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Malavazos, deceased et al.

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[45] **June 17, 1975**

[54] **ARITHMETIC UNIT FOR A POSTAGE METER**

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[52] **U.S. Cl.**..... **235/101;** 235/132 R; 235/133 R; 101/91

[51] **Int. Cl.**..... **G07g 1/00;** G06c 7/02

[58] **Field of Search**..... 235/101, 132 R, 133 R; 101/91

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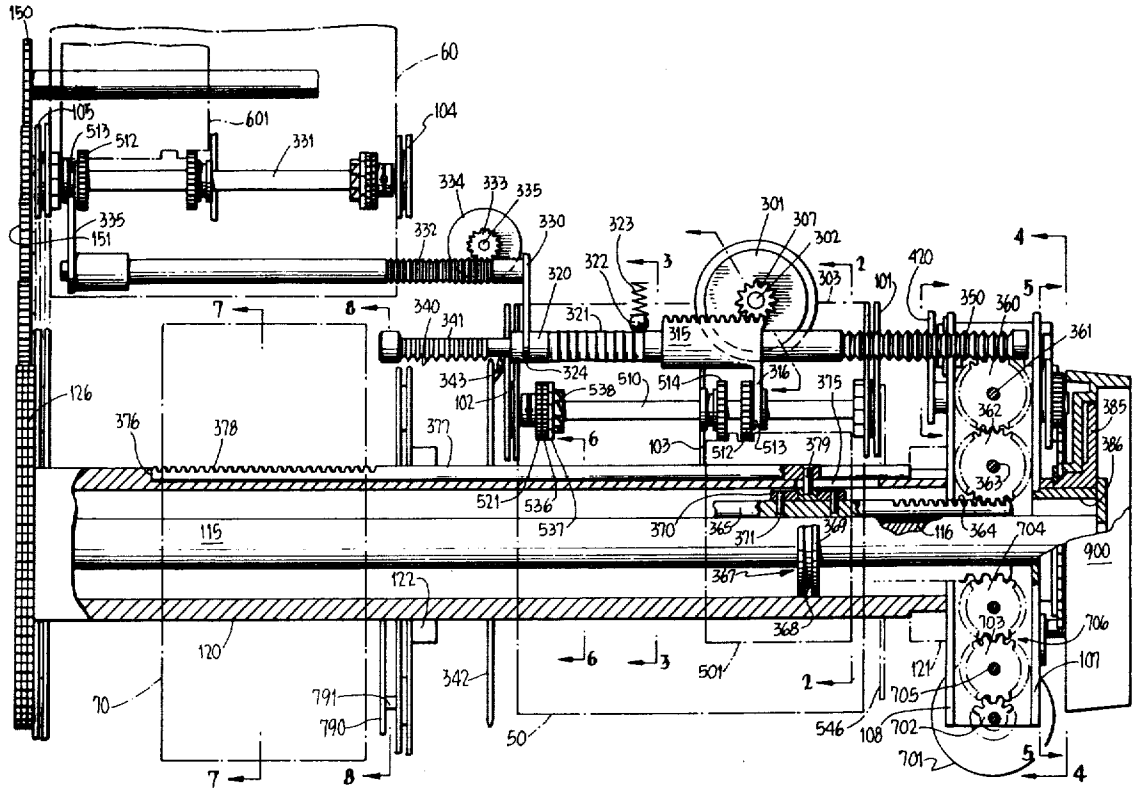
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Primary Examiner—Stephen J. Tomsky
Attorney, Agent, or Firm—Robyn Wilcox

[57] **ABSTRACT**

This invention relates to an arithmetic unit for a postage meter in which the arithmetic and printing mechanism, commonly called "the meter", is removably attached to a heavy base by easily removable means, so that the arithmetic printing unit may be readily separated therefrom and taken to a Post Office for resetting. The mechanism of the present invention comprises a hollow cylindrical drive shaft on which is mounted a single Thomas-type mutilated drum actuator; driven gears slidably, but non-rotatably mounted on register drive shafts that are arranged on a concentric arc around the actuator; preferably a second Thomas-type mutilated drum actuator driven from said drive shaft; a second plurality of driven gears mounted on register drive shafts which are concentrically arranged in an arc around said second actuator; a descending register driven from one of said actuators and its associated driven gears and register drive shafts; ascending register driven by said second actuator and its associated driven gears and register drive shafts; a manually operated and ordinally arranged selection mechanism to simultaneously set into each of the orders of the registers driven by said register drive shafts, the value of the stamp to be impressed upon the mail matter; and a postage printing mechanism set by said manually operable selection mechanism and driven by the drive shaft. Preferably, the means for setting the printing mechanism comprises a set of first selection bars in the interior of said hollow drive shaft and set by the manually operated selection mechanism, and a set of second longitudinal, or axial, members resting on the exterior of said drive shaft and operable to set the printing mechanism; and means for interconnecting the interior and exterior longitudinally movable members.

