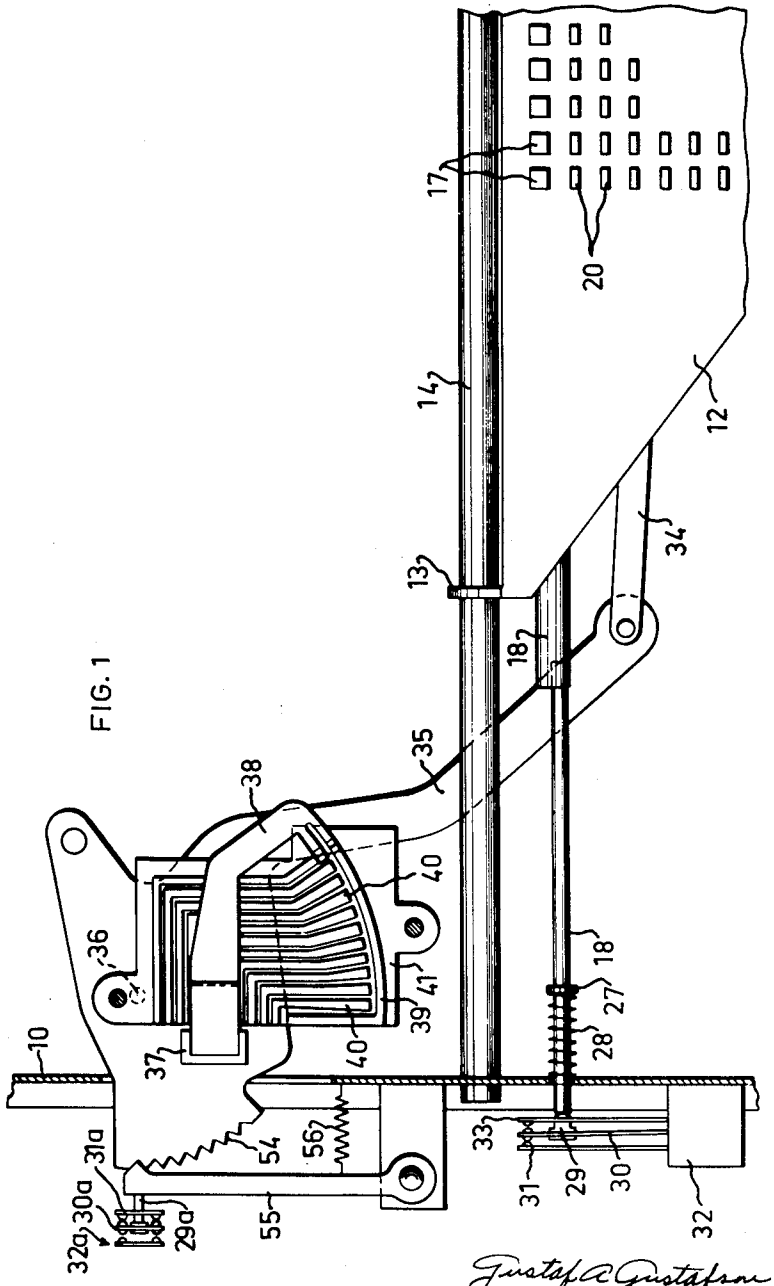
April 23, 1963 G. A. GUSTAFSON 3,086,700

