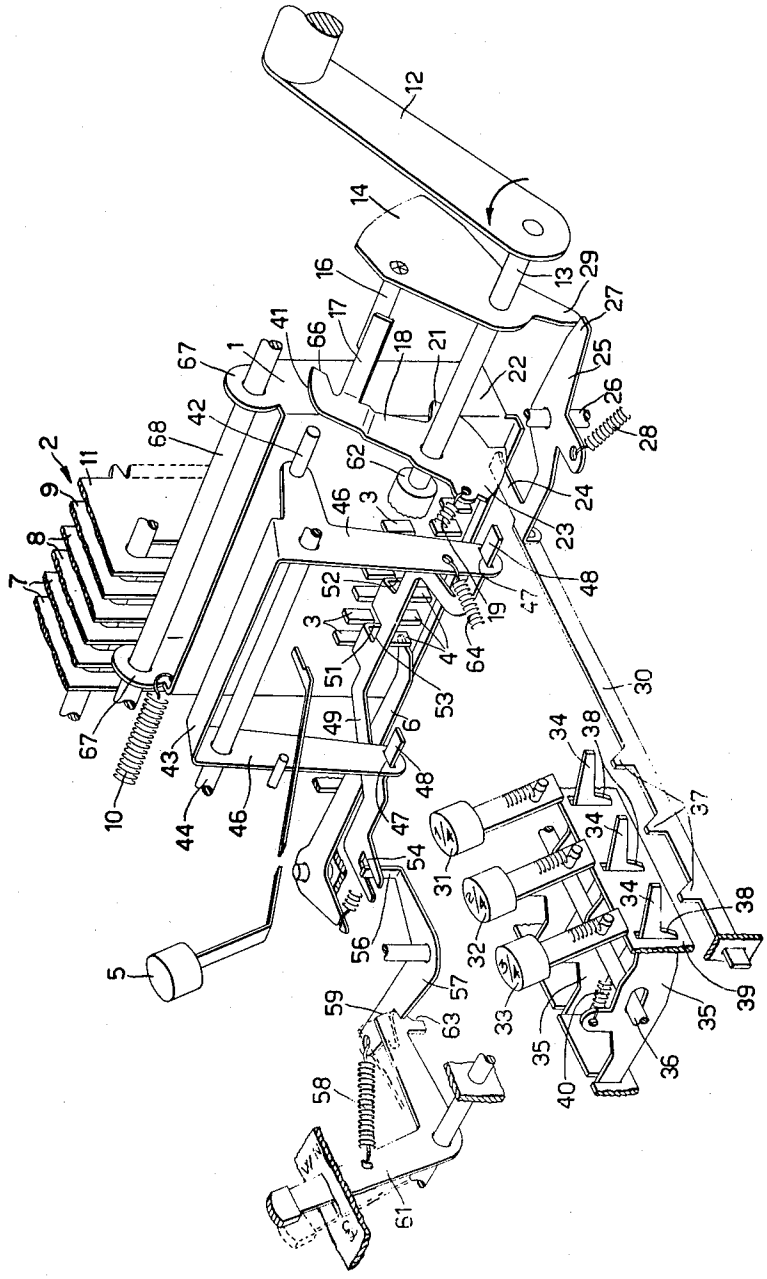
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TEN-KEY ADDING MACHINE FOR NON-UNIFORM DECIMAL DENOMINATIONS

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TEN-KEY ADDING MACHINE FOR NON-UNIFORM DECIMAL DENOMINATIONS

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The present invention relates to ten-key adding machines for non-uniform decimal denominations, comprising a multidenominational indexing mechanism whose denominations are settable by said keys, an accumulating mechanism adapted to cooperate with said indexing mechanism and having a plurality of decimal members and a number of lower non-decimal members, transverse traveling means controlled by said keys for stepwise shifting the cooperative relationship of said indexing mechanism and said accumulating mechanism, a manipulative member settable for conditioning the machine to accumulate decimal denominations only, and a main operating mechanism.

In the known machines said manipulative member controls a skipping device operable for causing said traveling means to additionally travel through a number of steps corresponding to the number of non-decimal members for skipping said non-decimal members. However, this travel is caused invariably at each machine cycle when the machine has been set for decimal accumulation, even if no denomination has been set, whereby this traveling means is subject to superfluous movements and thus to a major wear.

