation to dispense a selected numerical value and means for setting the numerical value to be dispensed, said setting means including variable input driving means operable in response to said rotation about said first axis to rotate said driven means of said register to change the numerical content thereof in accordance with the value with the bar means extending substantially parallel to said first axis, means mounting said bar means for translation substantially parallel to said first axis, and means connected to said register driving means to alter the variable input thereof in response to said bar means translation; the improvement comprising:

means for detenting said bar means in at least one predetermined position whereby to rectify said variable input at least at one amount level.

6. A device as in claim 5 wherein said detenting means is yieldable to permit translation of said bar means; said device further comprising means detenting to operation of said dispensing means for locking said detenting means in detenting position whereby to retain said bar means in said predetermined position during said value dispensing operation.

7. A device as in claim 5 wherein: said bar means has position-defining teeth thereon, and said detenting means compriSes pawl means and spring means causing said pawl means to nest between said teeth when said bar means Is in at least one predetermined position, and means pivotally mounting said pawl means whereby to rotate out of said nested position when axial translation of said bar means causes one of said teeth to engage said pawl means.

8. A device as in claim 7 further comprising means arranged to lock said pawl means in nested position in response to said value-dispensing operation.

9. Apparatus as defined by claim 5 additionally comprising

drive means adapted to rotate said assembly; and

means controlled by said bar detenting means for enabling operation of said drive means.

10. Apparatus as defined by claim 5 wherein said assembly includes a hollow shaft which surrounds and provides a pivot means for the rotational movement of said bar means.

11. In a numerical value dispensing device of the type having a numerical register including driven means rotatable to change the numerical content of said register, an assembly rotatable about a first axis and including means operable in response to such rotation to dispense a selected numerical value and means

for setting the numerical value to be dispensed thereby, said setting including means operable for selecting the numerical value to be dispensed and variable input driving means operable upon said rotation about said first axis to rotate said driven means to change the numerical content of said register by the amount of the numerical value selected, bar means extending substantially parallel to said first axis, means mounting said bar means for translation substantially parallel to said first axis, and means connecting said register driving means to alter said variable register input thereof in response to said bar translation; the improvement comprising:

means for sensing the position of said bar means;

and means responsive to said sensing means to lock said value dispensing means when said bar means is between predetermined positions.

12. A device as in claim **11** wherein: said bar means has position-revealing teeth thereon; and said position-sensing means comprises pawl means arranged to nest between said position-revealing teeth when said bar means is in at least one of said predetermined positions, and means pivotally mounting said pawl means whereby to rotate out of said nested position when axial translation of said bar means out of said predetermined position causes one of said position-revealing teeth to engage said pawl means; said locking means being arranged to lock said value dispensing means in response to said unnested position of said pawl means.

13. Apparatus as defined by claim **9** wherein said bar means includes a composite member having three racks formed thereon.

14. In a value dispensing device of the type having variable numerical value dispensing means; and a value setting assembly including selector means and bar means which are longitudinally translatable in response to said selector means and which have a toothed rack thereon; the improvement comprising:

pawl means arranged to nest between said rack teeth when said bar means is in at least one predetermined position;

means pivotally mounting said pawl means whereby to rotate into and out of nested engagement with said teeth;

means including a lockable and releasable trip mechanism operative to drive said value dispensing means when said trip mechanism is released;

shutter means movable to release said trip mechanism and engaging with said pawl means in a manner to prevent such movement of said shutter means when said pawl is out of said nested engagement, and to prevent movement of said pawl means out of said nested engagement when said shutter means moves to release said trip mechanism; said shutter means being formed with a pawl-receiving opening aligned with said pawl means, said pawl means, when not nested between said teeth, projecting into said pawl-receiving opening in position to engage said shutter means upon trip-mechanism-releasing movement thereof; said shutter means also being arranged so that said trip-mechanism-releasing movement thereof moves said pawl-receiving opening out of engageable alignment with said pawl means and interposes the body of said shutter means to block rotation of said pawl means;