3 Claims, 9 Drawing Figures



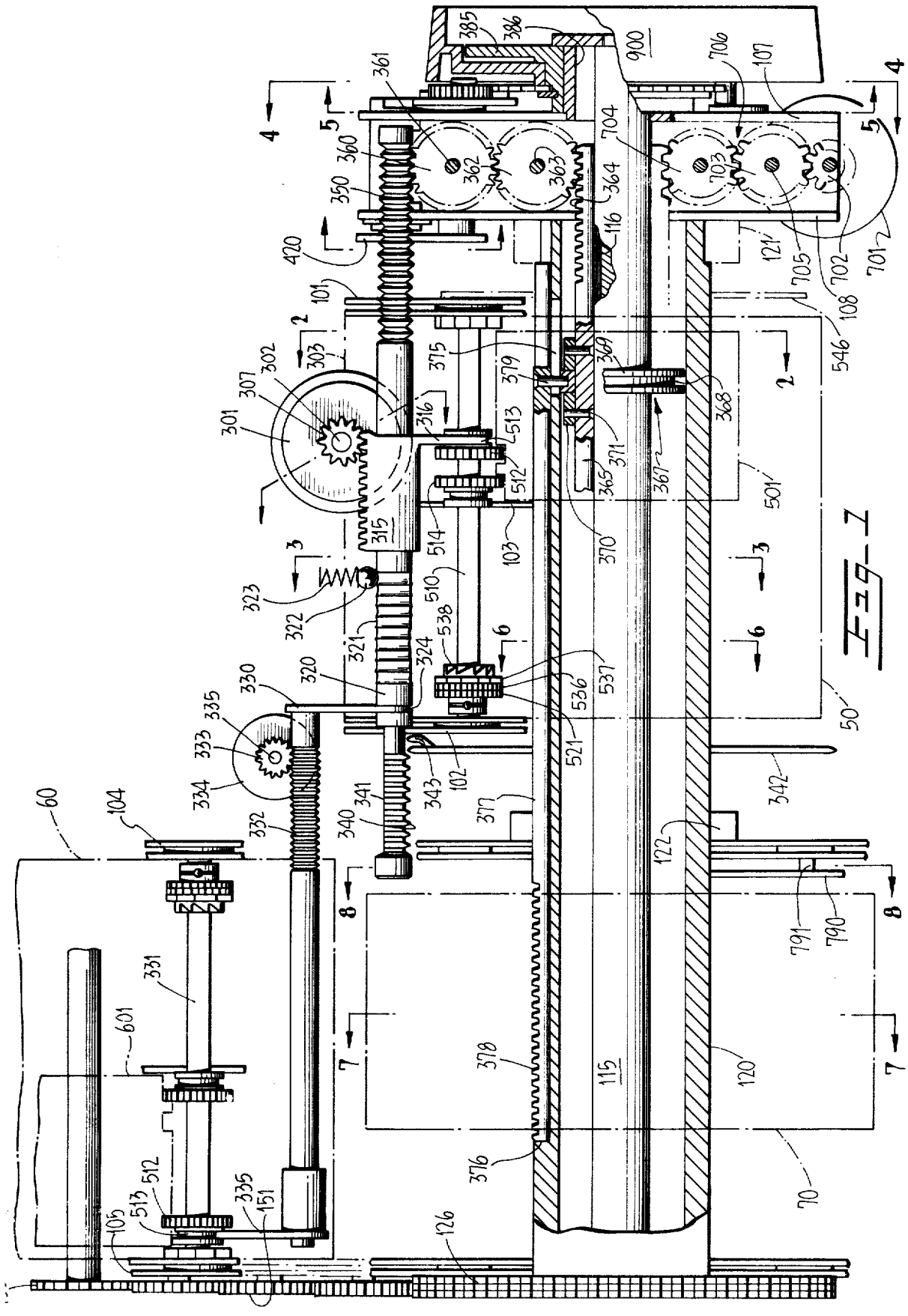

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FIG. 1

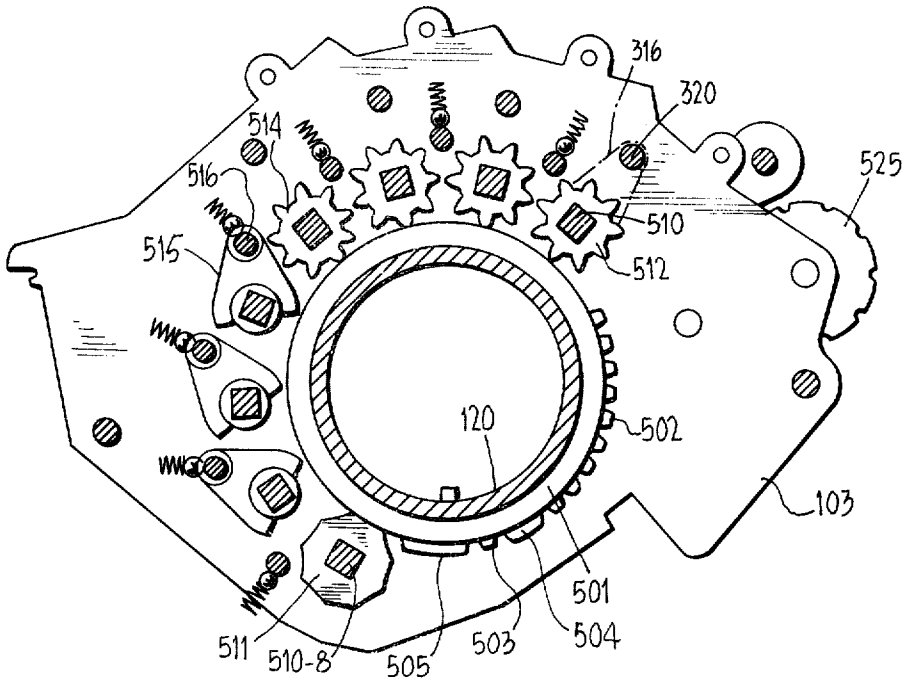

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Fig_2

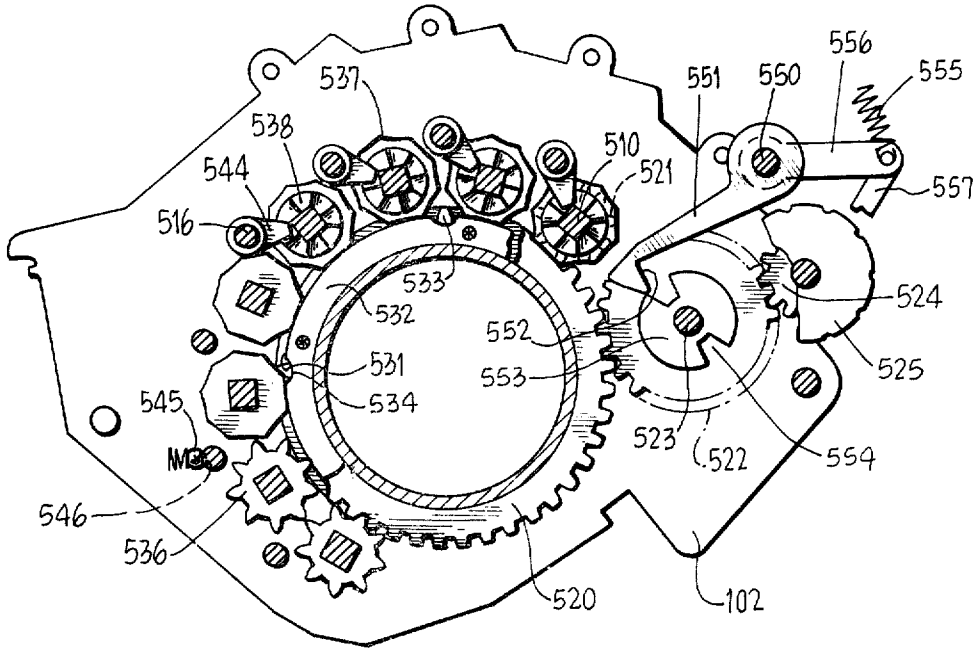

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Fig_3

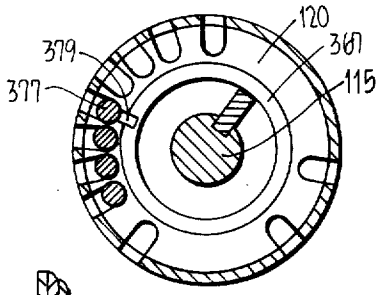


Fig_6

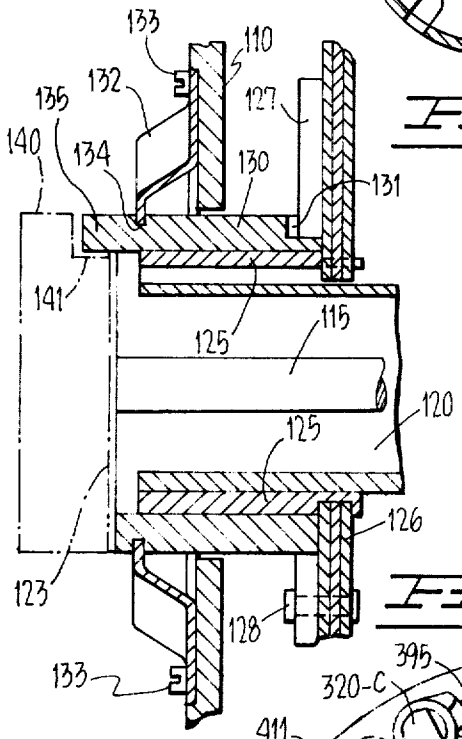


Fig_3

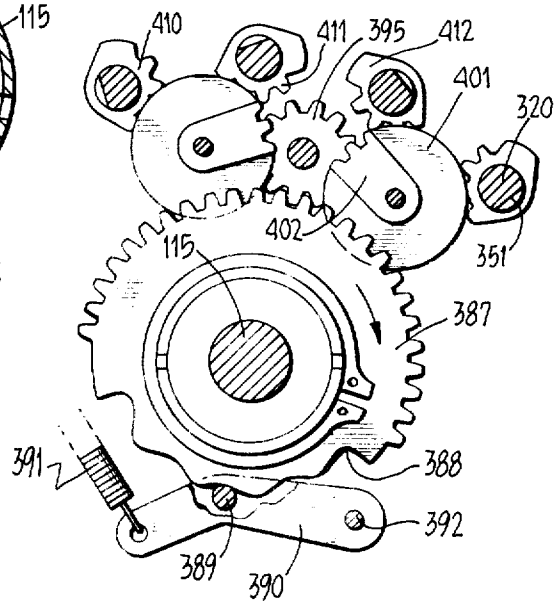


Fig_5

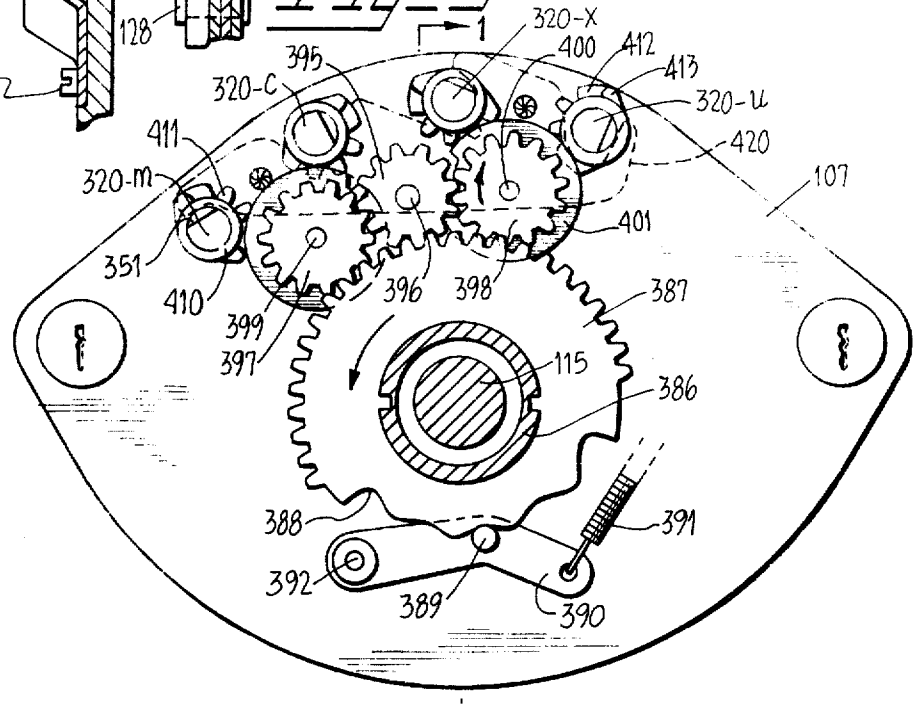


Fig_4

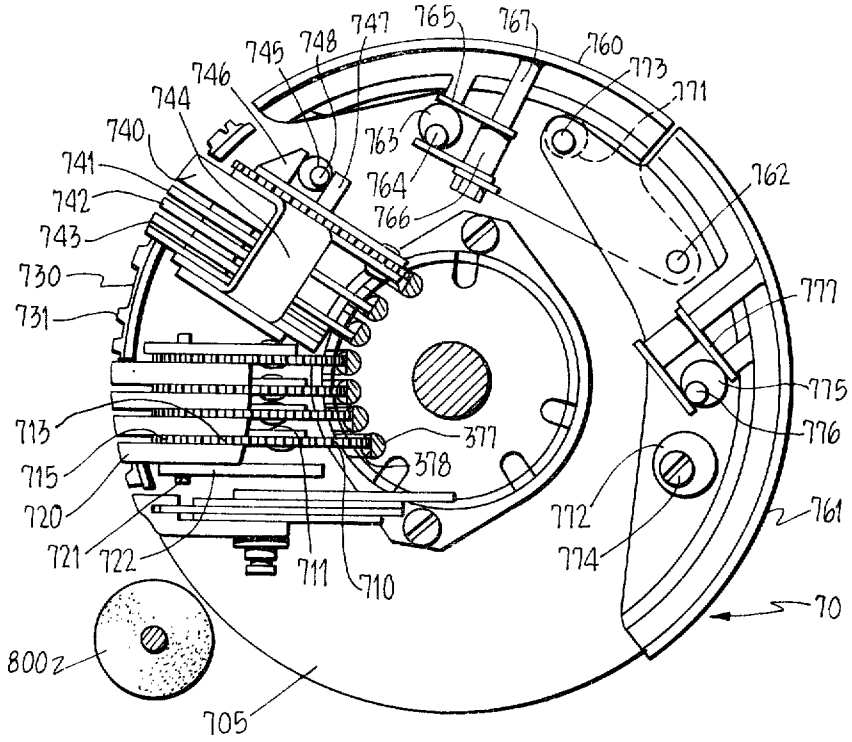

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Fig. 7

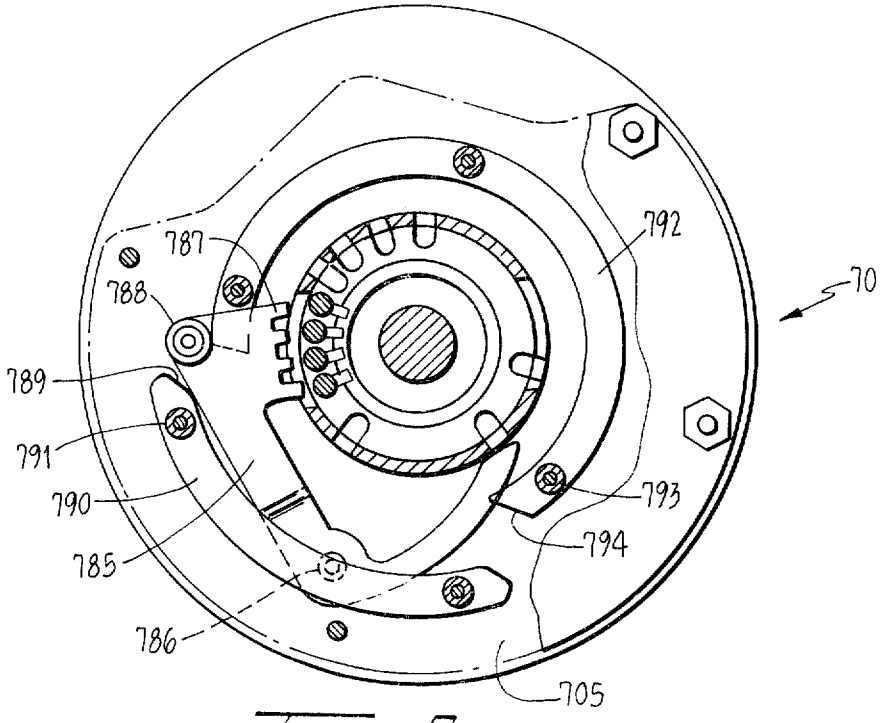

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Fig. 8

ARITHMETIC UNIT FOR A POSTAGE METER

BACKGROUND OF THE INVENTION

The present invention relates to the combination of the several functional elements which comprise what is generally known as a "Postage Meter". The several elements are described more in detail in the four applications filed on even date herewith, and is adapted to be associated with them, namely: (*a*) one entitled "Selection Mechanism for a Postage Meter", Ser. No. 457,594; (*b*) a second entitled "Register for a Postage Meter", Ser. No. 457,593; (*c*) a third entitled "Print Head for a Postage Meter", Ser. No. 457,595; and (*d*) a fourth entitled "Lock for Selection Mechanisms and Controls for a Postage Meter", Ser. No. 457,591. In one sense, these four applications could be considered as divisions of this application, although it is obvious that they are not legally such.

Postage meters are made under strict regulations prescribed by the United States Post Office which require, among other things, that a value selected for the meter must be accurately set in the value printing stamp of the meter and actually set into each of the registers: one in which the values are accumulated known as the "ascending register", and one in which a value of a stamp is subtracted from the value set by the Post Office at the time of payment for postage, known as the "descending register"; a mechanism which locks the meter against operation while the machine is printing and operating the registers, so that the amount printed by the print head and registered in the registers are exactly the same; and a mechanism which locks the meter against any operation when the value in the descending register falls below that which could be set into the machine by an operator. The particular invention described and claimed herein relates to the combination of the various essential mechanisms which constitute a postage meter.

It is well-known in the art that the Post Office with which a meter is registered will, upon the payment of an amount to cover postage desired by the user, reset the descending register from time to time, but the values accumulated in the ascending register are never changed except by machine operation.