The primary object of the present invention is to provide an adding machine obviating the above disadvantage.

Another object is to provide a skipping device which is simple in its operation and inexpensive to manufacture.

A further object is to provide a skipping device adapted to be operated the strictly necessary minimum number of times.

According to the invention, in an adding machine of the above type, I now provide a skipping device controlled by the above stated manipulative member and operable for causing the traveling means to additionally travel through a number of steps corresponding to the number of non-decimal members for skipping said non-decimal members, and means driven by the main operating mechanism and conditionable by the traveling means when one denomination at least has been set for operating said device.

Other objects, features and advantages of the invention will become apparent from the following description of a preferred embodiment thereof, taken in conjunction with the accompanying drawing, which shows a perspective partial forward view of a ten-key adding machine for the British currency system provided with a skipping device according to the invention.

Referring now to the drawing, the adding machine comprises a multidenominational indexing mechanism **1** whose denominations are settable by the keys of a conventional ten-key keyboard of which one numeral key **5** only is shown. The machine is further provided with an accumulating mechanism generically indicated by the numeral **2**, and with traveling means controlled by the key **5** for stepwise shifting the cooperative relationship of said indexing mechanism and said accumulating mechanism.

More particularly, in the present embodiment the indexing mechanism **1** is formed of a conventional pin carriage provided with individually settable stop pins arranged in rows and columns, each column corresponding

to one denomination. The stop pins of each column comprises apart from the usual numeral stop pins, not shown, a vertical pair of pins **3**, **4**, namely a zero pin **3** and an escapement pin **4**. The pin carriage **1** is provided itself with suitably traveling means such as lugs **67** slidably mounted on a transverse shaft **68** and is urged by a spring **10** to abut by means of the escapement pin **4** of the first denomination to be set against an escapement dog **6**.

The accumulating mechanism **2** has a plurality of decimal members or actuators **7** for accumulating the decimal denominations of an amount, such as the whole pounds, and a number of lower order non-decimal members or actuators **8**, **9** and **11** for accumulating the non-decimal denominations of an amount, namely: two actuators **8** for accumulating the shillings, the actuator **9** for accumulating the pence and the actuator **11** for accumulating the fractions of a penny.

Upon depression of the numeral key **5** a corresponding numeral stop pin and the escapement pin **4** of the first left hand denomination of the pin carriage **1** are set in a manner known per se, whereby the spring **10** is enabled to move the pin carriage one step towards the left until the escapement pin **4** of the next following denomination abuts against the dog **6**. In this manner the first left hand denomination of the pin carriage **1** is enabled to cooperate with the actuator **11**.

Furthermore the adding machine is provided with a main operating mechanism comprising a reciprocable handle **12** secured to a shaft **13** and a plate **14** secured to the shaft **13** as well. Finally the adding machine is provided with a manipulative member or lever **61** settable in a first position, shown by solid lines in the drawing, for conditioning the machine to accumulate decimal denominations only and in a second position, shown by broken lines, for conditioning the machine to accumulate non-uniform decimal denominations.

The lever **61** is provided with a pair of shoulders **59**, **63** adapted to alternately cooperate by the urge of a spring **58** with a notch of a lever **57** in order to hold the lever **61** in its first or second position, respectively. A bent lug **56** of the lever **57** engages a slot **54** of a skipping device comprising a plate **49**. The plate **49** is provided with two bent lugs **51** and **52** separated by a notch **53**, and with a pair of projections **48** each one engaging a slot **47** formed on an arm **46** of a bail **43** pivoted on a stationary shaft **44** and urged clockwise by a spring **64**. The plate **49** is transversely slidable with respect to the bail **43**.

When the lever **61** is set in its first position, shown by solid lines, the plate **49** locates the lug **51** in front of the first two adjacent pair of pins **3**, **4**, the lug **52** in front of the successive two adjacent pairs of pins **3**, **4**, and the notch **53** in front of the gap between said first two pairs and said successive two pairs.

