March 1, 1960 T. H. TOEPPEN 2,926,769

DECIMAL TABULATION DEVICE

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FIG. 1

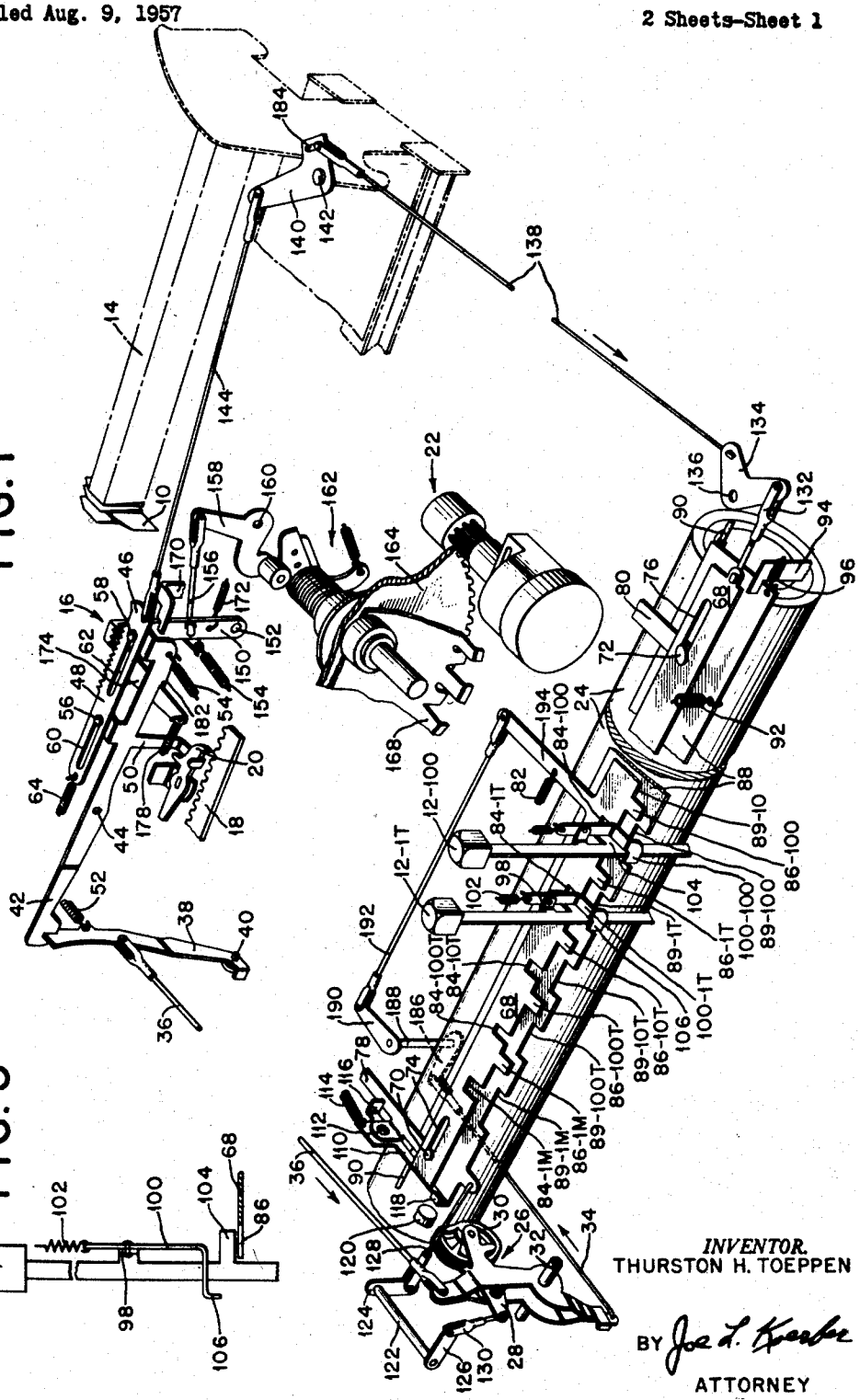
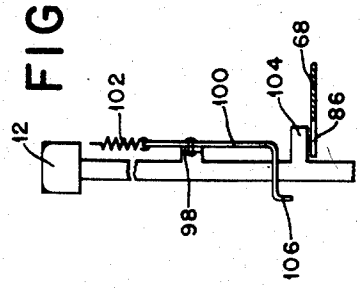