said pawl means being arranged so that, when the body of said shutter means is so interposed, said pawl means is locked in nested engagement with said teeth whereby to prevent the movement of said bar means which is required to operate said setting means, whereby a change of value setting cannot be accomplished during operation of said dispensing means;

said shutter means having a locking surface;

deadlock means pivotable between positions for engaging with and disengaging from said shutter locking surface, said deadlock means when in said engaging position blocking said movement of said shutter means whereby to prevent operation of said value dispensing means;

said trip mechanism including sensing means which moves toward said deadlock means during operation of said trip mechanism, said sensing means motion being effective, if said deadlock means is not blocked, to drive said deadlock means from said shutter-engaging to said disengaging position thereof, whereby to release said shutter means and allow said trip mechanism to operate said value dispensing means;

a numerical value register;

means for cumulatively altering the contents of said register to reflect numerical value dispensed by said dispensing means;

means for sensing when said register attains a predetermined numerical level; and

blocking means responsive to said register level sensing means for blocking movement of said deadlock means from its shutter-engaging position whereby to prevent movement of said shutter means and thereby prohibit release of said trip mechanism and operation of said value dispensing means when said register attains said predetermined level.

15. A device as in claim **14** further comprising: a compartment enclosing said register; a door for access to said register compartment; said blocking means being responsive also to opening of said register compartment door to block said deadlock means in its engaging position whereby to prevent movement of said shutter means and thereby prohibit release of said trip mechanism and operation of said value dispensing means when either said register compartment door is open or said register attains said predetermined level.

16. A device as in claim **15** wherein said blocking means is arranged for movement from said deadlock means unblocking position to either of two deadlock means blocking positions, said device comprising first means for moving said blocking means to a first one of said blocking positions in response to said register level sensing means when said register reaches said predetermined numerical level, and second means for moving said blocking member to a second one of said blocking positions in response to opening of said register compartment door.

17. In a value dispensing device of the type having variable numerical value dispensing means, and a value setting assembly including selector means and bar means which are longitudinally translatable in response to said selector means and which have a toothed rack thereon; the improvement comprising

pawl means arranged to nest between said rack teeth when said bar means is in at least one predetermined position;

means pivotally mounting said pawl means whereby to rotate into and out of nested engagement with said teeth;

means including a lockable and releasable trip mechanism operative to drive said value dispensing means when said trip mechanism is released;

shutter means movable to release said trip mechanism and engaging with said pawl means in a manner to prevent such movement of said shutter means when said pawl is out of said nested engagement, and to prevent movement of said pawl means out of said nested engagement when said shutter means moves to release said trip mechanism; and said shutter means being formed with a pawl-receiving opening aligned with said pawl means; said pawl means, when not nested between said teeth, projecting into said pawl-receiving opening in position to engage said shutter means upon trip-mechanism-releasing movement thereof, said shutter means also being arranged so that said trip-mechanism-releasing movement thereof moves said pawl-receiving opening out of engageable alignment with said pawl means and interposes the body of said shutter means to block rotation of said pawl means;

said pawl means being arranged so that, when the body of said shutter means is so interposed, said pawl means is locked in nested engagement with said teeth whereby to prevent the movement of said bar means which is required to operate said setting means, whereby a charge of value setting cannot be accomplished during operation of said dispensing means;

said shutter means having a locking surface;

deadlock means pivotable between positions for engaging with and disengaging from said shutter locking surface, said deadlock means when in said engaging position blocking said movement of said shutter means whereby to prevent operation of said value dispensing means;

said trip mechanism including a sensing means which moves toward said deadlock means during operation of said trip mechanism, said sensing means motion being effective, if said deadlock means is not blocked, to drive said deadlock means from said shutter-engaging to said disengaging position thereof, whereby to release said shutter means and allow said trip mechanism to operate said value dispensing means.