Other requirements of the Post Office are that the meter must be accurate in all aspects of its operation. It should be ruggedly constructed to withstand long and hard usage and it must be relatively trouble-free. It is well-known that a meter is so encased in its cover that it cannot be repaired and the mechanism cannot be changed in any way except to change what are known as "slogan" dies on the print head, and except that the descending register can have its setting changed at the Post Office when a Post Office official unlocks access to that register—any other repair or change in the meter requires that the meter be officially taken from service by the distributor and repaired in a facility that is subject to Post Office inspection. Hence, it is essential for a satisfactory postage meter to be extremely accurate in registering the values printed by it into both registers as well as to be rugged and trouble-free in its operation.

It is an object of the present invention to provide an arithmetic unit, commonly called a Postage Meter for a mailing machine which can be driven at a speed twice or even more than that commonly used at present.

It is another object of the present invention to provide a very rugged and simple construction for a postage meter so that its operation will be long and trouble-free.

It is a further object of the present invention to provide a postage meter that is completely accurate in its operation.

It is another object of the present invention to provide a postage meter that will print larger and more legible stamp designs that is now possible.

It is still a further object of the present invention to provide a postage meter in which the printing unit is immediately adjacent the main bearing of the postage machine, so that there will be less twisting of the mechanism of the meter than is now possible.

It is still a further object of the present invention to provide an overall design for a postage meter that is faster and will print larger stamp indicia than is now possible and which, at the same time, will be simple and rugged in construction.

It is still a further object of the present invention to provide a better postage meter than any now available.

These and further objects of the invention will be apparent from the description of the register in the following specification when construed in connection with the accompanying drawings in which:

FIG. **1** is a longitudinal cross-sectional view of the front portion of the main drive shaft taken along a vertical plane through the center of the shaft, and showing particularly the mechanism closely associated therewith.