Secured to the bail **43** is a pin **42** adapted to be engaged by an edge **41** of a member or lever **18** rockably and slidably mounted on the shaft **13** and sensing the transverse position of the pin carriage **1**. More particularly, the lever **18** is normally urged by a spring **19** both leftwards and clockwise to abut by means of a projection **21** against a flank **22** of the pin carriage **1** and by means of a bent lug **17** against a pin **16** secured to the plate **14**. In the normal position of the pin carriage **1** the edge **41** of the lever **18** is thus located in a vertical plane not interfering with a pin **42** of the bail **43**, whereby the lever **18** is normally disengaged from the plate **49**. The lever **18** is provided with a latch element formed of an edge **66**, which is adapted to cooperate with the pin **42** as will be hereinafter described.

It has been stated above that the actuator **11** is pro-

vided for a fractional denomination, namely for the quarters of a penny. A set of keys **31**, **32**, **33** are provided for setting-up a significant fraction value only, whereas if the value of the fractional denomination is zero no key need to be depressed. The fractional keys **31**, **32** and **33** when depressed are adapted to set an escapement pin **4** in a manner known per se. Furthermore, said keys **31**, **32**, **33** will engage a projection **34** of a corresponding lever **35** pivoted on a stationary shaft **36** to rock said lever clockwise and move the projection **34** into the path of a corresponding projection **37** of a cyclically reciprocated control member or slide **30**. The lever **35** is retained in the rocked position by a spring **40** which urges a shoulder **38** against a locking plate **39**. The lever **35** will be released at the end of the machine cycle in a known manner.

The slide **30** is connected to a lever **25** pivoted at **26** and provided with a projection **27** normally urged by a spring **28** to contact a projection **29** of the plate **14**. Another projection **24** of the lever **25** is adapted to be sensed by a projection **23** of the lever **18**.

The machine operates as follows:

When the handle **12** is rocked counterclockwise the pin **16** of the plate **14** will rock the lever **18** counterclockwise. If prior to this machine cycle no denomination has been set in the pin carriage **1**, the edge **41** moves idly past the pin **42** without operating the bail **43** and the plate **49**.

On the contrary, if a numeral key **5** has been depressed and thus one denomination at least has been set in the pin carriage **1** the flank **22** has released the projection **21** of the lever **18** which, however, is temporarily arrested by the projection **24** of the lever **25**.

Assuming now that the lever **61** has been set in its first position, shown by solid lines, to condition the machine for accumulating decimal denominations only, the notch **53** of the plate **49** is located in front of the gap between the first two pairs and the successive two pairs of pins **3**, **4**. Obviously, no fraction key **31**, **32**, **33** will be depressed in this case.

When the handle **12** is rocked counterclockwise, at the beginning of the machine cycle the projection **29** releases the lever **25**. Since no fractional key has been depressed, the slide **30** is allowed to move forward and the lever **25** is rocked counterclockwise by the spring **28**. The projection **24** is thus moved forwards and releases the projection **23** of the lever **18**. The spring **19** now shifts the lever **18** transversely until arrested by a hub **62** secured to the shaft **13**. The edge **41** is thus placed behind the pin **42**. The lever **18** upon being rocked now engages by means of its edge **41** the pin **42** and rocks the bail **43** counterclockwise. The bail **43** moves the plate **49** rearwards thus causing the lugs **51** and **52** to set four pairs of pins **3**, **4**, whereby the spring **10** may shift the carriage **1** leftwards until the first non-set escapement pin **4** is arrested by the dog **6**. The carriage **1** is thus advanced four steps, causing the four non-decimal actuators **8**, **9** and **11** to be skipped: moreover, the four zero pins **3** so set will now arrest the four non-decimal actuators **8**, **9** and **11** which will thus become ineffective.

It will thus be apparent that the plate **49** is operable for causing the traveling means to travel, additionally to the travel made when depressing the numeral key **5**, through a number of steps corresponding to the number of non-decimal actuators **8**, **9** and **11** for skipping said actuators. Moreover, it will be apparent that the lever **18** is driven by the main operating machanism and is conditionable by the traveling means when at least one denomination has been set for operating the plate **49**.

Near the end of the counterclockwise stroke of the handle **12**, the edge **41** of the lever **18** passes beyond the pin **42** thus releasing the bail **43** which is immediately restored by the spring **64**, while the lever **18** is kept rocked by the pin **16**. At the beginning of the return stroke of the handle **12** the pin **16** releases the lug **17**. The lever **18** is now urged by the spring **19** to rock clockwise, but its edge **66** is arrested by the front portion of the pin **42** and the lever **18** is latched in its rocked position.

