United States Patent

Kolly

[15] **3,681,576**

[45] **Aug. 1, 1972**

[54] **TRANSFER AND RESET DEVICE FOR CALCULATING MACHINES**

[72] Inventor: **Andre Kolly,** Geneva, Switzerland

[73] Assignee: **Kabushiki Kaisha Ricoh,** Tokyo, Japan

[22] Filed: **Aug. 17, 1970**

[21] Appl. No.: **64,364**

[30] **Foreign Application Priority Data**

Aug. 27, 1969 Switzerland 12,964/69

[52] **U.S. Cl.** .....**235/133 R**

[51] **Int. Cl.** **G06c 7/10**

[58] **Field of Search** ..235/133, 140, 141, 81 A, 60 R, 235/62 TK, 138

[56] **References Cited**

UNITED STATES PATENTS

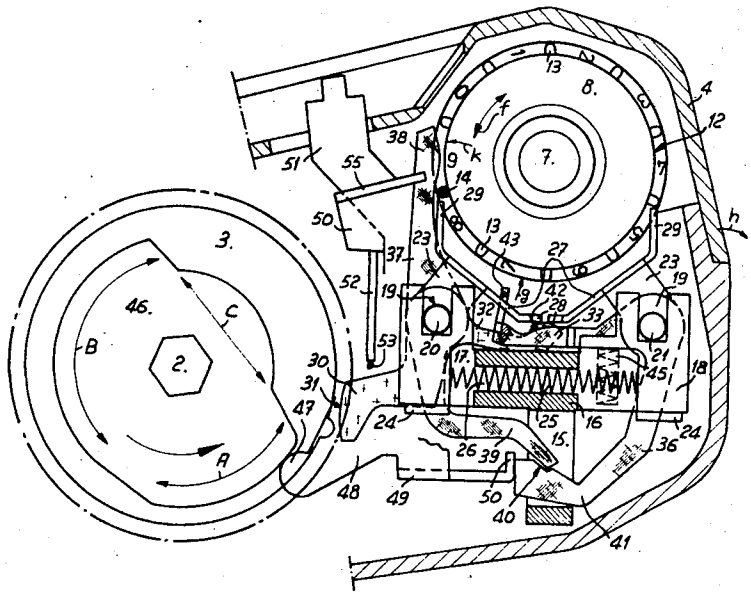
993,708	5/1911	Odhner	235/81 A
1,872,439	8/1932	Friden	235/81 A X
2,709,044	5/1955	Arvai	235/133 R
2,744,686	5/1956	Grip	235/140
2,838,241	6/1958	Philipp	235/138

Primary Examiner—Richard B. Wilkinson
Assistant Examiner—Stanley A. Wal
Attorney—Young & Thompson

[57] **ABSTRACT**

A calculating device device including an introduction device of the values and a storing device and a totalizer. Said totalizer comprises ciphered wheels driven in rotation through friction forces. The calculating-device comprises further a locking device hindering the revolution of the ciphered wheels, a setting to zero device and a carryover device in which the carryover is selected during the introduction of the values and completed during the rearming of the calculating device.