FIG. **2** is a transverse cross-sectional view of the selection mechanism taken on a plane perpendicular to the axis of the drive shaft through the forward part of the selection mechanism, such as along the plane indicated by the line **2—2** of FIG. **1.**

FIG. **3** is a cross-sectional view through the rearward part of the selection mechanism of the descending register showing the rearward part of the selection mechanism taken along a plane perpendicular to the axis of the drive shaft, such as indicated by the lines **3—3** of FIG. **1.**

FIG. **4** is a view of the selection locking mechanism taken at the forward end of the device, such as along the plane indicated by the line **4—4** of FIG. **1.**

FIG. **5** is a view of the back side of the mechanism shown in FIG. **4,** such as taken along the vertical plane indicated by the lines **5—5** of FIG. **1.**

FIG. **6** is a cross-sectional view through the drive shaft of the mechanism, taken on a vertical plane such as that indicated by line **6—6** of FIG. **1.**

FIG. **7** is a cross-sectional view through the print head of the present invention, such as along the vertical plane indicated by the line **7—7** of FIG. **1.**

FIG. **8** is a side view of the print head, such as taken along the transverse vertical plane indicated by the line **8—8** of FIG. **1**; and

FIG. **9** is a cross-sectional view of the left end of the drive shaft shown in FIG. **1,** showing particularly the mounting of that drive shaft and is an extension of the drive shaft shown in FIG. **1.**

It is well-known that a postage meter, such as the one involved in the present invention, should be rather light and easily portable, as it must be taken to the local Post Office from time to time in order to get it reset so that it may be used for an additional period of time. The use of postage meters is restricted by the Post Office to

those who have paid postage in advance. The regulations require that the user must pay for a selected amount of postage at the local Post Office where the machine is registered, whereupon a Post Office official will set the descending register in the meter for that amount of postage. When that amount of postage is exhausted, the meter must be taken back to the Post Office to be reset and postage paid thereon. Thus, it is common practice to divide postal machines into two different devices:

A. A base, which contains the drive mechanism and much of the auxiliary equipment, such as tape feeding devices, envelope transporting devices, moisteners, sealers, and particularly the motor which drives the mechanism. The meter itself is mounted in the base and the meter and all of the auxiliary equipment is driven by the power supply in the base.

B. The meter, which should be quite light and easily portable as it must be taken periodically to the local Post Office. It must have two registers (one ascending and one descending), a printing mechanism, and means for setting the register actuating mechanism and the printing devices. These mechanisms must be so interlocked that registers receive the exact value that is printed on the stamp.

This invention relates to the meter per se, and the base will be mentioned only insofar as it is necessary to support the postage meter, and to drive it.

The postage meter of the present invention will be enclosed in a cover (not shown in this application, as it forms no functional part in the operation of the mechanism contained in the meter). The cover, or casing, is necessary only to protect the mechanism and particularly the registers and the stamp printing dies, so that the register cannot be reset by an unauthorized person or a stamp taken from the die without operation of the registers.

The meter of the present invention is built around a main drive shaft **120** (FIGS. **1** and **9**). The front end of the drive shaft is journalled in a suitable bearing **121** in the front of the machine and in an intermediate bearing **122** affixed to an intermediate supporting plate **104.** The rear end of the drive shaft, or sleeve (FIG. **9**) is keyed to a sleeve **125** that is journalled in a drive sleeve **130.** The hub, or sleeve, **125** is also keyed to a large gear **126** which carries a clutch dog **127** pivotally mounted thereon by a suitable pivot stud **128.** The nose (not shown) on the clutch dog **127** is biased into engagement with a notch **131** formed in the drive sleeve, or hub, **130** by a suitable spring (not shown). The sleeve **130** is rotatably affixed to the rear frame plate **110** by any suitable means, such as brackets **132** which are rigidly secured to the base plate **110** by any suitable means, such as studs **133.** These brackets ride in a peripheral notch **134** formed in the wall of the drive sleeve **130.** The drive sleeve **130** is driven by means of a bracket, or ear, **135,** the bracket **135** being an offset portion of the drive sleeve **130.** The bracket **135** fits into a notch **141** of a drive disk **140** rotatably mounted in the base by means not pertinent to the present invention and therefore not shown. An end plate **123** may be rigidly attached to the rear end of the main drive shaft **120** in order to prevent any access to the drive shaft **120** while the meter is separated from the base. It will be understood that the disk **140** is driven by a suitable electric motor, likewise not pertinent to this invention and therefore not shown. It will be apparent, however, that rotation of the disk **140,** one complete revolution for each cycle of the machine, will rotate the main drive sleeve **130.** Normally the rotation of the drive sleeve **130** will rotate the hub **125** since the nose of the clutch pawl **127** is engaged in the notch **131** of the drive sleeve except at such time as the amount standing in the descending register is less than the maximum amount that could be set into the meter by an operator. The means for disabling operation of the clutch **127,** 131 will be described hereafter.

It is required by the Post Office that each meter be provided with two registers: an ascending register in which the total amount of postage is accumulated from the time it is first placed in service until it is oficially taken out of service, and is not changed, even by the Post Office, at any time; and a descending register which is set from time to time by a Post Office employee in the local Post Office where the meter is registered, and from which the value of the stamps set into the meter by its operator is successively subtracted. In the present invention it is preferred that the descending register actuator **501** (FIG. **1**) be placed on the main drive shaft **120,** which actuator will drive the descending register **50** in a subtractive direction. Preferably, the ascending register **60** will be substantially identical with the descending register but is driven additively by its own actuator **601** (which preferably is identical to the actuator for the descending register) but is driven in the reverse direction from the former. In the preferred form of the invention, this ascending register actuator **601** and its register **60** are driven from a gear train which comprises the gear **126** rigidly mounted on the drive shaft **120** and a gear train which includes the gears **150** and **151,** all of which are pivotally mounted on suitable pivot studs in the rear frame plate **105.**

The mechanism of the present invention is mounted in a frame structure which includes, among other things, a front frame plate **101,** intermediate frame plates **102, 104,** a rear plate **105,** and auxiliary front plates **107** and **108,** all shown in FIG. **1.** A fixed round shaft, or bar, **115** is rigidly supported at its front end in the front end by the auxiliary plates **107, 108** and at its rear in the cap, or end plate **123** (FIG. **9**). The main drive shaft **120** is a hollow cylinder surrounding the bar **115** and maintained in proper spacial relationship with the bar **115** by a series of eleven grooved disks **367** which primarily serve as intermediate members in setting a selected value into the printing head, as hereinafter described. These disks **367** are non-rotatably but slidably mounted on the fixed bar **115.** It will be understood that there are a series of such grooved disks **367** throughout the length of the drive shaft **120,** therebeing one for each order of the selection mechanism, one for setting the month of the date stamp, two for setting the days of the month, and four for setting the various mechanisms which control the print or non-print operation of the date stamp, the bulk rate printing slug and two slogan plates.

SELECTION MECHANISM

Each order of the selection mechanism of the present invention is set by a setting wheel **301** which is rotatably mounted on a stud **302** carried by a plate **303** extending between the front frame plate **101** and the intermediate plate **102.** Since operators occasionally let their hands rest on setting members, it is believed preferable for it to have a slipping connection with its gear

307, as is more fully explained in the application entitled "Selection Mechanism for a Postage Meter".

The gear 307 of each setting wheel 301 meshes with a rack 315 which is rigidly affixed to a selection bar 320 that is mounted in suitable bearings carried by the frame plates 101 and 102, for both longitudinal and rotating movement. Each rack 315 carries a yoke 316 that embraces a slot 513 in a 9-tooth gear 512 mounted on a square shaft 510, whereby the gear 512 will be differentially set opposite a selected value tooth on the mutilated drum 501, as more fully described in the application entitled "Register for a Postage Meter" above referred to.

The selection bar 320 is provided with a series of ten circular detent grooves 321 with which is associated a spring ball detent 322 that is resiliently pressed against the bar 320 by a compression spring 323, the ball and spring being held in a suitable cylindrical holder, not shown, carried by the frame of the device. Thus, the bar 320 can be longitudinally adjusted by rotation of the wheel 301 against the force of spring 323, and once adjusted, will be resiliently held in that position by the force of that spring.

It will be understood that there is a setting wheel 301 and an associated selection bar 320 for each order of the selection mechanism. In the preferred form of this invention there are four such setting mechanisms, so that a value of $99.99 may be printed and set into the register (or a value of $9.99-½ in those few instances in which a user desires a ½ mechanism). The bars 320 and setting wheels 301 are angularly placed around the actuator 501 as shown in FIGS. 2 and 3. Since the mechanisms of all of these selection setting devices are identical, it is believed that only one need be described.

Rearwardly of the detent grooves 321 on bar 320 is an annular notch 324. The groove 324 is embraced by an ascending register yoke 330 which is rigidly secured to an ascending register setting bar 331. The forward end of the register bar is provided with a series of circumferential teeth 332. These teeth mesh with a gear 333 which is rigidly secured to a check dial 334 mounted on a shaft 335. The check dial 334 is provided with indicia showing the values from 0 to 9, inclusive, and is visible through a suitable window in the frame, not shown. The operator can thus determine the value set in the register by looking at the check dials 334, which, at all times, will correctly register the value set in the mechanism. No indicia are required in the setting wheel 301, as that can slip with respect to the value set in the mechanism and hence it is preferred that this wheel have no indicia.

The ascending register selection bar 331 is suitably journalled in the machine for axial, or longitudinal movement, such as in bearings in the frame plates 104 and 105. Adjacent its rear end, the bar 331 carries a yoke 335 rigidly secured thereto by any suitable means, such as a pin, not identified. The outer, or Y, end of the yoke engages a notch 513 in the hub of a selection gear 512 in the ascending register, which gear, hub and notch are identical with that previously described in connection with the descending register 50 and its mutilated drum actuator 501. It will be understood by those skilled in the art that the gear 512 in the ascending register will drive the ascending register 60 to additively enter the same value in that register that is being subtracted from the descending register 50.