At the end of the return stroke of the handle **12** the pin carriage **1** is restored rightwards in a manner known per se. The right flank **22** of the pin carriage now engages the projection **21** of the lever **18** which is thus shifted back to the right, whereby the edge **66** is disengaged from the pin **42**. The lever **18** is thus unlatched and is rocked back to its normal position by the spring **19**.

It will thus be understood that in a sequence of repeat cycles, since as is well known in the art the carriage is not restored at the end of each cycle of the sequence, the lever **18** is held latched in its rocked position in front of the pin **42**, whereby the plate **49** is operated and the pin carriage **1** is shifted accordingly during the first cycle only of the sequence.

Assuming now that the lever **61** is rocked counterclockwise to its second position, shown by broken lines, to condition the machine for accumulating non-uniform decimal denominations, the shoulder **59** releases the lever **57** which is rocked counterclockwise by its spring **58** until arrested by the shoulder **63**. The lever **57** thus moves the plate **49** leftwards half a step of the pin carriage **1** and locates the lug **51** in front of the first pair of pins **3**, **4** to be set, the notch **53** in front of the second pair of pins **3**, **4** and the lug **52** in front of the third pair of pins **3**, **4**.

In this case, if at least one denomination has been set in the pin carriage and no fraction key **31**, **32** or **33** has been depressed, when the handle **12** is operated the lever **25** is rocked counterclockwise and the projection **24** releases the lever **18** as in the preceding case. The lever **18** now rocks the bail **43** whereby the lugs **51** and **52** of the plate **49** will set the first and third pairs of pins **3**, **4**. Since the second pair of pins **3**, **4** is not set, the pin carriage **1** is now shifted leftwards one step until the escapement pin **4** of the second pair is arrested by the dog **6**. Thus the third pair of pins **3**, **4** will have no effect on the accumulating mechanism **2**.

On the contrary, if any fractional key **31**, **32** or **33** has been depressed, the projection **34** of the corresponding lever **35** has been placed into the path of the corresponding projection **37** of the slide **30**. When the handle **12** is operated, the slide **30** is now arrested by the projection **34** and the projection **24** of the lever **25** does not release the projection **23** of the lever **18**. When the pin **16** rocks the lever **18** the edge **41** moves idly past the pin **42** without operating the bail **43** and the plate **49**. Thereupon the projection **23** of the lever **18** leaves the projection **24**, the lever **18** is shifted leftwards without affecting the bail **43** and is thereupon restored as in the above described cases.

It is thus clear that the lever **18** engages the pin **42** and operates the plate **49** when both the pin carriage **1** has advanced through its first step at least and no fractional key has been depressed.

It is intended that many changes, additions of parts and improvements may be made to the above described machine without departing from the scope thereof.

What I claim is:

1. In a ten-key adding machine for non-uniform decimal denominations, comprising a multi-denominational indexing mechanism whose denominations are settable by said keys, an accumulating mechanism adapted to cooperate with said indexing mechanism and having a plurality of decimal members and a number of lower order non-decimal members, transverse traveling means for shifting the cooperative relationship of said indexing mechanism and said accumulating mechanism, escapement means operable by said keys for controlling the stepwise travel of said traveling means, a manipulative member settable for conditioning the machine to accumulate decimal denominations only, and a main operating mechanism, the combination comprising:

(*a*) a skipping device controlled by said manipulative member and operable for causing said traveling means to additionally travel through a number of steps corresponding to the number of non-decimal members for skipping said non-decimal members,

(*b*) and means driven by said main operating mechanism and conditionable by said traveling means for operating said device when said traveling means have traveled at least one step.

2. In a ten-key adding machine for non-uniform decimal denominations, comprising a multi-denominational indexing mechanism whose denominations are settable by said keys, an accumulating mechanism adapted to cooperate with said indexing mechanism and having a plurality of decimal members and a number of lower order non-decimal members, transverse traveling means for shifting the cooperative relationship of said indexing mechanism and said accumulating mechanism, escapement means operable by said keys for controlling the stepwise travel of said traveling means, and a manipulative member settable for conditioning the machine to accumulate decimal denominations only, the combination comprising:

(*a*) a skipping device controlled by said manipulative member and operable for causing said traveling means to additionally travel through a number of steps corresponding to the number of non-decimal members for skipping said non-decimal members,

(*b*) and a member adapted to sense the transverse position of said traveling means for operating said device when said traveling means have traveled at least one step.