8 Claims, 3 Drawing Figures



PATENTED AUG 1 1972

3,681,576

SHEET 1 OF 2

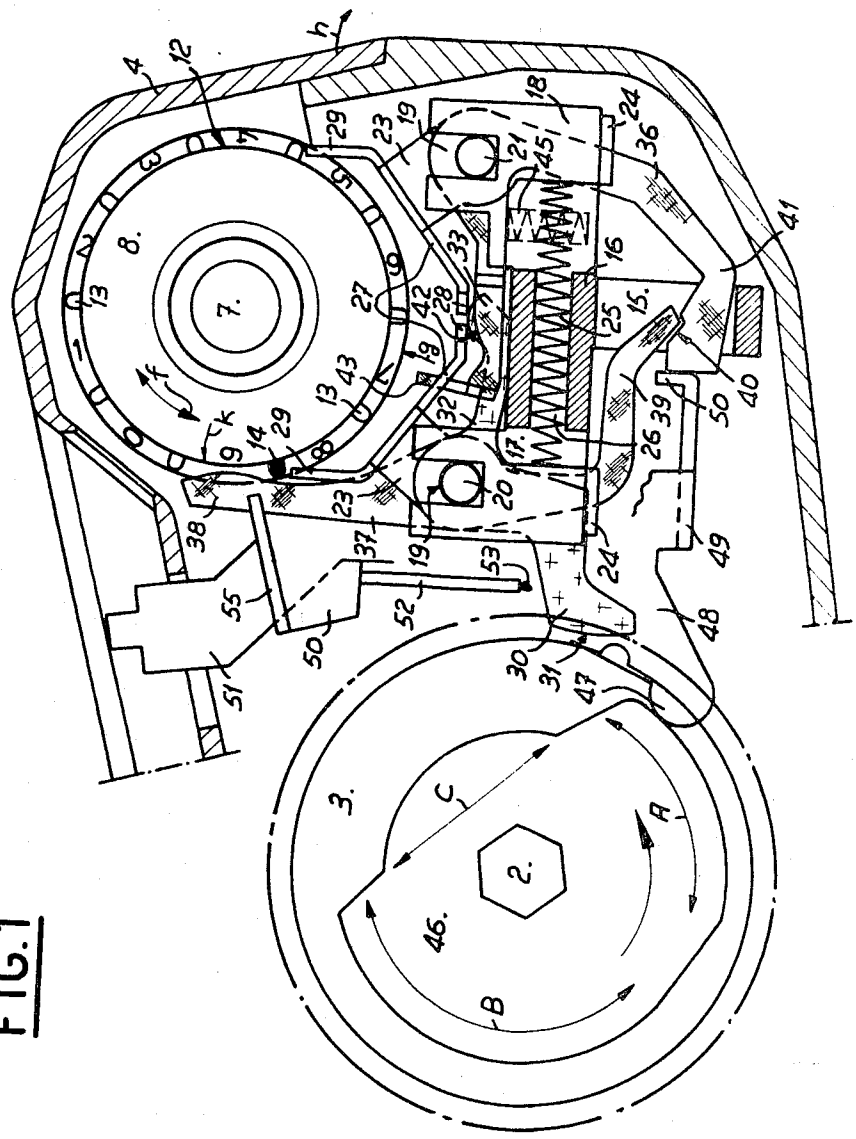


FIG. 1

INVENTOR

ANDRE KOLLY

BY Young & Thompson

ATTY'S.

FIG.2

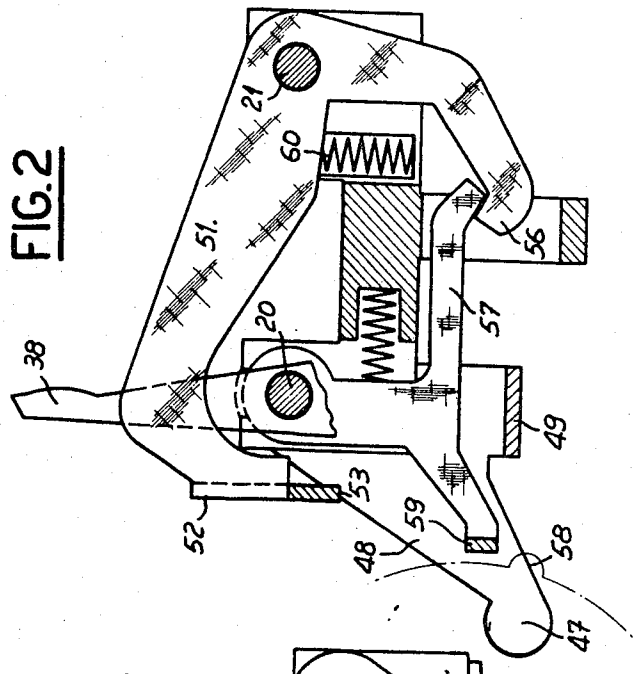
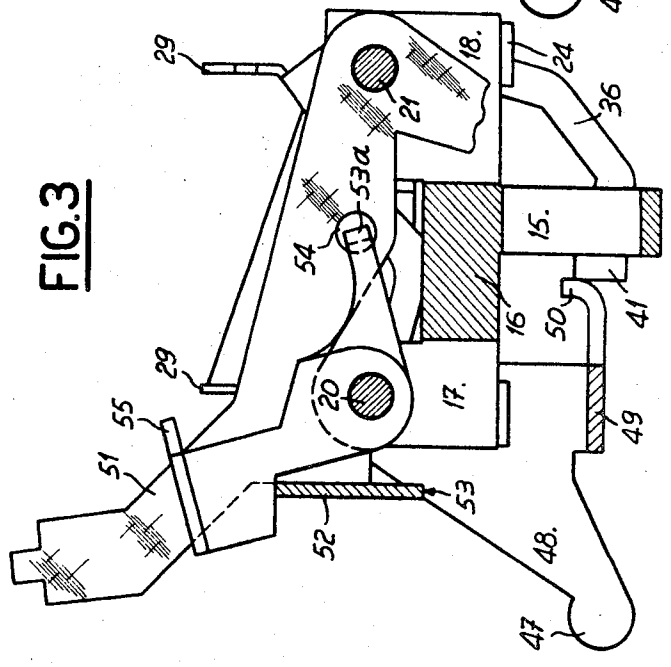


FIG.3



INVENTOR

ANDRE KOLLY

By Young & Thompson

ATTYS.