Adjacent the rear end of the main setting bar 320 is a series of nine circumferential rack teeth 340. As shown in FIG. 1, this section of the bar has a flattened surface 341. In the drawing, it would appear that this flattened surface 341 lies at the very top of the bar in the normal position of the bar. However, in actual construction, it is preferred that this flattened surface be slightly off to the side, being placed 107° from the bottom of the rack key when the bar 320 is in its normal position. Associated with the rack 340 is a restore cam 342, having a series of nine projecting cam faces 343 so angled as to restore the selection bar 320 one tooth, or step, forwardly as a cam face engages one of the teeth 340. These nine restore cam faces 343 are so angularly positioned that they trail all of the teeth on the mutilated drum actuator 501. Hence, after digitation is completed, the cam 342, 343 will normally restore the bar 320 to its 0 position, one step at a time, before the completion of the cycle of operation. On the other hand, if the selection bar 320 is rocked through an angle of 107°, the flat 341 will lie opposite the restore cam disk 342 and its nine camming teeth 343 cannot engage the teeth of rack 340 so that the bar will not be restored automatically.

Adjacent the forward end of the main selection bar 320 is a second series of circumferential rack teeth 350. While the setting bar can only be moved nine steps to enter a maximum value of nine in any order it is preferred to provide about double that number of teeth in order to lock the bar in a non-restore position by the means hereinafter described. At this point it can be noted that the central portion of this series of rack teeth is flattened as at 351 (see FIGS. 4 and 5), which permit the bar to be moved past a locking plate 420 in the normal position shown. However, when the bar 320 is rocked through an angle of 107°, the space between the adjacent teeth 350 will engage the edge of the plate 420, thereby locking the bar 320 in its adjusted position.

Whether or not the shaft 320 is in the automatic restore position shown in FIG. 1, or in the locked position just mentioned, the gear teeth of each setting, or selection, bar 320 meshes with a first idler gear 360 rotatably mounted on a pivot stud 361 and that, in turn, meshes with a second idler 362 rotatably mounted on a stud 363. The two gears 360 and 362 are mounted radially of the fixed bar 115 and drive shaft 120, as shown in FIG. 1. The second idler 362 meshes with a rack portion 364 on the forward end of a setting bar 365 which runs lengthwise of the fixed bar, or axle 115 and the rotating cylindrical drive shaft 120. Each bar 365 is held in its proper angular position by being nested in a groove 116 in the fixed bar 115. The bars 365 are therefore held against rotation of the drive shaft 120 but are free to move axially along the fixed shaft, or axle, 115.

Each of the interior setting bars 365 carries at an intermediate point a grooved disk 367. The grooved disk 367 has a central annular groove 368 and a pair of side walls 369, as shown in FIG. 1. The grooved disk 367 is mounted on its respective bar 365 by means of a pair of collars 370 tightly holding the grooved disk between them, each of the collars being riveted to the bar 365 by suitable rivets 371. In order to prevent interference between the different grooved disks 367 and their clamping rings 370, each order of the selection mechanism is spaced from the next by an increment slightly

greater than the next one can be moved. It will be understood that each of the eleven setting bars **365** (one for each order of the value selection mechanism, three for setting the date stamp, and one for each of the four controls previously mentioned) will readily slide under each of the other disks **367.** The rings **368** non-rotatably engage the interior wall of the main drive shaft **120.** Since there are eleven such disks **367,** it is obvious that they prevent any of the setting bars **365** from being displaced from their grooves in the axle **115.** The outside wall of the drive shaft **170** is provided with a series of eleven longitudinal slots **376** so angularly arranged as to most conveniently connect to the mechanisms in the print head **70** to which they relate. In each such slot **376** is an exterior setting bar **377,** the rear end of which is provided with gear teeth, or rack, **378.** A pin is riveted at the point in its bar **377** where it will register with the grooved disk **367** on the functionally related interior setting bars **365.** This pin **379,** as shown in FIG. **1,** is adapted to engage the groove **368** in the functionally related grooved disk **367** through a slot **375** through the walls of the drive shaft **120.**

It would appear from FIG. **1** that the interior bar **365** and the exterior bar **376** lie in the same angular plane. However, this figure has been distorted to show that the two are functionally associated. Actually, as shown in FIG. **6,** the two are angularly separated. As a practical matter, it is preferred to have the print wheels and the indicia for the stamp to trail the printing position (bottom of the figure) by a very slight angle so that it may contact an ink supply device and immediately print the stamp on the mail close to the leading edge of the mail (which generally goes from left to right). However, the setting mechanism is preferably placed on top of the machine where it is readily available to the operator, and with the unit order on the extreme right-hand as an operator faces the machine. The date stamp controls are most conveniently placed on the lower left side of the front of the machine, as shown in FIG. **1,** and the four print or non-print controls can be set in any place convenient to the operator. The angular displacement of the two setting bars **365** and **377** is readily accomplished by the use of the slotted disk **367.** Since the disk **367** is rigidly fastened to the inner bar **365,** it moves axially of the axle **115** and drive shaft **120** and in a plane perpendicular to both as the inner setting bar **365** moves longitudinally. Also, since the disk **367** forms a complete circle, the pin **379** (regardless of where the outer slot **376** and the slot **375** through the bottom of the exterior slot **376** into the interior of the cylindrical drive shaft **120,** are located) is always in contact with the slotted disk **367** and hence is effective to set the outer setting bar **377** in exact increments from the movement of the inner setting bar **365.** Thus, the manual setting devices can be arranged in the most advantageous position on the outside of the cover and be directly connected to its respective inner setting bar **365** and the outer setting bar **377** can be placed where most practical in the printing head **70.** It can be noted that the exterior setting bars **377** are held in their respective slots **376** against radial displacement as the front ends lie within the confines of the front actuator drum **501** and the rear ends lie within the confines of the print head **70** itself.

Thus, as the main selection bar **320** is moved to a differential position selected by the operator, the rack teeth **350,** through the medium of idler gears **360** and **362,** moves the interior rack bar **365** forwardly an equal differential amount. By means of the grooved disk, or collar, **367** and pin **379,** the rack bar **377,** lying in the groove **376** in the exterior walls of the main drive shaft **12,** is moved a like amount. When the main drive shaft **120** is rotated to enter the values into the respective registers **50** and **60** and rotate the print head **70** to print the proper stamp on mail matter, the rack **377** is held in an adjusted position as its pin travels completely around a circle by its constant contact with the walls **369** of grooved disk **367.** It will also be positively locked in this position throughout the printing and registering portion of a cycle of operation (the portion for each such operation being coextensive) as will be described later under the heading "Printing Head". It may be mentioned at this point that each cycle of operation requires a complete circle of 360°. Regardless of whether the meter is set for a single cycle of operation and the consequent automatic restore of the selection mechanism, or for a continuous series of operations on a locked value, the drive shaft **120** must automatically complete a full circle and will then stop unless an incoming piece of mail triggers another cycle before it is stopped. The means for cycling the drive shaft **120** is contained in the base and is not pertinent to this invention. However, it is understood by those skilled in this art that it is controlled by an incoming piece of mail operating a trigger. When operating continuously, the succeeding incoming letter triggers the next cycle before the completion of the pervious one, so the meter runs continuously without stopping.

The means for rotating the main selection bars to set them for either automatic restore or a fixed selection will now be described. It is seen in FIG. **1** that an interior hand wheel **385** is rotatably mounted on a collar **386** affixed to the forward end plate **107.** Adjacent the inner end of the hub of hand wheel **385** is a partial gear **387** (FIGS. **4** and **5**). This partial gear **387** can be resiliently detented in any adjusted position by means of five detent notches **388** which can be engaged by a pin **389** carried by an arm **390** that is pivoted on stud **392** and is resiliently biased into engagement with the partial gear **387** by means of a tension spring **391.** The partial gear meshes with an idler gear **395** that is pivotally mounted on the plate **107** by any suitable means, such as stud **396.** The idler **395** meshes with a pair of locking gears **397** and **398,** which are identical in construction, but since they are not similarly set, are given distinguishing reference characters. These gears are respectively mounted on studs **399** and **400** carried by the end plate **107.** Each of the gears **397** and **398** carry a Geneva wheel **401** and a 3-tooth gear segment **402** (see FIG. **5**). The three elements of gear **397** or **398** and its associated Geneva wheel **401** and 3-tooth gear segment **402** are affixed together to form an integral structure. The gear **397** and its assembly are effective to lock the thousands order selection bar **320-*m*** and the hundreds order selection bar **320-*c*** while the gear **398** and its assembly are effective to lock the tens order selection bar **320-*x*** and the units order selection bar **320-*u*.** (Where it is necessary to distinguish between orders of the selection mechanism, the suffix *u* is used to indicate the units order of the selection bar **320,** the suffix *x* to indicate the tens order, the suffix *c* to indicate the hundreds order, and the suffix *m* to indicate the thousands order selection bars.)

