Oct. 10, 1961 E. MENGE 3,003,688

VALUE ENTRY MECHANISM

Filed Dec. 22, 1954 2 Sheets-Sheet 1

Fig.1

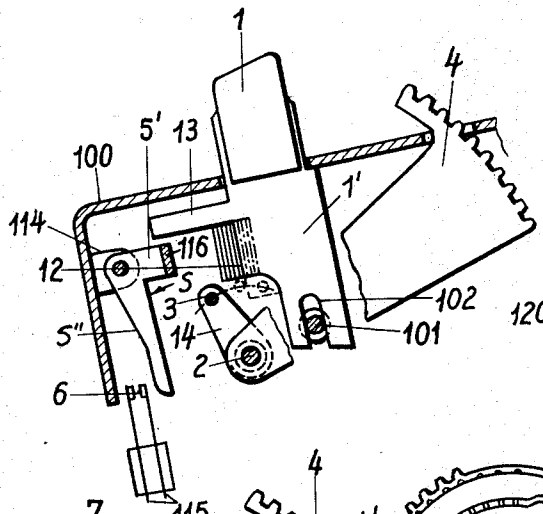


Fig.6

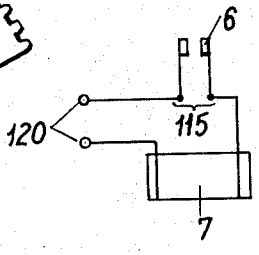
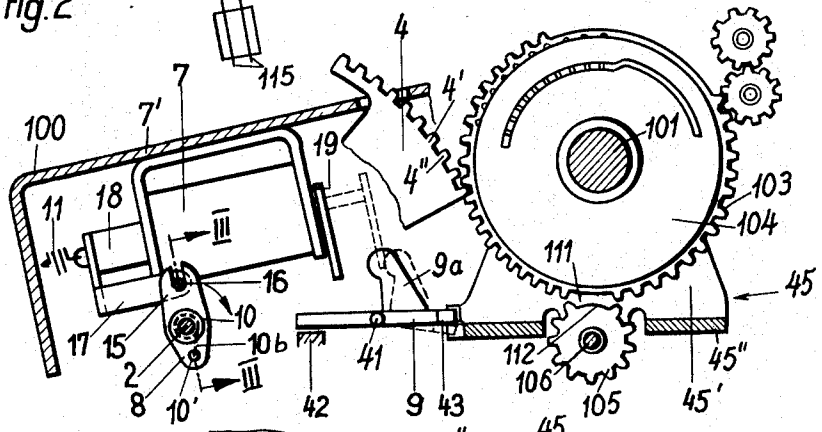


Fig.2



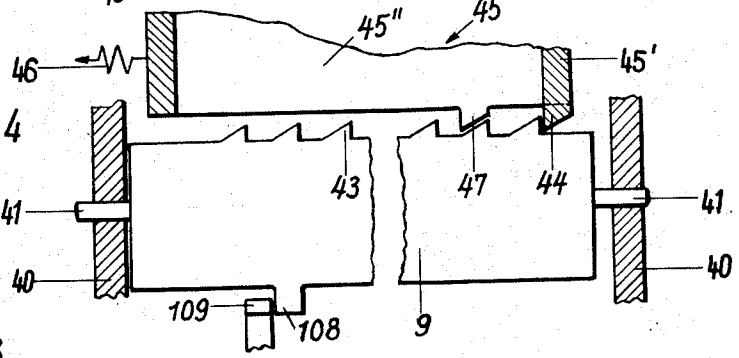


Fig.4

Fig.3

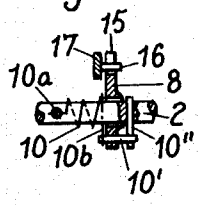
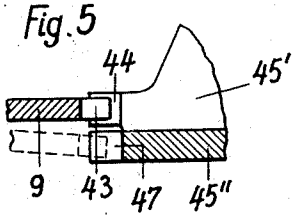


Fig.5



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VALUE ENTRY MECHANISM

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Fig. 1a.