ARRANGEMENTS IN CALCULATING MACHINES FOR SETTING UP NUMBERS ELECTROMECHANICALLY

Filed March 22, 1962 3 Sheets-Sheet 1

FIG. 1



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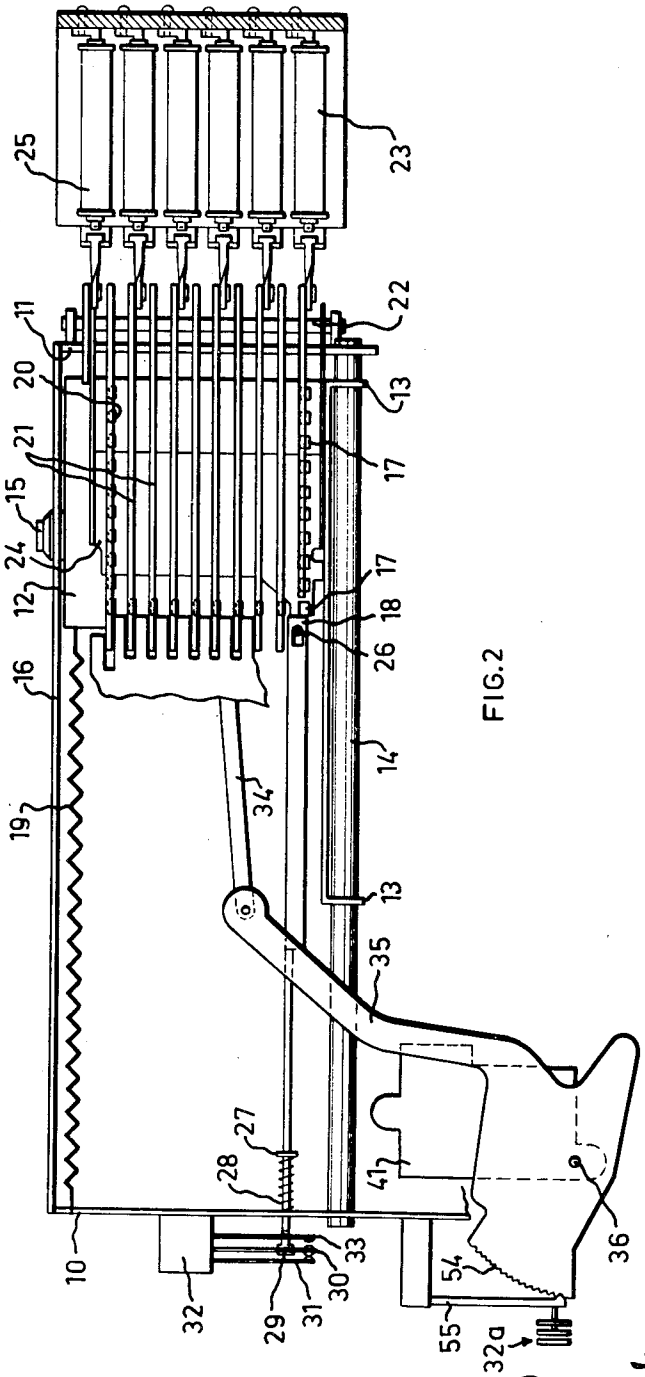


FIG.2

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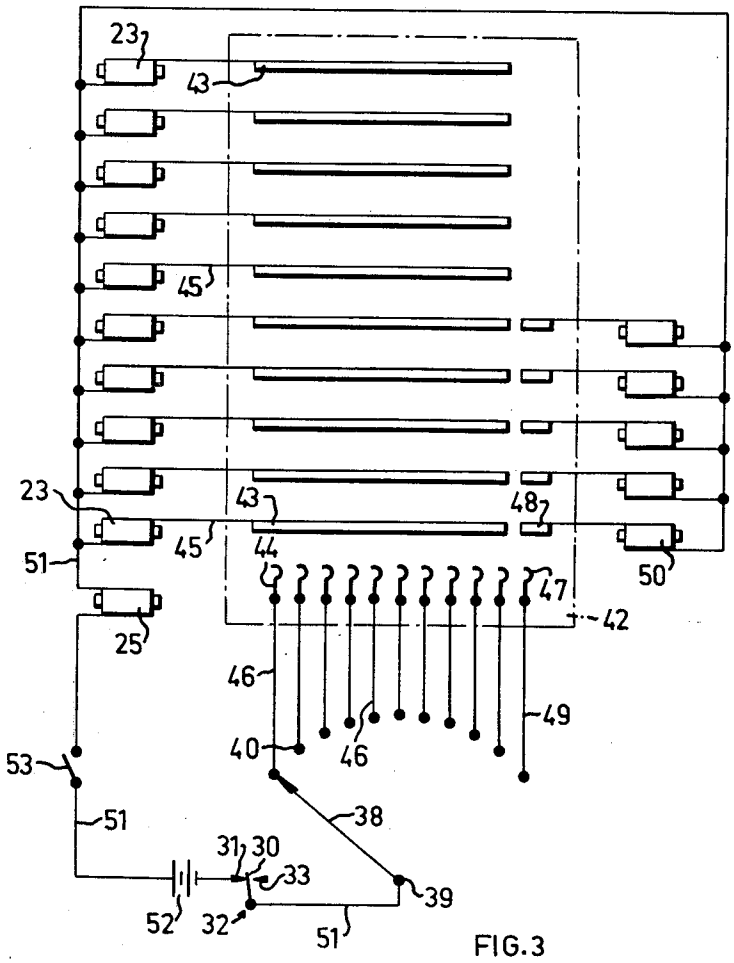