3. In a ten-key adding machine for non-uniform decimal denominations, comprising a multi-denominational indexing mechanism whose denominations are settable by said keys, an accumulating mechanism adapted to cooperate with said indexing mechanism and having a plurality of decimal members and a number of lower order non-decimal members, transverse traveling means for shifting the cooperative relationship of said indexing mechanism and said accumulating mechanism, escapement means operable by said keys for controlling the stepwise travel of said traveling means, a manipulative member settable for conditioning the machine to accumulate decimal denominations only, and a main operating mechanism, the combination comprising:

(*a*) a skipping device controlled by said manipulative member and operable for causing said traveling means to additionally travel through a number of steps corresponding to the number of non-decimal members for skipping said non-decimal members.

(*b*) and a member adapted to effect two successive movements for operating said device, the first movement being caused by said traveling means upon having traveled one step, the second movement being cyclically caused by said main operating mechanism.

4. In a ten-key adding machine for non-uniform decimal denominations, comprising a multi-denominational indexing mechanism whose denominations are settable by said keys, an accumulating mechanism adapted to cooperate with said indexing mechanism and having a plurality of decimal members and a number of lower order non-decimal members, transverse traveling means for shifting the cooperative relationship of said indexing mechanism and said accumulating mechanism, escapement means operable by said keys for controlling the stepwise travel of said traveling means, a manipulative member settable for conditioning the machine to accumulate decimal denominations only, and a main operating mechanism, the combination comprising:

(*a*) a skipping device controlled by said manipulative member and operable for causing said traveling means to additionally travel through a number of steps corresponding to the number of non-decimal members for skipping said non-decimal members,

(*b*) a lever shiftably and rockably mounted on the machine, said lever being normally disengaged from said device,

(*c*) a spring adapted to shift said lever for engaging said device when said traveling means have traveled at least one step,

(*d*) and a portion on said main operating mechanism adapted to rock cyclically said lever for operating said device so engaged.

5. In a ten-key adding machine for non-uniform decimal denominations, comprising a multi-denominational indexing mechanism whose denominations are settable by said keys, an accumulating mechanism adapted to cooperate with said indexing mechanism and having a plurality of decimal members and a number of lower order non-decimal members, transverse traveling means for shifting the cooperative relationship of said indexing mechanism and said accumulating mechanism, escapement means operable by said keys for controlling the stepwise travel of said traveling means, a manipulative member settable for conditioning the machine to accumulate decimal denominations only, and a main operating mechanism, the combination comprising:

(*a*) a skipping device controlled by said manipulative member and operable for causing said traveling means to additionally travel through a number of steps corresponding to the number of non-decimal members for skipping said non-decimal members,

(*b*) a lever shiftably and rockably mounted on the machine, said lever being normally disengaged from said element,

(*c*) a spring adapted to shift said lever for engaging said device when said traveling means have traveled at least one step and to rockably restore said lever,

(*d*) a portion on said main operating mechanism adapted to rock cyclically said lever for operating said device so engaged,

(*e*) and a latching element for latching said lever upon being so rocked against the restoring action of said spring, said lever being released by said latching element upon being shiftably restored by said traveling means when restored.

6. In a ten-key adding machine for non-uniform decimal denominations, comprising a transversely spring urged pin carriage whose denominations are settable by said keys, said carriage comprising a row of pairs of escapement and zero pins, an escapement dog cooperating with said escapement pins for enabling said carriage to transversely travel one step when each escapement pin is set, an accumulating mechanism adapted to cooperate with said carriage and having a plurality of decimal members and a number of lower order non-decimal members, a manipulative member settable for conditioning the machine to accumulate decimal denominations only, and a main operating mechanism, the combination comprising:

(*a*) a plate controlled by said manipulative member and operable for setting a number of pairs of said escapement and zero pins to enable said carriage to additionally travel through a number of steps corresponding to the number of non-decimal members for skipping said non-decimal members.

(*b*) a lever shiftably and rockably mounted on the machine, said lever being normally disengaged from said plate,

(*c*) a spring normally urging said lever to abut transversely against said carriage and adapted to shift said lever for engaging said plate when said carriage has traveled at least one step,

(*d*) and a portion on said operating mechanism adapted to rock cyclically said lever for operating said plate so engaged.