Associated with the wheels **397** and **398** and their integral Geneva wheels **401** and 3-tooth gear segments **402** are a set of gear sleeves **410** mounted on the forward ends of the selection bars **320** into which values can be selected. The gear sleeves are suitably keyed to the respective selection bar **320** by any suitable means, such as a chordal section mating with the flat **351** on the bar **320,** so that while the sleeves are held in a single plane, the bars **320** can move longitudinally within them. These mutilated gear sleeves **410** comprise a pair of central gear teeth **411** (FIGS. **4** and **5**). These gears have a width, or thickness, equal to the thickness of the Geneva disk **401** and the 3-tooth gear segment **302.** Adjacent the two central teeth **411** and lying on either side thereof is a long half-thickness section **112** having the radius of a gear tooth and extending angularly for a distance equivalent to two gear teeth, but the trailing edge of this section **412** is a full width tooth **413.** In either adjusted position, the Geneva wheel **401** will lie between the trailing gear tooth **413** and the first adjacent central tooth **411,** thereby preventing rotation of the mutilated gear **410.** When the 3-tooth gear segment **402** comes to a position opposite the mutilated gears **410,** the first gear tooth of the 3-tooth gear will engage the leading full tooth **413** and then drive the mutilated gear **410** through an angular distance of the two central gear teeth **411,** whereupon the Geneva wheel **401** again comes between the trailing full width tooth **413** and the adjacent central tooth **411.** Thus, the gear **410** and consequently its selection bar **320** can be rotated between two angular positions 107° apart and will be locked in the respective positions until again rotated by manipulation of the hand wheel **387.** Whenever the selection bar **320** is rotated from the position shown in FIG. **1** by the means just described, the flat **341** on the back end of the selection bar is rotated through an angle of 107° and consequently the restore cam **342** will lie opposite the flat **341** and can have no restorative effect upon the bar **320.** A similar flat **351** on the rearwrd portion of the gear teeth **350** on the forward end of the selection bar **320** normally faces a locking plate **420** that is rigidly mounted on the frame plate **108.** The locking late **420** is shown in dotted lines in FIG. **4.** In FIG. **4** the selection bars **320-*u*** and **320-*x*** are shown in the position indicated in FIG. **1** in which the flats **351** on those selection bars lie opposed to the locking bar **420,** while the flats **351** on the hundreds and thousands order have been rotated to lie angularly away from said plate. As shown in FIG. **4,** the plate **420** has four arms which lie opposite the selection shafts **320-*u*, 320-*x*, 320-*c*** and **320-*m***. When a selection bar **320** is so rocked, the associated arm of the locking plate **424** will engage between two adjacent teeth **350** on the bar **320** and hence it cannot be moved in either direction. By the means just described, the selection mechanism of the present invention can be set order-by-order from the highest to the lowest from an automatic restore position into a position in which automatic restoring is impossible and the selection mechanism is locked in its adjusted position; and can be unlocked from the lowest order to the highest.

It can be mentioned here that in the preferred form of this invention, the hand wheel can be partially or fully locked against adjustment by a locking wheel **900** (FIG. **1**). However, since it is not a necessary part of a meter according to Post Office regulations, and it is fully described in the above-mentioned copending application entitled "Locking Mechanism for a Postal Meter", it will not be described here.

REGISTERS

The registers of the present invention are driven by the old and well-known Thomas-type mutilated drum actuators **501** shown in FIG. **2.** In the present invention a single drum is effective to drive all of the orders of one of the registers and second drives all of the orders of the second. Since both actuators are identical, although they rotate in opposite directions, and the registers are identical except that the ascending register will not have a "lock-out" mechanism to disable the machine when the amount standing in the register is less than could be set into the machine by an operator, only the descending register will be described. The first drum **501** is mounted on the main drive shaft **120** of the machine. The drum is provided with nine teeth of differentially longitudinally extending teeth **502.** The teeth **502** differ in length by approximately the thickness of the driven gear **512** described in the next paragraph. The drum **501** is rotated in a counter-clockwise direction in this figure, and the driven gear **512** will be rotated one tooth-space if the gear is in alignment with the right end of the lowermost tooth **502,** two teeth if aligned with the right end of the second of such teeth, and on to nine increments if aligned with the ninth, or highest, such tooth. The tens-transfer mechanism is driven by a tens-transfer tooth **503,** which trails the lowermost, or trailing tooth **502** by considerable spa e as shown. A pair of Geneva blocks **504** and **505,** preferably formed integral with the drum **501,** are utilized to stop rotation of a driven gear **512** immediately after digitation is completed. One block **504** is aligned with the space between the trailing tooth **502** and the tens-transfer tooth **503,** and the second Geneva block **305** trails the transfer tooth **503,** as shown in this figure. Cooperating with the Geneva blocks **504, 505** is a Geneva disk **511** (one on each shaft **510**).

It has previously been indicated that there is a series of square shafts **510** angularly arranged around the mutilated drum **501.** These square shafts are journalled in the front frame plate **101** and intermediate frame plate **102,** and pass through enlarged apertures in the auxiliary plate **103.** The descending register herein described preferably has eight orders, so that conceivably it could be used to register $999,999.99 in postage, although only the four lower orders can receive selected values from an operator. The number of registers is obviously not important to the invention herein described, but it can be noted at this point that where a particular order is referred to, the square shafts **510** will be identified by **-8** as referring to the eighth order, etc. As above mentioned, each of the square shafts **510** is provided with a Geneva block **511,** as shown at **510-8** in FIG. **2.** Each of the square shafts **510** in the lower four orders carries a 9-tooth gear **512** slidably mounted thereon. Each of these gears has an extended hub provided with an annular slot **513** in which will be the respective yoke **316** already mentioned. Hence, there would be four gears **512** which could be engaged by the actuator drum **501.** It will be seen, therefore, that the positioning of a driven gear **512** with respect to the teeth **502** on drum **501,** in the lowest four orders of the register, will be effective, upon rotation of the drum, to enter incremental values in the corresponding orders of the register

through the incremental rotation of the gears **512** and square shafts **510.**

It should be mentioned at this point that tens-transfers are effected through the driving of a 9-tooth tens-transfer gear **514** (FIG. 2) from the rotation of the drum **501** and the tens-transfer tooth **503.** Normally, the transfer gears **514** are out of registration with the tooth **503.** The gears **514** (FIG. 2) are moved into the plane of the single transfer tooth **503** by means of a yoke **515** rigidly secured to a tens-transfer shaft **516,** the yoke engaging an annular groove, not shown, in the hub of the transfer gear. The operation of the bar **516,** and consequently the placement of gear **514** either in registration with the tens-transfer gear **503,** or out of such registration, will be described subsequently.

The register **50** itself is preferably placed between the auxiliary frame plate **103** and the intermediate frame plate **102.** In this space there are a series of 40-tooth gears **520** rotatably mounted on the main drive shaft **120.** There is one such gear for each order of the register. The **40**-tooth gears are driven by their respective driving gears (see FIG. 3) **521** which are rigidly mounted on the square shaft **510** in registration with the 40-tooth gear **520.** The 40-tooth gear, in the preferred embodiment of this invention, drives a 20-tooth idler **522.** These idlers **522** are mounted upon a common shaft **523** and, in turn, mesh with and drive a 10-tooth dial gear **524.** Attached to the gear **524** is a dial **525** which will be viewable through an appropriate window in the meter cover (not shown herein). It will be obvious from FIG. **3** that the differential rotation of a selection gear **512** will effect a corresponding differential rotation of the 9-tooth gear **521,** as both are mounted on the same square shaft. Such incremental rotation of the gear **521** will drive the 40-tooth gear **520,** and accordingly, the idler **522** and the dial **525** will be rotated a differential amount depending upon the location of the selection gear **512** with respect to the teeth **502** of drum **501.**

Rigidly secured to the 40-tooth gear **520,** as by means of rivets **530,** is a 4-tooth gear **531** and a Geneva block disk **532** (see FIG. **3**). The 4-tooth gear **531** has its four teeth **533** equally spaced, or ten gear apart with respect to the teeth of 40-tooth gear **520.** The Geneva block **532** has corresponding notches **534** adjacent each tooth **533** on 4-tooth gear **531.** Adjacent the 9-tooth gear **521** which drives the 40-tooth gear **520** but not connected thereto, is a driven gear **536,** which gear registers with the 4-tooth gear **533** above mentioned. Rigidly secured to the gear **536** is a Geneva wheel **537** whereby the gear **536** and Geneva **537** are turned simultaneously. The Geneva **537** is provided with nine projecting cam faces **538.** It follows that rotation of the 9-tooth gear **521** on the square shaft **510** drives the 40-tooth gear **320,** but the Geneva block **532** and Geneva **537,** because of the cooperation of these two, will hold the gear **536** against rotation until the 40-tooth gear **520** has gone from a 0 to a 9 position. At that time, the single tooth **533** will mesh with the teeth of gear **536** and drive it one tooth-space, thereby rotating the Geneva block **537** and the cams **538** one tooth-space likewise.