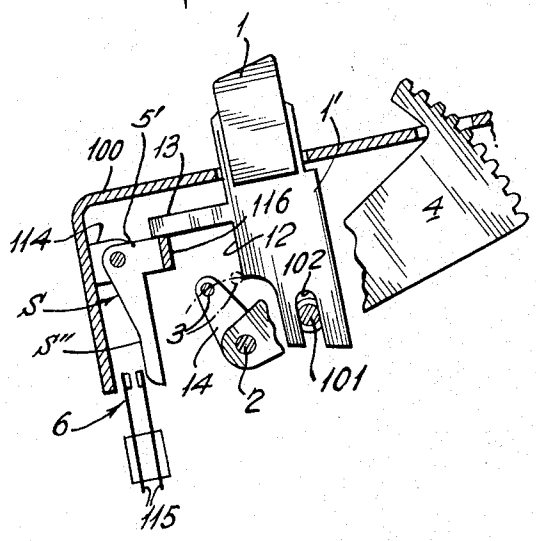
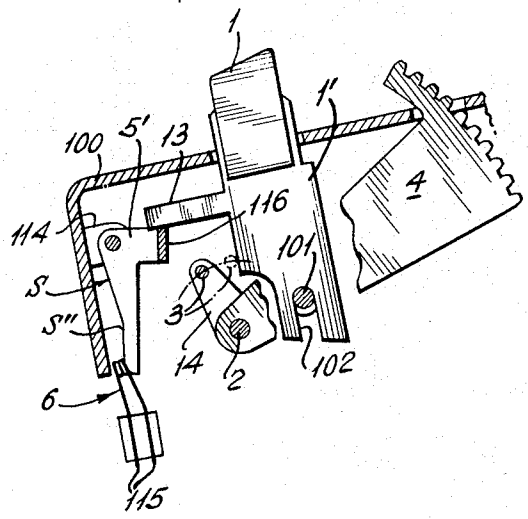


Fig. 1b.



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3,003,688
VALUE ENTRY MECHANISM

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1 Claim. (Cl. 235—63)

The present invention relates to an operation selecting and initialing mechanism for calculating machines or the like, and more particularly to an operation selecting and initialing mechanism in which by pressing a key an operation is selected and an electromagnet initiating the operation is energized.

It is an object of the present invention to provide a key arrangement of the kind described which is relatively simple and inexpensive.

It is another object of the present invention to reduce the overall number of the electromagnets.

It is a further object of the present invention to reduce the force exerted by the fingers of the hand of an operator operating the keys.

In one embodiment of the present invention each key is provided immediately on the stem thereof, in addition to a member actuating an electric switch, with a selecting device arranged in such a manner that by depressing the key, the selecting device is brought into an operative position and subsequently, by the actuation of the electric switch, an electromagnet is energized, said electromagnet performing the work required for the selected function.

The selecting device immediately arranged on the stem of the key may be formed for numeral keys by stop faces arranged on the stems in steps corresponding to the different numeral values.

For example, with a numeral key the stop face may be arranged so as to be shifted by the downward movement of the key into the path of a stop rod carrying out an angular movement. Subsequently the rod is rotated by the armature of an electromagnet, after the closing of a contact by the further downward movement of the key, until it impinges upon the stop of the key, thus effecting the adjustment of an adjusting slide or the like, and performing, under circumstances, additional operating steps of the slide such as steps corresponding to a decade.

Preferably between the stop rod and the armature of the electromagnet a device such as a spring is provided for taking up a further motion of the armature.

Furthermore it has been found advantageous to arrange a switching member of a slide stepping device at the end of the path of the armature of the electromagnet.

Preferably the same principle is applied to a calculating machine or the like having mathematical operation control keys for switching in or carrying out calculating operations or the like. Here the selecting device may include a locking device arranged for releasing one of a series of controlling slides associated, for instance, with operations such as totalling or subtotalling.

A device to be actuated in common with each control slide, for instance, a coupling for a control or drive shaft is preferably arranged so as to be actuated directly by the electromagnet without transmitting the driving force thereof through any springs actuating the control slide or slides so that the springs may be correspondingly weaker.