TRANSFER AND RESET DEVICE FOR CALCULATING MACHINES

The present invention relates to a calculating device of a calculating machine comprising a device for entering the values on a storing device and a totalizer comprising ciphered wheels driven in rotation by friction by means of a shaft on which they are idly mounted, each of these wheels being provided with a carryover abutment. The calculating device is characterized by the fact that it comprises a locking device of the angular position of these ciphered wheels controlled by the storing device, comprising associated with each ciphered wheel of the totalizer, two locks pivoted on the said support along an axis which extends parallel to the totalizer and located on either side of it; as well as a carryover device controlling also the said locking device, presenting for each ciphered wheel of the totalizer, a carryover lever pivoted on the said support and an arm of which is located, in rest position, in the path of the said carryover abutment of the corresponding ciphered wheel whereas another of these arms cooperates through a carryover pinion pivoted on the said support with the ends of control levers of the locks associated with the ciphered wheel corresponding to the immediately upper decade to the one with which the arm is located on the trajectory of the carryover abutment, so that during the passage of the said carryover abutment under the said arm of the carryover lever it provokes a tilting of it which causes in its turn the selecting of the pinion of the said ciphered wheel corresponding to the immediately upper decade to the one causing the pivoting of the carryover lever.

The attached drawings show schematically and by way of example one embodiment of the calculating device according to the invention.

FIG. 1 is a transverse cross section of it.

FIG. 2 is a partial cross section of it. FIG. 3 is another view in partial cross section.

The calculating device is shown in FIGS. 1 and 2 as being part of an assembly comprising a device for the introduction of the values, by conventional mechanism. This assembly comprises further a driving device, which is manual in the example shown, and a storing device which is again conventional.

The manual driving device comprises a bell crank driving in rotation a shaft 2, carrying the storing device 3, pivoted on the frame 4. This shaft 2 drives through the intermediary of a conventional reversing device and gear train (not shown) a driving shaft 7 of the calculating device at an angular speed which is twice that of the shaft 2.

In a variant, this driving device could comprise an electrical motor replacing the ball crank for the driving in rotation of the shaft 2 carrying the storing device 3. In such a variant, the driving device would comprise also the different electrical circuits necessary to the control of this motor.

The devices for the introduction of the values and the driving device as well as the storing device will not be described in more detail here, because they can be of conventional design.

The calculating device comprises a totalizer formed by ciphered wheels or drums 8, only one of which is illustrated, idly mounted on the driving shaft 7 and driven by said shaft in rotation through friction forces.

This driving shaft 7 comprises an axial abutment (not shown) against which the ciphered wheels 8 are stacked and applied against a resilient action, constituted in the embodiment shown by a spring (not shown) one end of which bears on the frontal face of the stacked ciphered wheels 8 and the other against an abutment mounted on the shaft 7. The ciphered wheels 8 are of plastic material and may be hollowed in order to be very light so that very low friction forces suffice to ensure their driving in rotation.

Each of the ciphered wheels 8 presents on its periphery 12 ciphers from 0 to 9 evenly distributed about the entire periphery. Further, this outside surface or periphery 12 of the ciphered wheels 8 comprises also abutment members 13 located between each cipher from 0 to 9 and a carryover abutment 14 which is longer than the abutment members 13.

The calculating device shown comprises further a support 15 constituted by standard parts on which are mounted the locking device and the carryover device.

This support 15 is constituted by a part, of plastic material in the example shown, comprising a body 16 extending the whole length of the totalizer at least, in which are provided openings 17 and 18 the number of which corresponds to the number of ciphered wheels of the totalizer, but the width of which is equal to a fraction, for example ⅓ of 1/6 of the width of these ciphered wheels 8. This support 15 comprises two longitudinal grooves 19, that is to say extending parallel to the shaft 7 and intended to receive axles 20 and 21 respectively, which are fast with the frame 4. These axles 20 and 21 define thus the position of the support 15 with respect to the totalizer of the calculating device. The support 15 is fixed with respect to the totalizer in such a way that its upper plane which is parallel to the axles 20 and 21, extends parallel to the driving shaft 7 and that each opening 17 and 18 extends on one and the other side of a plane passing through the frontal face of a ciphered wheel. These openings 17 and 18 are thus located in front of two neighboring ciphered wheels over a part of the width of each of them.