FIG. 5



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DECIMAL TABULATION DEVICE

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FIG. 2

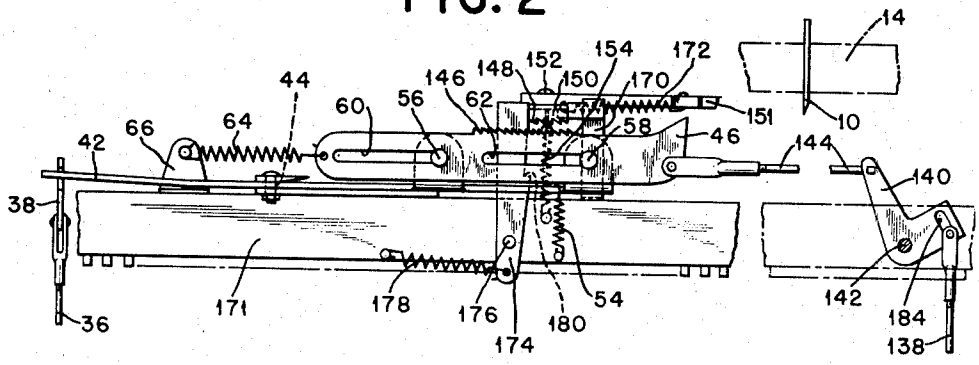


FIG. 3

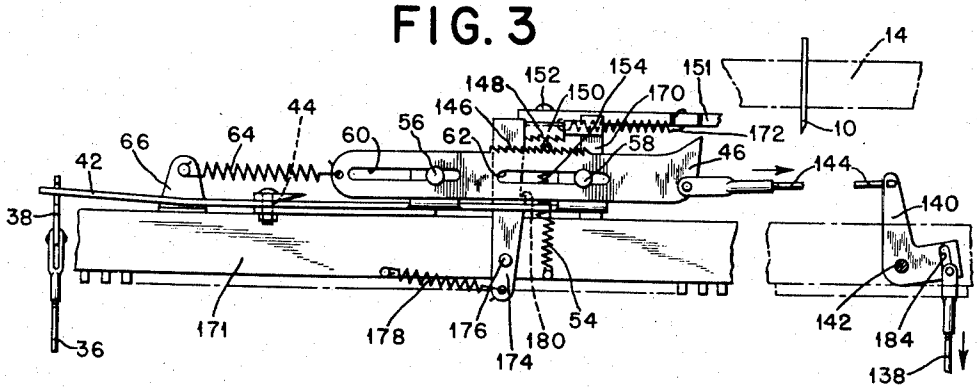
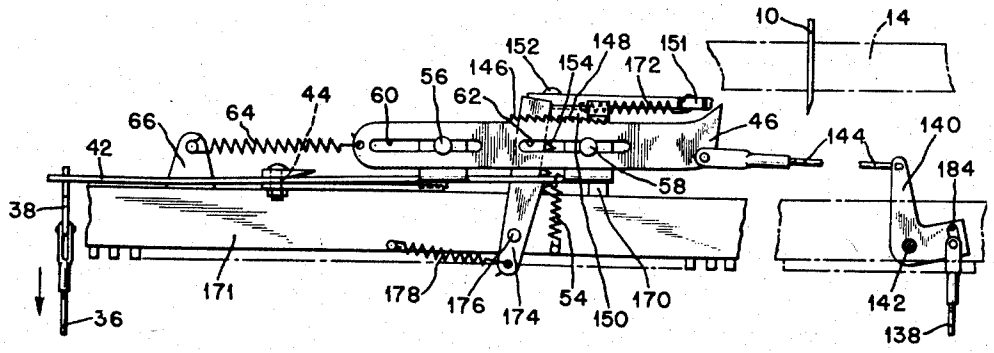


FIG. 4



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DECIMAL TABULATION DEVICE

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Application August 9, 1957, Serial No. 677,298

8 Claims. (Cl. 197—178)

This invention relates to a decimal tabulation device for typewriters and like machines and more particularly to a power operated decimal tabulation device.