FIG.3

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3,086,700

ARRANGEMENTS IN CALCULATING MACHINES FOR SETTING UP NUMBERS ELECTROMECHANICALLY

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3 Claims. (Cl. 235—60)

In calculating machines having a setting pin carriage which is movable along a path in the machine between a row of denominational order positions, there are mechanisms in extence which set up numbers on the carriage by means of setting pin actuators and electromagnets operating said actuators, said electromagnets each having one terminal connected to a common bus bar to which a source of current is connected, and the other terminal connected to a digit line leading to a transmitter, and feed means are adapted upon each operation of the actuators to shift the carriage one denominational order step in one direction, the feed direction, in the path of the carriage from one denominational order position to the next following position and simultaneously to switch the bus bar from its connection with one denominational order line to its connection with another denominational order line, said denominational order lines each being connected to one denominational order in the transmitter which is adapted to establish electric connection between the respective denominational order line and one of the digit lines.

In the known arrangements of this type the rate at which digits are fed to the calculating machine is determined by the transmitter or some device other than the calculating machine proper. This implies that the rate must be made so slow that the setting pin carriage of the calculating machine will surely have time to move one denominational order step between the points of time at which two consecutive digits are supplied to the calculating machine. Still, errors may occur if the setting pin carriage for some reason or other takes an abnormally long time to move from one denominational order position to the next following position. The present invention eliminates this drawback and moreover permits as rapid a transmission as possible of digits to the calculating machine.

The invention is thus characterized by the fact that a switch is connected in the bus bar in series with the source of current and that means cooperating with the carriage are adapted to hold the switch closed only when the carriage substantially occupies any of its denominational order positions.

For further elucidation, the invention will be described in more detail in the following reference being had to the accompanying drawings which illustrate two examples of the invention. In the drawings:

FIG. 1 is a top plan view of part of a calculating machine to which the invention has been applied;

FIG. 2 is a bottom plan view of the arrangement in FIG. 1, some parts necessary for the understanding of the invention having been added;

FIG. 3 is an electric wiring diagram of the arrangement.

In FIGS. 1 and 2, 10 and 11 designate two frame end walls of a calculating machine which is equipped with a conventional setting pin carriage **12** for setting up numbers in the calculating machine. Setting pin carriage **12** is movable in a straight path between frame end walls **10**, **11**, having two apertured lugs **13** slidable along a rod **14** between said end walls and rolling on a roller **15** along a rail **16** between said end walls. In the conventional manner the carriage supports a row of ten step pins **17**, which extends close to and along the rod **14**. In the non-actuated state said step pins **17** project from the underside of the carriage, and together with a stop abutment **18** to be described in the following these pins determine ten denominational order positions of carriage **12** along the path thereof. A tension spring **19** expanded between carriage **12** and frame end wall **10** tends to move the carriage to the left as viewed in FIGS. 1 and 2. In the initial position shown in said FIGURES carriage **12** is in the position closest to frame end wall **11** and the step pin **17** farthest to the left in FIG. 2 bears against the stop abutment **18** to retain carriage **12** in the initial position or the first denominational order position against the action of spring **19**. Said step pin **17** is adjustable, in a manner to be described in the following into an actuated position in which the pin is pushed upwardly in the carriage in such a way that its lower end is approximately at a level with the underside of the carriage. Upon such adjustment of the setting pin, spring **19** will shift the carriage **12** to the left as viewed in FIG. 1 into its second denominational order position in which the second step pin **17** from the left in FIG. 2 bears against the stop abutment **18**. By successively depressing the step pins **17** the carriage can thus be shifted denominational order by denominational order to the left as viewed in FIGS. 1 and 2.