The locking device comprises two locks 23 disposed respectively in each of the openings 17, 18. Each of these locks 23 comprises a center part pivoted on the corresponding axle 20, 21 and three arms.

A return arm 24 extends downwardly, that is to say inside the corresponding openings 17, 18. These two return arms 24 are subjected to a return resilient action by a coil compression spring 25 located inside a hole 26 provided in the body 16 of the support 15 and connecting the two opposed openings 17, 18. This spring 25 tends to spread apart these two return arms 24.

Control arms 27 extend towards the inside of the support 15. The ends of the two corresponding arms 27 are located approximately in a middle longitudinal plane of the support 15, this plane containing also the axis of the shaft 7. The ends of these corresponding arms 27 comprise a lateral dog 28. These arms 27 extend within the space located between the support 15 and the ciphered wheels 8 and are maintained in rest position, against the action of spring 25 in a manner to be described herebelow.

Finally a stop arm 29 extends towards the corresponding ciphered wheel 8. This stop arm is displaceable between two positions, under the effect of

the displacement of the control arm **27** and against the action of the return spring **25**, in one rest position or lock position of which its extremity is disposed in the path of the abutment members **13** and of the carryover abutment **14** of the corresponding ciphered wheel **8** and in another inactive position of which its extremity is located out of reach of these abutment members **13** and of the carryover abutment **14**.

This locking device comprises further an actuating lever **30** pivoted on the axle **20** and comprising a working surface **31** emerging from the support **15** and a working arm **32** the end **33** of which is in contact with its upper face with the two lateral dogs **28** of the corresponding control arm **27**. In rest position, shown in the drawing, defined by the return spring **25** the end of this working arm **32** rests on the lower surface of the upper face of the body **16** of the support **15**.

The working face **31** of this actuating lever **30** is located in the path of elements, set in active position, of the storing device.

The working of this locking device is as follows:

During the driving in rotation of the storing device **3**, the driving shaft **7** driven by aforementioned direction reverser and gear train (not shown), is driven for example in direction of the arrow *f* which tends to drive the ciphered wheels **8** also in the direction of this arrow *f*. However, these ciphered wheels **8** are locked in an angular position which is determined by the ends of the stop arms **29** against one of which, according to the direction of rotation of the totalizer, abuts one or the other of the abutment members **13** or the carryover abutment **14**.

During the passage of an extensible actuator element, put in active position, of the storing device in front of the locking device, this element enters in contact with the working face **31** of the actuating lever **30** and causes a tilting of it in direction of the arrow *g* around the axis **20**. This tilting causes an upward displacement (FIG. **1**) of the end of the working arm **32** of the said lever **30** which drives, against the action of the return spring **25**, the control arm **27** of the locks **23** in its displacement. The upward displacement of these control arms **27** causes the tilting in the direction of the arrows *h* of the locks **23** causing a spreading apart of the stop arms **29** up to a position for which the rotation of the corresponding ciphered wheel **8** can take place freely. This ciphered wheel **8** is thus driven by friction in the direction of rotation of the shaft **7**.

When the extensible actuator element leaves the working face **31** of the actuating lever **30**, the locks **23** come back in locking position under the action of the spring **25** and the rotation of the ciphered wheel **8** continues up to the time when a next abutment member **13**, or the carryover abutment **14**, of this ciphered wheel comes to rest against the end of one of these stop arms **29** of the locks **23**.

It is to be noted that the action of the elements of the storing device on the actuating lever **30** is very short, the locking device is free during this period which is less than the period necessary for the ciphered wheel **8** to effect a tenth of revolution so that it can be displaced for each actuating of the lever **30** only of the value corresponding to the passage of one cipher to the next.

To increase the unlocking speed once several successive elements of the storing device **3** are set in active position, the working face **31** of the lever **30** is such that the second element is already in contact with it before the first element loses contact with it. In such a way one reduces greatly the amplitudes of the angular movements of the members of the locking device.

The carryover device comprises a carryover lever **37** pivoted on the axle **20** which presents an upper arm **38** and a lower arm **39**.