A cam follower arm **544** is rigidly mounted on the tens-transfer bar **516** by any suitable means, not shown. The bar **516** is slidably mounted in the front and intermediate plates **101** and **102,** respectively. Normally, the shaft **316** is held in its rearward position by means of a detent mechanism which, for purposes of illustration, is shown as spring-pressed ball **545** (FIG. **3**) engaging a pair of adjacent notches **546** in the bar **516.** Normally, the bars **516** are positioned rearwardly by means of a restore disk **546** having diametrically opposed cam faces **547.** Thus, the bars **516** are restored to their rearward inoperative position, both before and subsequent to digitatation. This is preferred, as it permits adjustment of the descending register by Post Office officials to accommodate additional prepaid postage without regard as to whether a tens-transfer is effected or not.

It has already been mentioned that the tens-transfer bar **516** also carries the tens-transfer drive gear yoke **515** which is rigidly secured thereon by any suitable means, not shown. The yoke **515** registers with an annular notch in the tens-transfer gear **514.** It follows that each step of the gear **536** and its Geneva disk **537** and integral cams **538,** is effective to push the follower arm **544** forwardly. This, of course, pushes the bar **516** forwardly and accordingly the yoke **515** and tens-transfer gear **516** forwardly to be in registration with the single tens-transfer tooth **303** on the drum **301.**

It is believed obvious that the placing of the selection gear **512** in a proper incremental position on its square shaft **510** by means of the selection mechanism described above will, upon rotation of the drive shaft, first rotate that gear and the square shaft **510** on which it is located an incremental amount, following which the rotation of the gear is stopped by the registration of the Geneva **511** with the first Geneva block **504** on the drum. Whenever the 40-tooth gear **520** has gone through the 0 to 9 position, it will have rotated the gear **536,** Geneva **537** and the cams **538** one tooth-space, thereby projecting the assembly of the follower arm **544,** bar **516,** yoke **515,** and transfer gear **514** of the adjacent higher order into alignment with the single tooth transfer gear **503.** The break between the first Geneva block **504** and the second block **505,** which is aligned with the transfer tooth **503,** permits a single step of rotation of the square shaft **510** in the adjacent higher order, and that rotation is then blocked by the second Geneva block **505.** It is seen in FIG. **7** that the second Geneva block **505** is longer than **504** but is not entirely around but is still relatively short so that after the tens-transfer is effected and rotation of the shaft **510** is definitely stopped, the Geneva **511** will not be in opposition to any blocking surface, such as **504** or **505.**

It is customary in devices using the Thomas principle of the mutilated drum and positionable selection gears driven thereby, to use 10 teeth on the selection gear and subsequent mechanisms. It has been found that by using 9-tooth gears, a substantially heavier Geneva, such as **511,** can be used. The 9-tooth Geneva gives a much more pronounced arcuate section between the teeth and thereby provides a stronger and more reliable detent, and one which does not wear nearly as readily as the customary 10-tooth Genevas. This enables a faster and longer operation of the meter and much longer usage than would be possible with a 10-tooth gear. It had been thought that 10-tooth gears were necessary in order to provide for the proper operation of the tens-transfer mechanism. However, it has been found that by using the 40-tooth gears between the register drive shaft **510** and its register dial **525,** the tens-transfer can be properly secured. As a matter of fact, the two gears **512** and **514** on the register driving shaft

could have less than nine teeth, such as eight, or even less; and the intermediate gear could be a 30-tooth, or even a 20-tooth gear and accurate tens-transfers be properly secured. The numbers mentioned are preferred as they adapt themselves to the size and weight of the meter.

It has been mentioned that one of the requirements of the Post Office regulations is that when the descending register reaches the amount equal to the maximum that can be set upon the selection mechanism and thereby entered into the dials, the machine must be locked against operation. In the present device this is accomplished by means of the mechanism best shown in FIG. 3. A locking shaft **550** is journalled in the front and intermediate frame plates **101** and **102**, respectively. This shaft carries four arms **551** rigidly mounted on the shaft by any suitable means, not shown. As shown in FIG. **3**, the arms **551** are each provided with a nose **552** which lies in the same plane as a diametrically notched disk **553** attached to the 20-tooth gear **522**. The notches **554** of this disk are so located that they register with the nose **552** each time the respective dial **525** stands in a 0 position. The shaft **550** is biased in a counterclockwise position in FIG. **3** by a spring **555** tensioned between an arm **556**, also rigidly attached to shaft **550** and a suitable seat, not shown, on the frame. A link **557** connects the arm **556** to the clutch pawl **127** (FIG. **9**). It is obvious that the shaft **550** cannot rock so long as any one of the noses **552** of the four arms **551** register with the circumference of its respective disk **553**. However, when all noses **552** can enter their respective notches **554**, the set of four arms **551** and the shaft **550** will be rocked (counter-clockwise in FIG. **3**) to pull the clutch pawl **127** out of engagement with notch **131** and thereby disable the clutch that drives the main drive shaft **120**. The machine is thus locked against further operation until the descending register is reset by the local Post Office.

In the preferred embodiment of this invention, four orders of the register can be driven by the actuator **301**, thereby registering up to postage of $99.99 for each operation. Another four orders of the register are provided without selection mechanism but operative to be driven by the tens-transfer mechanism herein described. While this excess register is believed so large that it will very seldom, if ever, be used, it does permit a large user in sufficient amounts to avoid the necessity of frequent trips to the Post Office to have the meter reset.

It is believed obvious that the ascending register **60** of the meter can be identical to the descending register herein described with the elimination of the lockout mechanism just described. The actuator, selection gears, register drive gear train, and the tens-transfer mechanism are preferably interchangeable. If the actuator **601** of the ascending register **60** is driven in the reverse direction to the main drive shaft **120**, this register will operate additively while the descending register is operating subtractively. This is readily secured by means of the gear train **126**, **150** and **151** previously mentioned.

PRINT HEAD

It will be understood that their is a pair of setting bars **365** and **377** for each order of the value selection mechanism which, in the preferred form of the present invention is four, as this enables the large value stamp (up to $99.99) to be posted. There are, therefore, four print wheels in the print head for registering like values on the printed stamp. There will be three pairs of exterior-interior setting bars **377**, **365** for use in printing the date, one for the month, two for the days of the month (the year, since it is used so infrequently, can be set by a stylus). There is a control bar adapted to set the "date stamp" into either a printing or non-printing position, and another pair of setting bars for setting two "slogan" plates into printing or non-printing position, and a fourth for setting a "bulk rate slug" into either a printing or non-printing position. It can be noted here that due to the size of the print head (in the preferred form of the present invention being approximately four and one-half inches in diameter), there is available for printing slogans or other material, such as return addresses, more than another linear seven inches for such plates. In the preferred form of the invention, two are used—one of three inches and one of four inches, both of which can be set to non-printing or printing position. Hence, there are eleven pairs of exterior-interior setting bars **377**, **365**, all of which operate in substantially the same manner.

The value setting wheels which enter values into the register and print the value of the stamp are readily settable through the selection wheel previously mentioned. The date stamps are controlled through wheels, preferably the hand-setting wheels **701** (FIG. **1**). It will be understood that there are three such wheels, although only one is shown in this figure, one such wheel being used for printing the name of the month, and the other two for the date of the month. A gear **702** on each such wheel meshes with an idler **703**, and that, in turn, meshes with a third gear **704**. These gears are rotatably mounted on pivot studs **705** carried by plate **706** extending between frame plates **107** and **108**. The gear **704** meshes with the rack **364** of the functionally related selection bar **365**.

The print head **70** (FIG. **7**) in the preferred form of this invention carries four value print wheels **720** corresponding to the four manually set selection wheels **301** previously described. These four value print wheels **720** are preferably mounted on a single shaft **721** carried by a U-shaped frame member **722** rigidly mounted on the web **705** of the print head **70**. As shown in this figure, the wheels must vary slightly in shape and curvature, as they are mounted on a shaft **721** that, if extended, would form a cord with the circumference of the print head **70**. Only one of these value print wheels can be perpendicular to the circumference of the print head and since the others are parallel to it, they decrease in size and increasingly increase in curvature as shown.