7. In a ten-key adding machine for non-uniform deci-

mal denominations, comprisng a multi-denominational indexing mechanism whose denominations are settable by said keys, an accumulating mechanism adapted to cooperate with said indexing mechanism and having a plurality of decimal members and a number of lower order non-decimal members, transverse traveling means controlled by said keys for stepwise shifting the cooperative relationship of said indexing mechanism and said accumulating mechanism, one of said non-decimal members being provided for a fractional denomination manually settable if its value is not zero, a manipulative member movable between two positions for conditioning the machine to accumulate either decimal denominations only or non-uniform decimal denominations, and a main operating mechanism, the combination comprising:

(*a*) a skipping device controlled by said manipulative member and operable for causing said traveling means to additionally travel through a number of steps corresponding to the number of said traveling means to additionally travel through a number of steps corresponding to the number of said non-decimal members when said manipulative member conditions the machine to accumulate decimal denominations only and for causing said traveling means to additionally travel one step when said manipulative member conditions the machine to accumulate non-uniform decimal denominations,

(*b*) a lever shiftably and rockably mounted on the machine, said lever being normally disengaged from said device and being shifted for engaging said device when both said traveling means have traveled through the first step and no fraction has been setup,

(*c*) and a portion on said operating mechanism adapted to rock cyclically said lever for operating said device so engaged.

8. In a ten-key adding machine for non-uniform decimal denominations, comprising a multidenominational indexing mechanism whose denominations are settable by said keys, an accumulating mechanism adapted to cooperate with said indexing mechanism and having a plurality of decimal members and a number of lower order non-decimal members, transversely traveling means controlled by said keys for stepwise shifting the cooperative relationship of said indexing mechanism and said accumulating mechanism, one of said non-decimal members being provided for a fractional denomination manually settable if its value is not zero, a manipulative member settable in a first position for conditioning the machine to accumulate decimal denominations only and in a second position for conditioning the machine to accumulate non-uniform decimal denominations, the combination comprising:

(*a*) a skipping device controlled by said manipulative member and operable for causing said traveling means to additionally travel through a number of steps corresponding to the number of said non-decimal members when said manipulative member is set in said first position and for causing said traveling means to additionally travel one step when said manipulative member is set in said second position,

(*b*) a cyclically movable control member adapted to be arrested upon setting the fractional denomination,

(*c*) a member adapted to simultaneously sense said traveling means and said control member for engaging said device when said traveling means have traveled through the first step and said control member is not arrested,

(*d*) and a portion on said operating mechanism for cyclically causing said sensing member to operate said device so engaged.

9. In a ten-key adding machine for non-uniform decimal denominations, comprising a transversely spring urged pin carriage whose denominations are settable by said keys, said carriage comprising a row of pairs of escapement and zero pins, an escapement dog cooperating with said escapement pins for enabling said carriage to transversely travel one step when each escapement pin is set, an accumulating mechanism adapted to cooperate with said carriage and having a plurality of decimal members and a number of lower order non-decimal members, one of said non-decimal members being provided for a fractional denomination manually settable if its value is not zero, a manipulative member settable in a first position for conditioning the machine to accumulate decimal denominations only and in a second position for conditioning the machine to accumulate non-unform decimal denominations, and a main operating mechanism, the combination comprising:

(*a*) a set of keys depressible for setting said fractional denomination,

(*b*) a plate operable for setting said escapement pins and zero pins,

(*c*) a notch on said plate,

(*d*) means for connecting said plate to said manipulative member so that when said manipulative member is set in said first position said plate will be located in front of a number of pairs of escapement and zero pins corresponding to the number of said non-decimal members and said notch will be located in front of the gap between the second and third pair of escapement and zero pins to be set, whereas when said manipulative member is set in said second position said plate will be located with said notch in front of the second pair of escapement and zero pins to be set, whereby said second escapement pin will arrest the travel of said carriage,

(*e*) a control member cyclically movable when no fraction key has been depressed,

(*f*) a lever shiftably and rockably mounted on the machine, said lever being normally disengaged from said plate,

(*g*) a spring normally urging said lever to abut transversely against said carriage and adapted to shift said lever for engaging said plate when both said carriage has traveled through its first step and said control member is so moved,

(*h*) and a portion on said operating mechanism adapted to rock cyclically said lever for operating said plate so engaged.

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