The end of this lower arm **39** is normally in contact with a shoulder **40** of the lower arm **41** of an intermediate lever **36** pivoted on the axle **21**. This intermediate lever **36** comprises further a control arm **33** a part of the upper surface **42** of which is located under the two lateral dogs **28** of the control arms **27** whereas its extremity constitutes a stop **43** which can be placed in the path of the abutment member **13** of a ciphered wheel **8**. This intermediate lever **36** is subjected to the action of a return spring **45** tending to displace the stop **43** towards the ciphered wheel **8** but lever **36** is maintained in rest position by the carryover lever **37** and shoulder **40** of arm **41** tends to apply the upper arm **38** of lever **37** against the periphery of the ciphered wheel **8**.

The upper arm **38** of the carryover lever **37** enters in contact through its free end with the surface of the corresponding ciphered wheel **8**. This free end presents a rounded shape acting as a cam. This free end is located in the path of the carryover abutment **14** but not in the path of the abutment members **13**. The cam constituted by said free end causes under the action of the passage of the carryover abutment **14** the tilting in the direction of the arrow *k* of the carryover lever **37**. It is to be noted that the upper arm **38** of the carryover lever **37** rests on the periphery of a ciphered wheel **8** corresponding to a given decade, but that the lower arm **39** of this same carryover lever **37** acts during an angular displacement of this upper arm **38** to release the lever **36**, which tends to swing control arms **27** on the locks **23** relative to the ciphered wheel **8** of the immediately upper decade.

In this way every time the ciphered wheel **8** makes a complete revolution, the carryover abutment **14** actuates the carryover lever **37** which selects the corresponding intermediate carryover lever **36** the shoulder of which escapes the end of the lower arm of the carryover lever **37**. This intermediate carryover lever **36** abuts however against a carryover stirrup **49** (which will be described later on) so that it cannot actuate these calculating locks **23** and so that the corresponding ciphered wheel is always locked and stopped against the stop **43**. The carryover is thus preselected.

This calculating device comprises further a cycle control cam **46** carried and rotated by the shaft **2**. This cam comprises three parts approximately equal in angular amplitude. The first A which is the higher one (of a maximum diameter) corresponding to the rearming of the calculating device, the second B of a medium height (of a medium diameter) corresponding to the introduction of the values through the storing device on the ciphered wheels of the calculating device and the third C (of a smaller diameter) of less height corresponding to the carryover selected during the introduction of the values.

The active part or periphery of this cam **46**, comprising the parts A, B and C, cooperates with the end **47** of an arm **48** of the carryover stirrup **49** pivoted on the axle **20**. This carryover stirrup **49** extends across the whole width of the calculating device and comprises an abutment **50** cooperating with the end face of the intermediate carryover lever **36**. According to the position of the cam **46** this stirrup **49** may be placed in three distinctive positions:

a. An advanced position (FIG. **3**) for which it enters into contact with the arm **41** and displaces the inter-Mediate carryover lever **36** further away than the rest position against the action of the return spring. This position corresponds to the rearming of the calculating device.

b. A middle position (part B of the cam **46**) in which it is no longer in contact with the intermediate carryover levers **36** which are maintained in rest position by the corresponding carryover levers **37**, but for which the intermediate carryover levers **36** which have been preselected are maintained against the action of their return spring in a position such that they have escaped the corresponding carryover lever but where they have not actuated the calculating locks **23** and where the stop **43** is not yet located in the path of an abutment member **13**.

c. A retracted position (corresponding to part C of the cycle cam **46**) in which the intermediate carryover levers **36**, which have been selected during the introduction, cause the swinging apart of the calculating locks **23** and thus the unlocking of the corresponding ciphered wheels **8** and the setting in active position of the stop **43**. Thus the ciphered wheels **8** for which a carryover has to be effected are free and are driven in rotation for a 20th of a revolution approximately up to the point where they are stopped by the stop **43** entering in contact with an abutment member **13**.

Thus thanks to the carry-over device a passage of the selected carryover during the introduction of the values is partially effected during the part of the cycle during which the part C of the cam **46** is in contact with the end **47** of the arm **48** of the carryover stirrup **49** and partially during the rearming operation. In fact when the intermediate carryover levers **36** are again placed in rest position (FIG. **3**) the calculating locks **23** fall again into the locking position of the ciphered wheels **8** and the stop **43** is withdrawn from the path of the corresponding abutment member **13** so that the passage of the carryover is completed.

It is to be noted that when the passage of the carryover is not made simultaneously with the introduction of the values, there is no possibility for ambiguity, even if a carryover is selected simultaneously during the introduction of a value on the same ciphered wheel **8**.