These print wheels are set by means of the exterior setting bar **377**, the operation of which has heretofore been described. The rack **378** on the rear end of this setting bar meshes with a gear **710** pivotally mounted on a mounting plate **711** by any suitable means, not shown. The gear **710** meshes with an idler **713**, likewise pivotally mounted on the plate **711** by some suitable means, not shown. The gear, in turn, meshes with a print wheel gear **715** which is rigidly secured to each of the value print wheels **720**. Thus, it is seen that the longitudinal movement of the setting bars **365** and **377**, through the gear train **710**, **713** and **715**, will set the respective value wheels **720** to the proper positions. The value printing wheels **720** are centered in a postage de-

sign die plate **730** which carries a design **731** approved by the Post Office. The die plate **730** is affixed to the print head by any suitable means, such as screws, not shown.

The mechanism for printing the date on the envelope adjacent the stamp comprises a month printing wheel **740**, two date setting wheels **741**, **742** which can be identical, although the first one will never print more than three digits, and a year wheel **743**. As mentioned previously, the year wheel, since it is set only once a year, can be adjusted by a stylus. The three wheels **740**, 741 and **742**, however, are changed more often and accordingly it is preferred to control them from the manual setting of the setting wheels **701** previously mentioned. The setting wheels **701** (FIG. **1**) position interior setting bars **365** as heretofore explained, and they, in turn, translate the exterior setting bars **377** for controlling the three print wheels **740**, **741** and **742**. The longitudinal movement of the three sets of bars for the dating mechanism to operate gear trains similar to the gear train **710**, **713** and **715** heretofore described set the date stamps to the selected position.

It is well-known that in some types of mail the Post Office does not want the date sprinted, so that the dating mechanism should be selectively controlled—both to either a print or a non-print position. This control can be readily secured by providing an eccentric **745** which lies between opposed arms **746** and **747** on a frame **744**, which carry the dating print wheels. The frame **744** is pivotally mounted on the web **705** of the print head. It will be obvious from a glance of FIG. 7 that rotation of the eccentric **745** about its pivot **748** will rock the frame **744** through an angle sufficient to move the entire frame away from the periphery of the print head, so that it will no longer be in a print position. The rotation of the eccentric on its shaft **748** can be secured through a gear train meshing with the functionally related exterior setting bar **377**.

It was mentioned previously that the preferred form of the print wheel of this invention has a diameter of 4½ inches and accordingly, there is approximately seven inches of space left for slogan plates, or the like. It can be noted that when the print head is at rest (full cycle position shown), there is a large blank space between the tail end of the second slogan plate and the postage die **730**. It is preferred that there be no printing die in printing position in the full cycle position. Preferably, this usable space is divided into two sections, or slogan plates **760** and **761** (FIG. 7). In this figure, the first slogan plate **760** has a length of three inches, and the second plate **761** has a length of 4 inches. These are much larger than any heretofore usable, as most print heads heretofore have been about half the diameter of that in this preferred form. The first plate **760** is pivoted on a stud **762** and is moved in and out of printing position by an eccentric **763** mounted on a shaft **764** carried by the web of the wheel. The eccentric **763** is embraced by a pair of arms **765** which are connected by a sleeve **766**. The sleeve **766** is rigidly mounted on a bar **767** formed integrally with the circumference of the slogan plate **760**. It will be understood that any suitable slogan die can be mounted on the plate **760** by any suitable means, such as screws (not shown). The shaft **764** and its integral eccentric **763** can be rotated to rock the slogan plate **760** into and out of printing position by means of a gear train operated by an exterior setting bar **377**, similar to that previously described in connection with the postage value print wheels.

The longer plate **761** is pivotally mounted on a stud **773** that extends through an aperture **771** in the first slogan plate **760**. The plate **761** is controlled by an eccentric **775** formed on a shaft **776**. What appears to be another eccentric is actually a clearance aperture **772** and a frame bar **774** that rigidly ties the two side pieces, or webs, **705** that form the frame of the print head. The inward or outward movement of this plate **761** is controlled by the rotation of the eccentric **775** that is integral with a rotatable shaft **776** journalled in suitable bearings carried by the web **705** of the print head **70**. The eccentric **775** is embraced between a pair of arms **777** that are rigidly mounted on a post **778** which is rigidly mounted on the peripheral wall of the slogan plate **761**. This eccentric is controlled in the same manner as those previously mentioned.

One of the requirements of the Post Office of the manufacturer of postage meters requires that the value printing devices be centered in a proper digital position and be rigidly locked in their adjusted position throughout the printing cycle, so that they are not subject to displacement from the position selected by the operator. This is readily secured in the present invention by means of a locking arm **785** (FIG. **8**) that is pivotally mounted on the outside of a web **705** of the print wheel **70** as by means of a pivot stud **786** rigidly mounted on the web of the print wheel. This locking arm **785** carries four teeth **787**, each of which, when the locking arm **785** is rocked (clockwise in FIG. **8** from the position shown) engages between the teeth **378** of the respective exterior setting rack **377** which lie immediately outside of the inside web **705**. It will be seen in FIG. **1** that there is at least one inter-tooth space to the outside (to the right) of the print head **70**. Since setting of the value wheel is to the right from a zero position, it is obvious that the teeth **787** can mesh with the teeth of these four exterior racks in any adjusted position of the racks. When so locked against movement, not only the bar **377** and print wheels **720** are centered and firmly held against any displacement, but the respective selection bars **320** are also locked against adjustment.

The locking arm **785** carries a roller **788** pivotally mounted thereon. As the print head starts to rotate (counterclockwise in this figure), the roller engages the leading beveled edge **789** of a cam bar **790** that is rigidly mounted on the backside (left in FIG. **1**) of the frame plate **104**. The cam plate **790** is spaced away from the frame plate by suitable spacers and studs **791**. The cam plate **790** has a length which keeps the locking arm **785** in deep contact with the teeth of the rack **378** throughout the printing phase of a cycle of operation. Trailing the locking cam plate **790** is an unlocking cam plate **792**, also mounted on the frame plate **104**. This cam plate likewise is spaced from the adjacent frame plate by suitable spacers and studs **793**. This cam plate **792** is located inside of the locking cam plate **790** and as the roller **788** comes off of cam **790**, it is moved outwardly by a leading cam edge **794** and will thereafter roll against the outside of this cam plate **792**. In this position, the locking arm **785** is out of locking engagement with the racks **378** and the entire setting mechanism can be restored to zero if necessary.

It will be understood that a suitable inking mechanism **800** of any suitable construction is placed ahead of the stamp die and before the printing mechanisms of

the print head can reach the printing position, i.e., the lowermost peripheral edge of the print head in FIG. 7.

What is claimed is:

1. An arithmetic and printing unit for a postage meter comprising:

1. a cylindrical hollow main drive shaft;
2. means for mounting said drive shaft for rotation;
3. means for cyclically rotating said drive shaft;
4. an ascending register and a descending register;
5. a print head mounted on said drive shaft;
6. a manually operative selection mechanism for selecting values to be registered in said registers and in said print head;
7. a mutilated drum actuator for one of said registers mounted on said drive shaft;
8. means controlled by said selection mechanism for operating one of said registers from said actuator differentially from the value set in said selection mechanism;
9. a second mutilated drum actuator;
10. means driven by said main drive shaft for driving said second mutilated drum actuator;
11. means controlled by said selection mechanism for registering a value in said second register from the operation of said second actuator;
12. value stamping members for printing a stamp value on mail matter positionably mounted within said print head; and
13. means controlled by said selection mechanism for positioning said stamping members.

2. The apparatus of claim **1** comprising also means for locking said value stamping members and said selection mechanism against adjustment during an initial portion of a cycle of rotation of said drive shaft, said means comprising:

a. an arm pivotally mounted on said print head;
b. locking means on said arm for engaging the exterior bars; and
c. means operated during an initial portion of a cycle of operation of said drive shaft for operating said arm.

3. The apparatus of claim **1** wherein said registers comprise:

1. a plurality of register drive shafts circumferentially arranged around each of said actuators;
2. 9-tooth selection gears slidably but non-rotatably mounted on some of said shafts;
3. a tens-transfer gear slidably but non-rotatably mounted on each of said shafts;
4. a 9-tooth gear rigidly mounted on said shaft;
5. a 40-tooth gear meshing with said last mentioned gear;
6. a 20-tooth gear meshing with said 40-tooth gear;
7. a 10-tooth gear meshing with said 20-tooth gear;
8. a dial rigidly mounted on said 10-tooth gear;
9. a 4-tooth gear and a Geneva wheel mounted on said 40-tooth gear;
10. a 9-tooth gear and a Geneva wheel rotatably mounted on said shaft and registering with said 4-tooth gear and said Geneva, respectively;
11. projecting cam faces in said last-mentioned gear and Geneva;
12. a cam follower moved longitudinally by said cam projections; and
13. means moved by said cam follower for moving said tens-transfer gear of the adjacent higher order into alignment with the single tens-transfer tooth on said actuator.

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