At right angles to rod **14** there extends opposite each step pin **17** a row of nine setting pins **20** for digits 0–8 while step pin **17** forms the setting pin for digit 9 in the conventional manner (for greater simplicity all setting pins have not been shown in FIG. 2). When a step pin **17** bears against stop abutment **18**, said abutment and the setting pins **20** aligned therewith each are directly above one setting pin actuator **21** which is in the form of a bellcrank lever mounted on a shaft **22** in frame end wall **11**. Each of these setting pin actuators **21** can be swung in a known manner by an electromagnet **23**, upon energization of the magnet, to push the respective setting pin **17** or **20** upwards in carriage **12** in the customary manner for setting up the respective digit in the denominational order in question for carriage **12**. When one of the setting pins **20** for digits 0–8 is adjusted, the associated step pin **17** also must be adjusted at the same time in order that carriage **12** may be advanced one step for inserting a digit in the next following order. This can be done by causing the setting pin actuators **21** when they are swung to carry along a plate **24** which is mounted on shaft **22** and which thereby actuates in a known manner the step pin **17** engaging abutment **18**, by means of a lug (not shown). To relieve magnets **23** for digits 0–8 of part of the work of adjusting not only their setting pin **20** but also step pin **17**, an additional electromagnet **25** is provided in this example, which magnet is energized at the same time as any of magnets **23** for digits 0–9. Magnets **23** and **25** are arranged in two rows one above the other, and for greater clarity only the lower row of magnets is shown in FIG. 2. It is pointed out that the arrangement as described so far agrees with that described in French patent specification 1,227,362 to which reference is made regarding further details.

In an embodiment of the invention, according to FIGS. 1 and 2, the stepping stop abutment **18** is shiftable in a direction parallel with the path of movement of carriage **12**. The stepping stop abutment **18** is in the form of a rod which has one end slidably mounted in frame end wall **10** and the other end provided with a slot in which engages a pin **26** attached to the machine frame. Secured to rod **18** is a ring **27**, and a tension spring **28** is positioned between said ring and frame end wall **10**. Spring **19** is stronger than spring **28** and through carriage

12 and one step pin 17 keeps rod 18 pushed to the left as viewed in FIGS. 1 and 2 against the action of spring 28 to the position shown in which pin 26 bears against one end of the slot in rod 18. In this position the end of rod 18 outside frame end wall 10 bears against a pin 29 on a contact spring 30 and holds said contact spring in electric contact with a contact spring 31 in an electric switch 32 which is mounted on frame end wall 10. Switch 32 has a further contact spring 33 which has not, however, any function in the present connection. When a step pin 17 is adjusted upon setting up of a digit in the order of the step pin in carriage 12, rod 18 loses its support that counter-acts spring 28 so that said spring moves rod 18 to the right as viewed in FIGS. 1 and 2, whereby the electric contact between contact springs 30 and 31 is broken. At the same time carriage 12 begins to move to the left as viewed in FIGS. 1 and 2 under the action of spring 19 so that the next following non-actuated step pin 17 bears against rod 18, pushing it against the action of spring 28 back into the neutral position as shown in FIGS. 1 and 2, the contact springs 30 and 31 being again moved into electric contact with one another by means of rod 18. Switch 32 is thus kept closed when carriage 12 occupies a denominational order position but is open while carriage 12 moves from one denominational order position to the next following position.

Carriage 12 is connected by means of a link 34 to a lever 35 which is mounted for swinging movement on a shaft 36 in the machine frame. Secured to lever 35 by means of an insulating block 37 is a sliding contact arm 38 which has a finger sliding on a contact bar 39 and another finger which touches eleven contact segments 40 in sequence. Contact bar 39 and contact segments 40 are positioned on an insulating plate 41 which is secured to the machine frame. In the initial position shown in FIG. 1 contact arm 38 bears against segment 40 farthest to the right, and when carriage 12 is moved through ten denominational order steps contact arm 38 is swung into engagement with ten of segments 40 in sequence to be finally moved into contact with the eleventh segment 40, farthest to the left in FIG. 1 for initiating the calculating machine. When the machine has been initiated in this manner, the number set up on the setting pin carriage 12 is entered and treated in the machine whereupon carriage 12 is restored to its initial position by means not shown which cause simultaneous restoring of setting pins 17, 20 to their initial position in the known manner.