18. In a value dispensing device of the type having value dispensing means, means including a motor for driving said value dispensing means through an operating cycle, a switch for starting and stopping said motor, a trip mechanism for closing said switch to start a value dispensing cycle and re-opening said switch at the conclusion of said cycle, and secured means for setting and registering the numerical value to be dispensed; the improvement comprising:

means responsive to said secured means for blocking operation of said trip mechanism;

said trip mechanism including an operating control and trip means movable in response to said operating control for closing said motor switch; said trip means further including sensing means movable during operation of said trip means;

said blocking means including deadlock means responsive to said secured means for blocking said movement of said sensing means whereby to prevent operation of said trip means;

shutter means movable to release said sensing means from blocking engagement with said deadlock means;

means biasing said shutter means to perform said releasing motion;

said deadlock means being positioned to block said releasing motion of said shutter means, and said sensing means motion being effective, if said deadlock means is not blocked, to drive said deadlock means out of shutter-blocking-position whereby to release said shutter means, whereby said shutter means then releases said sensing means from said deadlock means to permit operation of said trip mechanism to drive said value dispensing means;

means for sensing when said registering means attains a predetermined numerical level, and

a blocking member responsive to said register level sensing means for locking said deadlock means in position to block said shutter means whereby to prevent release of said sensing means and prevent operation of said trip mechanism and value dispensing means when said register attains said predetermined level.

19. A device as in claim **18** further comprising: a compartment enclosing said register; a door for access to said register compartment; said blocking means being responsive also to opening of said register compartment door to lock said deadlock means in position to block said shutter means whereby to prevent release of said sensing means and prevent operation of said trip mechanism value dispensing means when said register compartment door is open.

20. A device as in claim **18** wherein said blocking means is arranged for movement from a deadlock means unblocking position to either of two deadlock means blocking positions, said device comprising first means for moving said blocking means to a first one of said blocking positions in response to said register level sensing means when said register reaches said predetermined numerical level, and second means for driving said blocking member to a second one of said blocking positions in response to opening of said register compartment door.

21. In a value dispensing device of the type having value dispensing means, means including a motor for driving said value dispensing means through an operating cycle, a switch for starting and stopping said motor, a trip mechanism for closing said switch to start a value dispensing cycle and re-opening said switch at the conclusion of said cycle, and secured means for setting and registering the numerical value to be dispensed; the improvement comprising:

means responsive to said secured means for blocking operation of said trip mechanism;

said trip mechanism including an operating control and trip means movable in response to said operating control for closing said motor switch;

said trip means further including sensing means movable during operation of said trip means;

said blocking means including deadlock means responsive to said secured means for blocking movement of said sensing means whereby to prevent operation of said trip means;

shutter means movable to release said sensing means from blocking engagement with said deadlock means;

means biasing said shutter means to perform said releasing motion;

said deadlock means being positioned to block said releasing motion of said shutter means, and said sensing means motion being effective; if said deadlock means is not blocked, to drive said deadlock means out of shutter-blocking-position whereby to release said shutter means, whereby said shutter means then releases said sensing means from said deadlock means to permit operation of said trip mechanism to drive said value dispensing means;

a blocking member arranged for movement from a deadlock means unblocking position to either of two positions for blocking said deadlock means in said shutter-blocking position thereof, whereby to prevent operation of said value dispensing means;

first means for moving said blocking means to a first one of said blocking positions; and

second means for moving said blocking member to a second one of said blocking positions.