This calculating device comprises further a setting to zero device comprising a stirrup **51** pivoted on axle **20** and displaceable between an inactive position (FIG. **3**) and an active position. This stirrup **51** comprises a frontal flap **52** the lower edge of which **53** is intended to cooperate with the actuating levers **30** of all the ciphered wheels **8**. An abutment stirrup **50** also pivoted on the axle **20** is connected to the stirrup **51** through a finger **53***a* extending in a hole **54** in stirrup **51** and the upper edge of its flap **55** is intended to cooperate with the carryover abutment **14** of each ciphered wheel **8**.

When the operator wants to set the totalizer to zero he pivots the stirrup **51** up to its active position in which the levers **30** of all the ciphered wheels **8** are actuated by the edge **53** of the flap **52** whereas the flap **55** is placed in the path of the carryover abutment **14** of the ciphered wheels **8**. The locking devices are thus unlocked and the ciphered wheels **8** are driven by the shaft **7** up to the point where each of them is stopped in zero position, the carryover abutment **14** coming into contact with the flap **55**. The totalizer is thus set to zero and the stirrup **51** can be returned to inactive position.

It is further to be noted that when the user has displaced the setting to zero stirrup **51** it is locked in active position, its finger **56** contacting a locking arm **57** pivoted on the axle **20**. This locking is maintained up to the point where a boss **58** carried by the cam **46** for example, acts on an actuating lever **59** and frees the beak of the arm **57** from the setting to zero stirrup **51** which returns to rest position under the action of its return spring **60**.

Thanks to the reversal device included in the transmission between the shaft **2** and the shaft **7** the calculating device described may work either in addition or in subtraction according to whether shafts **2** and **7** rotate in the same direction or in reverse directions.

I claim:

1. In a calculating device comprising a storing device for receiving values, a totalizer comprising a shaft and a stack of ciphered wheels frictionally mounted on the shaft, and a carryover abutment on each said wheel; the improvement comprising a locking device for locking the angular position of said wheels, said locking device comprising two spaced axles parallel to said shaft, pairs of locks pivoted on said axles, the locks of each said pair being disposed on opposite sides of a different said wheel, one lock of each said pair being mounted on each said axle, means for swinging each said pair of locks simultaneously toward and away from said wheels thereby selectively to stop and release said wheels, a first carryover lever pivotally mounted for rotation about an axis parallel to said shaft, said carryover lever having an arm in the path of movement of said carryover abutment of a first said wheel, a second carryover lever pivotally mounted for rotation about an axis parallel to said shaft, said second carryover lever having one end that engages the locks of a said pair of locks to swing said pair of locks simultaneously sway from a second said wheel which is next to said first wheel in said stack of wheels and another end that contacts an end of said first carryover lever, said carryover abutment on said first wheel engaging said first carryover lever to release said second carryover lever to swing said pair of locks associated with said second wheel.

2. A device as claimed in claim **1**, said carryover levers and locks and axles being mounted on a support that extends full length of the totalizer.

3. A device as claimed in claim **1**, there being ten abutments uniformly spaced about the periphery of each ciphered wheel, one of said abutments being said carryover abutment, the other nine abutments being engageable with said locks in the position in which said locks are swung together.

4. A device as claimed in claim **3**, said abutments other than said carryover abutment being free from engagement with said first carryover lever.

5. A device as claimed in claim 3, said locks including stop arms movable into and out of the paths of said nine abutments, and means resiliently urging said stop arms into the paths of said nine abutments.

6. A device as claimed in claim 1, said storing device comprising at least one member rotatable about a second shaft parallel to the first-mentioned shaft, an actuating lever mounted for pivotal movement about an axis parallel to said shafts and engageable with said locks, and means on said rotatable member engaging said actuating lever to swing said locks away from said wheels to release said wheels.

7. A device as claimed in claim 1, and a zero resetting device comprising a member mounted for pivotal movement about an axis parallel to the axis of said shaft and engaging said actuating lever to release said wheels and to engage said carryover abutments to rotate said wheels frictionally relative to said shaft to a zero position of said wheels.

8. A device as claimed in claim 1, said storing device comprising a member rotatable about a second shaft parallel to said first-mentioned shaft, a cam on said second shaft, a carryover stirrup pivotally mounted for movement about an axis parallel to said shafts, said cam engaging said stirrup to move said stirrup between positions in which said stirrup engages and releases said second carryover lever to move said second carryover lever about its axis of rotation.

* * * * *