Numbers can be entered in the calculating machine by means of any suitable transmitter whatever which is capable of electrically interconnecting digit lines and denominational order lines in the manner required for entering a desired number in the calculating machine. FIG. 3, by way of example, shows within a dash and dot rectangle a transmitter 42 which has ten consecutive contact bars 43 for digits 0–9 and ten sliding contacts 44 each corresponding to one denominational order. Sliding contacts 44 can be adjusted, by means not shown, such as a weighing mechanism or register actuator in a calculating machine, into electric contact with any contact bar 43 whatever, corresponding to the number to be transferred to setting pin carriage 12. By means of digit lines 45 contact bars 43 are each connected to one of the electromagnets 23, and sliding contacts 44 are each connected by means of denominational order lines 46 to one of the 10 contact segments 40 in order from right to left in FIG. 1 and from left to right in FIG. 3. Transmitter 42 also contains for instance a sliding contact 47 which is movable into electric contact with any one of five contact bars 48 in order to cause the calculating machine in the known manner to treat the number set up in carriage 12 in a certain manner, e.g. by addition or subtraction. By means of a line 49 sliding contact 47 is connected to the eleventh contact segment 40 while contact bars 48 are each connected to one terminal of one starting magnet 50 which is adapted in a known manner to initiate the calculating machine according to the desired mode of operation, e.g. addition or subtraction. Parts 47—50 actually have nothing to do with the present invention and are mentioned only for the sake of completeness. One terminal of all electromagnets 23, 50 is connected to a bus bar 51 which extends to the contact bar 39 and in series contains magnet 25 actuating the step pins 17, a switch 53, a source of current 52, and switch 32.

After the sliding contacts 44 of the transmitter 42 have been set for the number which is to be transferred to the setting pin carriage 12 switch 53 is closed, which will close a circuit from source of current 52 via closed switch 32, contact bar 39, sliding contact arm 38, first contact segment 40, the associated denominational order line 46, sliding contact 44 connected to said line 46, contact bar 43 touched by said contact 44, the associated digit line 45, the corresponding electromagnet 23, bus bar 51, electromagnet 25, closed switch 53, and back to source of current 52, the correct setting pin being adjusted in the first order of carriage 12 together with the associated step, pin 17. As a result, switch 32 is opened by rod 18 in the manner earlier described while carriage 12 moves to the next denominational order position. When the carriage reaches the new denominational order position switch 32 is again closed in the manner earlier described so that the next digit can be transferred from the transmitter to setting pin carriage 12 in the same way as the first digit. The cycle proceeds step after step, and finally contact arm 38 reaches contact segment 40 connected to line 49, one of the electromagnets 50 being energized for initiating the calculating machined to carry out the desired mode of operation. It is thus clear that the movement of setting pin carriage 12 from order to order determines the rate at which digits are transferred from the transmitter to the setting pin carriage, since transfer takes place only when switch 32 is closed.

In an alternative of the arrangement described, switch 32 can be operated by a mechanism other than the stepping stop abutment 18. This alternative is also shown in FIGS. 1 and 2. In this alternative, stepping stop abutment 18 may be fixedly arranged. In this alternative, setting pin carriage 12 or a part movable therewith, in the present instance lever 35, has a row of cam means which in the selected example consists of approximately triangular teeth 54 on an arcuate edge of lever 35, the center of curvature of said edge being located on the center line of the shaft 36 on which lever 35 is mounted. Cooperating with said cam means is a cam follower 55 in the shape of an arm which is mounted for swinging movement on frame end wall 10 and has a nose which a spring 56 keeps engaged with the cam means or teeth 54. Arm 55 actuates pin 29*a* of switch 32*a*. In the initial position shown the triangular nose of arm 55 engages in the space between two cam projections 54, and contact spring 30*a* of switch 32*a* makes electric contact with contact spring 31*a* to keep the source of current 52 connected to contact bar 39 in accordance with FIG. 3. When setting pin carriage 12 moves from one denominational order position to the next following position, a tooth 54 moves arm 55 counter-clockwise as viewed in FIG. 1 so that the contact between contact springs 30*a* and 31*a* is broken in switch 32*a*. Contact springs 30*a* and 31*a* again engage when setting pin carriage 12 reaches its new denominational order position.

By giving teeth 54 and cam follower 55 a suitable shape it is possible to make sure that switch 32 is closed when a step pin 17 on carriage 12 during the denominational order step which is being carried out by the carriage has almost but not quite met the fixedly arranged stepping stop abutment, i.e. the carriage has almost but not quite reached its new denominational order position, so that step pin 17 and possibly also a setting pin 20 is adjusted in the manner described before the step actually meets the stepping stop abutment, whereby the carriage can continue its movement without interruption

until the entire desired number has been set up in the carriage. As the carriage can move at different speeds in different machines of the same make and model it is suitable to design the operating mechanism for switch **32** in such a way that the stage during each denominational order step of carriage **12** in which the switch is closed is controlled as required for providing a substantially uninterrupted movement of the carriage in the manner indicated above. For this purpose the part carrying the cam teeth **54**, or the cam follower **55**, can be replaced whenever required by other parts of a similar nature but of a slightly different shape, which provide the desired effect. However, the cam follower and the cam means can also be made adjustable relative to one another for said purpose, for instance the mounting shaft of the cam follower **55** may be made adjustable towards and away from said cam means.