Decimal tabulation devices are utilized extensively, for example, in statistical typing, that is, in the printing of numerical information. Such information is usually recorded so that corresponding denominational orders in the different numbers are aligned vertically. Since the numbers in a column may comprise varying numbers of digits, denominational tabulating devices have been provided to enable direct tabulation to the first significant digit of each number being recorded in a column.

While various devices have been designed to accomplish the above operation, it is the principal object of this invention to provide an improved decimal tabulation device.

A further object of this invention is to provide an improved, power operated decimal tabulation device.

Another object of this invention is to provide such a device which will operate in conjunction with a carriage decelerating mechanism.

A further object of the invention is to provide a decimal tabulation device having an interlock to prevent repeated tabulation when a tabulation key is held depressed.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a partial perspective view showing the decimal tabulation device.

Figs. 2, 3 and 4 are partial plan views showing various stages of operation of the tabulating mechanism.

Fig. 5 shows details of the key mechanism.

Briefly this invention includes a plurality of decimal keys operable selectively to first preset a tab stop lever in accordance with the number of type spaces to be skipped and then to release a carriage for movement through the selected number of spaces while at the same time resetting the presetting mechanism.

Referring to Fig. 1, the usual tab stop or column stop **10** is set by conventional means (not shown). In the typing of dollars and cents values, the tab stop is set to stop the carriage normally for typing the decimal point between the dollars and the cents values. Assuming that the largest value typed will comprise seven digits to the left of the decimal point, the machine will have seven decimal tab keys **12**, further designated **12–1**, **12–10**, **12–100**, **12–1T** (one thousand), **12–10T**, **12–100T**, **12–1M** (one million) plus the usual tab keys (only tab keys **12–1T** and **12–100** are shown). It is obvious that a greater or lesser number of decimal tab keys could be provided. The usual tab key operates in the conventional manner to advance the carriage to a tab stop **10**. The operation of the usual tab key is well known and therefore is omitted here. It will suffice to state that operation of the latter key in the device disclosed herein will tabulate the typewriter carriage in the usual manner to a position for typing the decimal point. The keys **12** are mounted in a conventional manner (not shown) for vertical sliding movement.

The usual tab rack **14** carrying the settable tab stops **10** is mounted on the typewriter carriage. The tab stop mechanism, generally designated **16**, is mounted on the frame of the machine for cooperation with set tab stops **10** for positioning the typewriter carriage. The usual escapement rack **18** (partially shown) is fixed to the carriage and cooperates with an escapement dog **20** for controlling the movement of the carriage which is spring biased in one direction for movement when the dog **20** is retracted from the rack **18**. This type of carriage escapement is well known in the art.

A centrifugal tab governor generally designaed **22**, shown and described in a copending application, Serial No. 556,630, filed December 30, 1955, on behalf of R. D. Dodge and J. H. Norcross, now Patent No. 2,854,124, is connected with the tab mechanism **16** for decelerating the carriage at the end of the tabulation movement.

The usual power driven roller **24** cooperates with the usual cam assembly **26** for operating the tab mechanism **16** as described hereinafter. The cam assembly **26** is well known in the art and it will suffice to state that a downward movement of a lever **28** engages an eccentric cam **30** with the driven roller **24**. Rotation of the cam **30** causes the cam assembly **26** to rock counterclockwise about its pivot **32** thereby moving links **34** and **36** in the direction of the arrows.

The tab stop mechanism **16** is generally of a well known type, the pull on the link **36** pivoting a lever **38** about a pivot point **40**, thereby pivoting a tab lever **42** about a pivot **44** and swinging the nose **46** of a tab check lever or counter stop **48** into the path of a set tab stop **10** and, through an extension **50** of the tab lever **42**, withdrawing the dog **20** from the rack **18** whereby the carriage may advance to the left under spring tension until the tab stop **10** engages the nose **46** of the tab check lever **48**. The lever **38** is normally biased clockwise by a spring **52** fastened to the frame of the machine. Similarly the tab lever **42** is biased clockwise by a spring **54**. The tab check lever **48** is slidably mounted by studs **56** and **58** and slots **60** and **62** (see also Figs. 2, 3 and 4) and is biased to the left by a spring **64** fastened at the other end to a fixed bracket **66**.