22. In a value dispensing device of the type having value dispensing means, means including a motor for driving said value dispensing means through an operating cycle, a switch for starting and stopping said motor, a trip mechanism for closing said switch to start a value dispensing cycle and reopening said switch at the conclusion of said cycle, and secured means for setting and registering the numerical value to be dispensed; the improvement comprising:

means responsive to said secured means for blocking operation of said trip mechanism;

said trip mechanism including an operating control and trip means movable in response to said operating control for closing said motor switch; said trip means further including sensing means movable during operation of said trip means;

said blocking means including deadlock means responsive to said secured means for blocking said movement of said sensing means whereby to prevent operation of said trip means;

shutter means movable to release said sensing means from blocking engagement with said deadlock means;

means biasing said shutter means to perform said releasing motion;

said deadlock means being positioned to block said releasing motion of said shutter means, and said sensing means motion being effective, if said deadlock means is not blocked, to drive said deadlock means out of shutter-blocking-position whereby to release said shutter means, whereby said shutter means then releases said sensing means from said deadlock means to permit operation of said trip mechanism to drive said value dispensing means;

register driving means for altering the numerical contents of said registering means;

said setting means being operable to adjust said register driving means whereby to determine the numerical input of said driving means to said registering means; and

means for rectifying said setting means to set said numerical input at least at one numerical level, said rectifying means being effective to prevent release of said shutter means except when said setting means is at said level.

23. A device as in claim 22 wherein said setting means includes toothed bar means, means mounting said bar means for translation, and means connecting said register driving means to alter said numerical setting thereof in response to said bar means translation; said rectifying means comprising pawl means arranged to nest between said teeth thereof when said bar means is in at least one predetermined position;

and means pivotally mounting said pawl whereby to rotate into and out of nested engagement with said teeth;

said shutter means engaging with said pawl means in a manner to prevent said releasing movement of said shutter means when said pawl means is out of said nested engagement.

24. A device as in claim 23 wherein said shutter means is arranged to prevent movement of said pawl means out of said nested engagement when said shutter means moves to release said trip mechanism whereby to lock said bar means in said predetermined position so that the numerical input of said register driving means to said registering means cannot be changed while said trip mechanism is operating said value dispensing means.

25. A device as in claim 24 wherein: said shutter means is formed with a pawl receiving opening aligned with said pawl means; said pawl means, when not nested, projecting into said opening in position to engage said shutter means on movement thereof; said shutter means is arranged so that said releasing movement thereof moves said pawl-receiving opening out of engageable alignment with said pawl means and interposes the body of said shutter means to block rotation of said pawl means; and said pawl means is arranged so that, when the body of said shutter means is so interposed, said pawl means is locked in nested engagement with said teeth.

26. In a numerical value dispensing device of the type having at least one numerical register including driven means rotatable to change the numerical content of said register, an assembly rotatable about a first axis and including means operable in response to such rotation to dispense a selected numerical value and means for setting the numerical value to be dispensed, said setting means including variable input driving means operable in response to said rotation about said first axis to rotate said driven means of said register to change the numerical content thereof in accordance with the value dispensed, bar means extending substantially parallel to said first axis, means mounting said bar means for translation substantially parallel to said first

axis, and connecting means coupled to said variable input driving means to alter the variable input thereof to said register in response to translation of said bar means;

said variable input driving means comprising at least one gear cluster adapted to be rotatably indexed about a second axis;

said connecting means including a pinion which is carried at the outer axial end of the said gear cluster and which operatively meshes with a rack carried by said bar means.

27. Apparatus as defined by claim 26 wherein said value dispensing means includes a printing member, wherein said device includes a plurality of numerical register, and a plurality of respectively associated setting means.

28. Apparatus as defined by claim 27 wherein said plurality of setting means includes two pairs of gear clusters.

29. Apparatus as defined by claim 28 wherein a first pair of said cluster gears engage and drive the respective driven means of an associated pair of registers during a first portion of the rotation of said assembly, and wherein said second pair of cluster gears engage and drive the respective driven means of another associated pair of registers during a later portion of the rotation of said assembly.

30. Apparatus as defined by claim 26 wherein said bar means comprises at least one multi-part composite bar member that has three racks formed thereon, a first one of said racks being adapted to set a print wheel that is mounted on said assembly, a second one of said racks being adapted to engage said pinion, and the third one of said racks being adapted to engage a gear means that is connected to a thumb-operated amount setting wheel mounted on said assembly.

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