What I claim and desire to secure by Letters Patent is:

1. In a calculating machine adapted to be connected to digit lines and denominational order lines extending from a transmitter having means for establishing electric connection between the digit lines and the denominational order lines for representing a number to be entered in the calculating machine; a setting pin carriage, indexing means connected to said carriage for stepping said carriage through a plurality of denominational order positions, setting pins on said carriage arranged in a plurality of rows, one for each of the denominational order positions of said carriage, setting pin actuators engageable with said setting pins for selective and consecutive setting of said pins in the successive rows while said carriage is stepped past said setting pin actuators, electromagnetic means connected to said setting pin actuators for operating said setting pin actuators, a bus bar, said electromagnetic means being electrically connected to said bus bar and adapted to be connected to the digit lines extending from the transmitter, a movable contact movable along said bus bar and coupled to said carriage for movement in conjunction with said carriage, a series of fixed contacts, one for each of the denominational order lines extending from the transmitter and adapted to be connected thereto, said movable contact being successively movable into contact with said fixed contacts for connecting said bus bar to a different one of said fixed contacts in each of the denominational order positions of said carriage, a current source and switch means connected in series between said electromagnetic means and said movable contact, and control means cooperating with said carriage and engageable with said switch means and holding said switch means closed only when said carriage substantially occupies any of its denominational order positions.

2. In a calculating machine adapted to be connected to digit lines and denominational order lines extending from a transmitter having means for establishing electric connection between the digit lines and the denominational order lines for representing a number to be entered in the calculating machine; a setting pin carriage, indexing means connected to said carriage for stepping said carriage through a plurality of denominational order positions, setting pins on said carriage arranged in a plurality of rows, one for each of the denominational order positions of said carriage, setting pin actuators engageable with said setting pins for selective and consecutive setting of said pins in the successive rows while said carriage is stepped past said setting pin actuators, electromagnetic means connected to said setting pin actuators for operating said setting pin actuators, a bus bar, said electromagnetic means being electrically connected to said bus bar and adapted to be connected to the digit lines extending from the transmitter, a movable contact movable along said bus bar and coupled to said carriage for movement in conjunction with said carriage, a series of fixed contacts, one for each of the denominational order lines extending from the transmitter and adapted to be connected thereto, said movable contact being successively movable into contact with said fixed contacts for connecting said bus bar to a different one of said fixed contacts in each of the denominational order positions of said carriage, a current source and switch means connected in series between said electromagnetic means and said movable contact, a series of cam means coupled to said carriage and movable in conjunctoin with said carriage, and a cam follower associated with said switch means and engaged by said cam means for holding said switch means closed only when said carriage substantially occupies any of its denominational order positions.

3. In a calculating machine adapted to be connected to digit lines and denominational order lines extending from a transmitter having means for establishing electric connection between the digit lines and the denominational order lines for representing a number to be entered in the calculating machine; a setting pin carriage, feed means connected to said carriage for moving said carriage through a plurality of denominational order positions, setting pins on said carriage arranged in a plurality of rows, one for each of the denominational order positions of said carriage, step pins on said carriage, one for each row of said setting pins, a stepping stop abutment, said step pins bearing in sequence against said stepping stop abutment to retain said carriage in the respective denominational order position thereof, setting pin actuators engageable with said setting pins for selective and consecutive setting of said pins in the row corresponding to said step pin abutting against said stepping stop abutment means and for moving said step pins away from said stepping stop abutment means to allow said feed means to move said carriage one step to the next succeeding denominational order position, electromagnetic means connected to said setting pin actuators for operating said setting pin actuators, a bus bar, said electromagnetic means being electrically connected to said bus bar and adapted to be connected to the digit lines extending from the transmitter, a movable contact movable along said bus bar and coupled to said carriage for movement in conjunction with said carriage, a series of fixed contacts, one for each of the denominational order lines extending from the transmitter and adapted to be connected thereto, said movable contact being successively movable into contact with said fixed contacts for connecting said bus bar to a different one of said fixed contacts in each of the denominational order positions of said carriage, a current source and switch means connected in series between said electromagnetic means and said movable contact, said stepping stop abutment means being mechanically connected with said switch means for holding said switch means closed only when one of said step pins abuts said stepping stop abutment means.

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