As stated hereinbefore, the set tab stop **10** is positioned to cooperate with the tab check lever **48**, in its normal position of Fig. 2 (normal in the sense that the lever **48** is positioned with the studs **56** and **58** at the extreme right ends of the slots **60** and **62**), to position the carriage with the decimal point print space at the print position. For other positioning, the tab check lever **48** is shifted to the right, relative to the tab lever **42**, a predetermined amount depending upon the desired extent of tabulation, prior to release of the carriage in which positions the studs **56** and **58** are positioned other than at the right ends of the slots **60** and **62** (see Figs. 3 and 4). The nose **46** then engages the tab stop **10** at an earlier time and limits the carriage movement to fewer spaces.

Referring to Fig. 1, a slide **68** is mounted by studs **70** and **72** and slots **74** and **76** on brackets **78** and **80** which are fixed to the machine frame. The slide **68** is biased to the left by a spring **82** which is fixed at the opposite end to the frame of the machine. The slide contains slots **84–1M**, **84–100T**, **84–10T**, **84–1T**, **84–100**, **84–10** and **84–1** (the illustration in Fig. 1 is broken for convenience of illustration and the slots **84–10** and **84–1** and associated elements referred to hereinafter are not shown),

corresponding to the respective keys 12–1M through 12–1. The slide 82 also carries extensions 86–1M, 86–100T, 86–10T, 86–1T, 86–100, 86–10 and 86–1 corresponding to respectively designated keys 12 and notches 84.

A bail 88 is pivotally and slidably mounted on a rod 90; bail 88 is biased clockwise about the rod 90 by a spring 92 and is biased to the right against a stop member 94 by a spring 96; bail 88 has formed therein notches 89, further designated 89–1M, 89–100T, 89–10T, 89–1T, 89–100, 89–10 and 89–1.

Referring to Figs. 1 and 5, the stem of each key 12 has formed thereon a lug 98 pivotally mounting a member 100. The members 100 are further designated 100–1M, 100–100T, 100–10T, 100–1T, 100–100, 100–10 and 100–1. A spring 102 fastened to each member 100 biases the entire key assembly upwardly. A second lug 104 formed on each key stem is normally positioned directly above a corresponding one of the slots 84. An elbow formed in the member 100 is normally above the plane of the slide 68, but, upon depression of a key 12, the corresponding member 100 is moved to intersect the plane of the slide 68 whereby movement of the slide 68 to the left causes an extension, for example 86–1T, to engage the vertical arm of the corresponding member 100–1T. An extension 106 of each member 100 intersects the left hand edge of a corresponding one of the notches 89, formed in the bail 88.

When a key 12 is depressed, the lug 104 passes through the corresponding slot 84 in the slide 68 and bears upon the bail 88, rotating the bail 88 counterclockwise about the rod 90 and against the tension of the spring 92. A lever 110 is pivoted at 112 on the bracket 78 and is biased clockwise by a spring 114 such that a lug 116 on the lever 110 acts as a stop against the bracket 78.

The lever 110 normally abuts the left end of the slide 68 and restrains the slide against movement by the biasing spring 82. When the bail 88 is rotated, a lug 118 formed on the bail 88 effects counterclockwise rotation of the lever 110 thereby removing the restraining effect on the slide 68 and permitting the slide 68 to move to the left. The extensions 86 of the slide 68 are differentially spaced from corresponding keys 12, as follows:

Extension 86	Distance from corresponding key 12
86–1M	7 increments of space.
86–100T	6 increments of space.
86–10T	5 increments of space.
86–1T	4 increments of space.
86–100	3 increments of space.
86–10	2 increments of space.
86–1	1 increments of space.

Normally the tab check lever 48, in the example specified hereinbefore, will cause eight spaces of tabulation to print the decimal point. When the key 12–1 is depressed, it is desired, through mechanisms described hereinafter, to shift the tab check lever 48 one space to the right relative to the tab lever 42, so as to engage the tab stop 10 after only seven spaces of tabulation, thereby positioning the carriage for typing in the units order position. Similarly, depressing the key 12–1T shifts the tab check lever 48 four spaces with respect to the tab lever 42 and, upon tabulation, stops the carriage after four spaces of movement in a position for typing in the thousands order position.

When the slide 68 is released and moved to the left, and an extension 86 engages the corresponding interposed member 100, the member 100 is pivoted clockwise and the extension 106 slides the bail 88 to the left on the rod 90 until the lug 118 abuts a stop 120 carried by the frame. This shifting motion unlatches the lug 118 from the lever 110 which then rotates clockwise to bear against the bottom of the slide 68.

A rod 122 pivotally mounted on the machine frame has fixed thereto arms 124 and 126. The arm 124 is connected to a lug on the bail 88 by a link 128 whereas the arm 126 is connected by a link 130 to the lever 28. When the bail 88 slides to the left, the arms 124 and 126 are rotated clockwise about the axis of the rod 122 causing downward movement of the link 130 and the lever 28 and consequent actuation of the cam assembly 26, as described hereinbefore.

When the slide 68 moved to the left to shift the bail 88, it also, through a link 132, effected clockwise movement of a crank 134 pivoted at 136 on the frame. Through a link 138, a second crank 140, pivoted on the frame at 142, is pivoted clockwise, exerting a pull on a link 144. The link 144 is connected to the tab check lever 48 and shifts the lever 48 to the right, relative to the tab lever 42, a number of increments determined by the particular key 12 which is operated.

When the cam assembly 26 is actuated, as described hereinbefore, and pulls on the link 36, the tab lever 42 is rotated about its pivot 44 and, through the studs 56 and 58, moves the tab check lever 48 toward the tab rack 14 and interposes the nose 46 in the plane of a set tab stop 10. Referring to Figs. 2, 3 and 4, certain ones of teeth 146 on the tab check lever 48 (depending upon the lateral position assumed by the lever 48 relative to the lever 42) engage teeth 148 on a decelerator lever 150 which is pivoted at 152, Fig. 1, and biased toward the front of the machine by a spring 154. Through a link 156 and a crank 158 pivoted at 160, the decelerator lever 150, during tabulation, actuates a one-way spring clutch 162 to control, through a gear 164 and the governor device 22, the speed of the carriage. At 168 is shown a fragment of a tape spool conventionally used, in conjunction with a clock spring (not shown) and a tape attached to the carriage, for advancing a typewriter carriage. This type of carriage speed governor is shown and described in the copending application Serial No. 556,630, cited hereinbefore. The decelerator lever 150 is normally engaged by a bracket 170 fixed to the rear carriage rail 171, Figs. 1, 3 and 4, which restrains the lever 150 from movement to the right under tension of a spring 172.

As the levers 42 and 48 continue to move together toward the tab rack 14, the escapement dog 20 is retracted from the rack 18 in the conventional manner, thereby releasing the carriage which advances to the left. By the time the escapement dog 20 is released from the rack 18, the teeth 146 have fully mated with the teeth 148 and further motion of the tab check lever 48 pushes the decelerator lever 150 past the edge of the bracket 170. The spring 172 then pulls the lever 150 and the engaged tab check pawl to the right, overcoming the weaker spring 64. This action conditions the governor mechanism 22 so that it will decelerate the carriage when struck by a stop 10.

As the cam 30 rolls over, it is necessary to prevent the lever 48 from disengaging prematurely from the decelerator lever 150. This is accomplished by a latch 174, which is pivoted at 176 on the rear carriage rail 171 and biased clockwise by a spring 178. The rear end of the latch 174 bears on the left side of the decelerator lever 150 so that, when the lever 150 moves to the right as described, the latch 174 follows. Since the tab lever 42 is then at its point of maximum rotational advance, a step 180, Fig. 2, in the right side of latch 174 engages a step 182, best shown in Fig. 1, in the lower edge of the lever 42. This latch action keeps the lever 42 in the advanced position until the decelerator lever 150 is restored. Fig. 4 shows the various parts at this stage, ready to intercept the set tab stop 10.

As the carriage advances it is under direct control of the governor through drum 168 until the tab stop 10 strikes the nose 46. After stop 10 strikes the nose 46, it forces the tab check lever 48 and the decelerator lever 150 to the left, thereby overdriving the governor at a controlled rate through link 156 and lever 158 etc. Near the end of this motion, the decelerator lever 150 again

bears on the latch 174, rotating it counterclockwise and unlatching the tab lever 42 just after the lever 150 passes the left edge of the stop on the bracket 170. The spring 154 biases the lever 150 toward the front of the machine but cannot move it until the lever 150 passes the stop on the bracket 170 and the lever 42 is unlatched from the latch 174. When the lever 42 is restored, the dog 20 re-engages the rack 18, stopping the carriage at the position determined by the presetting of the tab check lever 48 relative to the tab lever 42 and the set tab stop 10. A slot 184 in the crank 140 permits overthrow motion of the tab check lever 48 and the connecting link 144 when the lever 48 is shifted relative to the lever 42.

The first half of the rise of the cam 26, through the link 36, actuates the tabulating mechanism 16 as described hereinbefore. The second half of the cam rise is utilized to reset the selection mechanism. The link 34 pushes on an arm 186 fixed to a rod 188 pivotally mounted on the frame. A second arm 190 also is fixed to the rod 188 and, through a link 192, to an extension 194 of the slide 68. The rearward movement of the link 34 causes the slide 68 to be restored to the right where the spring biased lever 110, spring biased clockwise, will engage the slide and hold it. When the key lever 12 is released, it rises under tension of its spring 102 and releases the bail 88 which pivots clockwise under tension of the spring 92. When the slide 68 is released, the lug 106 of the member 100 no longer holds the bail 88 to the left and bail 88 is restored to the right, against the stop 94, by the spring 96 whereby the lug 118 re-engages the lever 110.

When a key 12 is depressed and the side 68 has shifted to the left, the lug 104 on the actuated key 12 is trapped below the slide 68 so that the key stem cannot restore to normal until the end of the cycle when the slide 68 is restored to the right. This interlock insures that a quick operation of a key will produce a complete cycle. On the other hand, a repeat operation is undesirable if a key is held depressed. In that event, the lever 110 holds the slide 68 when it is restored and cannot be released again until the bail 88 has been restored by releasing the depressed key whereby the lug 118 re-engages the lever 110 for the next tabulating operation.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. In a business machine having a movable carriage, the combination of a column stop moved by said carriage, a counter stop movable into the path of said column stop, means mounting said counter stop for movement parallel with the path of movement of the column stop, said counter stop having a plurality of indexing teeth defining different denominational positions of said counter stop, a decelerator lever having teeth engageable with said denominational teeth of said counter stop, a carriage decelerator operable by said decelerator lever, a series of selective devices representing different denominational stopping positions of said carriage relative to said column stop, means controlled by said devices for effecting said parallel movement of said counter stop to index said stop element to different denominational positions relative to said decelerator lever and said column stop, means operable for moving said counter stop into engagement with said decelerator lever and into the path of said column stop, and means controlled by said devices for operating the last said means.

2. In a carriage tabulating mechanism, a column stop and a counter stop, one of which stops is mounted for movement into the path of the other to define a carriage stopping position by engagement of one stop with the other, one of said stops being selectively movable parallel with said path to different denominational positions, a series of denominational keys for moving said selectively movable stop to said denominational positions, a decelerator lever engageable with said selectively movable stop, a carriage decelerator operable by said decelerator lever, means rendered operative by the operation of a denominational key to first engage said selectively movable stop with said decelerator lever in the denominational position defined by the operated key and thereafter effect the first named movement of said one stop into the path of the other stop, and means operable by said key for releasing said carriage whereby said carriage moves until said counter stop and said column stop engage.

3. In a carriage tabulating mechanism having a carriage moved stop and a stop which remains fixed while the carriage moves, one of said stops being movable into the path of the other to arrest the carriage by impact of the carriage moved stop with the fixed stop, one of said stops acting as a counter stop and the other as a column stop, means to mount said counter stop for variable selective movement parallel to said path to any one of a plurality of different denominational positions, a plurality of teeth carried by said counter stop, denominational key mechanism for selectively moving said counter stop to its different denominational positions, a decelerator lever having teeth engageable with said teeth of said counter stop according to the denominational position of said counter stop, a carriage decelerator operable by said decelerator lever, and power means rendered effective by the operation of any denominational key for engaging said counter stop with said decelerator lever, for pivoting said fixed stop into the path of said carriage moved stop, and for releasing said carriage for movement.

4. In a carriage tabulating mechanism having a carriage moved stop and a stop which remains fixed while the carriage moves and arrests the carriage by impact of the carriage moved stop with the fixed stop, one of said stops being movable into a path containing the other stop, means to mount one of said stops for variable selective movement parallel with said path to any one of a plurality of different denominational positions, a plurality of teeth carried by said selectively movable stop, denominational key mechanism for selectively moving said selectively movable stop to its different denominational positions, a decelerator lever having teeth engageable with said teeth of said selectively movable stop according to the denominational position of said selectively movable stop, a carriage decelerator operable by said decelerator lever, and power means for engaging said selectively movable stop with said decelerator lever, moving said movable stop into the path of said fixed stop and releasing said carriage for movement.

5. In a carriage tabulating mechanism, a pair of coacting stops, one moved by the carriage and the other remaining fixed during a tabulating movement of the carriage up to the time of an impact between said stops, means to mount one of the stops for variable selective movement parallel with the path of the carriage to different denominational positions, a plurality of teeth carried by said variably movable stop, a decelerator lever having teeth engageable with said teeth of said variably movable stop according to the position of said stop, a carriage decelerator operable by said decelerator lever, a denominational selecting mechanism operable for variably selectively moving said selectively movable stop to said denominational position, means for locking said mechanism in operated position, and means operable by said mechanism at the end of the variable setting movement of said selectively movable stop, as a preliminary to a tabulating movement of said carriage, for engaging said variably movable stop with said decelerator lever, placing one of

said stops in the path of the other and releasing said carriage for movement, means rendered operative by impact between said stops for restoring said variably movable stop and means for unlocking said selecting mechanism.

6. In a denominational carriage tabulating mechanism, a pair of coacting stops, one moved by the carriage and the other remaining stationary during a tabulating movement of the carriage, means mounting one of said stops for selective movement parallel to the path of said carriage to different denominational positions, means for actuating said tabulating mechanism, a denominational mechanism for selectively positioning said selectively movable stop comprising a plurality of denominational keys biased to an inactive position, a denominational member mounted for longitudinal movement, latched in an inoperative position and biased toward an operative position, an actuating member mounted for pivotal and longitudinal movement to an operative position and biased to an inoperative position, means operable by said denominational member for selectively moving said selectively movable stop to different denominational positions according to the denominational key operated, means operable by said actuating member for unlatching said denominational member, means operable by said actuating member for operating said means for actuating said tabulating mechanism and for restoring said denominational member to said inoperative position after tabulating, and interposer means carried by said denominational keys operable for pivotally actuating said actuating member for releasing said denominational member and for interposing relative to said denominational member and said actuating member for actuating said means operable for selectively moving said movable stop and said means operable for operating said tabulating and restoring means.

7. In a denominational carriage tabulating mechanism, a pair of coacting stops, one moved by the carriage and

the other remaining stationary during a tabulating movement of the carriage, means mounting one of said stops for selective movement parallel to the path of said carriage to different denominational positions, means for actuating said tabulating mechanism, a denominational mechanism for selectively positioning said selectively movable stop comprising a plurality of denominational key levers, a latched denominational member movable variable distances according to the denominational key actuated, means operable by said denominational member for moving said selectively movable stop variable distances according to the movement of said denominational member, means for restoring said denominational member to a latched position, means for operating said tabulation actuating means and said denominational member restoring means, an actuating member pivotally and slidably actuatable, means on said key levers for pivotally actuating said actuating member for unlatching said denominational member and for operatively connecting said unlatched denominational member and said actuating member for sliding actuation of said actuating member, and an operative connection between said actuating member and said means for operating said tabulation actuating means and said denominational member restoring means.

8. The device of claim 7 wherein said denominational keys carry latch means engageable with said denominational member in its actuated position to latch an actuated one of said keys in actuated position until said denominational member is restored.

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