With an arrangement according to the present invention the hand of the operator need not exert any force besides the simple setting of the key, and particularly no further linking members have to be provided since the energy required for carrying out the calculating or switching operation is supplied by a single electromagnet selectively actuated by a group of keys which is energized by the finger pressure exerted on the keys.

Other objects and advantages of the present invention will become apparent from the following detailed description thereof when read with reference to the accompanying drawings showing, by way of example, some embodiments of the present invention. In the drawings:

FIG. 1 is a side elevation, partly in section, of a numeral key and the parts associated therewith, of an adding or calculating machine according to the present invention,

FIGS. 1*a* and 1*b* are views similar to FIG. 1, showing some of the elements in different positions,

FIG. 2 is a side elevation, partly in section, of the electromagnet cooperating with the numeral key shown in FIG. 1, and of some parts associated therewith,

FIG. 3 is a section taken along the line III—III of FIG. 2,

FIG. 4 is an enlarged plan view, partly in section, of part of FIG. 2,

FIG. 5 is a side elevation on a larger scale, partly in section, of certain parts shown in FIG. 2, and

FIG. 6 is a wiring diagram of the electro-magnet shown in FIG. 2.

Referring now to the drawings, and first to FIG. 1, the numeral key **1** of an adding or calculating machine is provided with a stem **1'** penetrating into the frame **100** of the machine. The bottom part of the stem **1'** is provided with a vertical slot **102** engaged by the recessed part of a shaft **101** so as to guide the stem **1'** and the key **1** attached to the same. A stop face **12** is formed in the lower part of the stem **1'**, said stop face **12** projecting more or less according to the value associated with the numeral key **1**. By a slight touch, the key **1** is moved to a predetermined position as shown in FIG. **1***a* in which the stop face **12** is brought into the path of a rockable bar **3** forming a stop and being connected at the ends thereof, respectively, by two one-armed levers **14** with the shaft **2** (FIGS. 2 and 3) on one end of which is arranged a freely rockable lever **8** forked at the upper end thereof so as to form a fork **15**. A helical spring **10** connected with one end **10***a* thereof with the shaft **2** surrounds the same. The other end **10***b* of the spring **10** is connected with one end of a stop member **10'** attached to the lower portion of the lever **8**. Thus the other end of the stop member **10'** is forced towards a pin **10''** rigidly connected with the shaft **2**. The lever **8** engages by the forked part **15** thereof a pin **16** attached to an angle **17** rigidly connected with one end of the armature **18** of an electromagnet **7**. An arm **19** is connected to the other end of the armature **18**. A spring **11** connects the frame **100** with the armature **18** and urges the same into the position shown in FIG. 2 in which the arm **19** is adjacent to the stirrup **7'** forming part of the electromagnet **7**.

A lever **9** is arranged for rocking motion about the bearing pins **41** thereof engaging, respectively, holes provided in bearing plates **40**. The lever **9** is provided with a stop member **9***a* rigidly connected therewith near the

pivots or bearing pins **41** thereof and adapted to come into engagement with the arm **19** when the armature **18** is in the other end position thereof shown in dotted lines in FIG. 2. The bearing pins **41** allow an angular displacement of the rocking lever **9**, the distance between the bearing plates **40** being somewhat larger than the axial length of the rocking lever **9** as shown clearly in FIG. 4.

A spring (not shown) urges the rocking lever **9** from the position thereof indicated in dotted lines in FIG. 2 into the position shown in full lines in which the rocking lever **9** rests against a stationary stop **42** of the machine. The rocking lever **9** is provided with a set of saw teeth **43** which are in the path of a marginal or tripping tooth **44** projecting from the part **45'** of a frame or slide **45** which is pulled by a spring **46** towards the left in FIG. 4. The slide **45** is provided with a recess for a shaft **107** which corresponds to the shaft **2** disclosed in my co-pending application Serial No. 323,411, filed December 1, 1952 for a Calculating Machine, and carries a groove disk **104** provided with a toothed portion **103** corresponding, respectively, to the groove disk **9** and the toothed portion **23** disclosed in my co-pending application Serial No. 323,411, mentioned hereinabove. The toothed portion **103** is provided with a gap **111** corresponding to two missing teeth and is engaged by a toothed wheel **105** which has also a gap **112** corresponding to two teeth. The toothed wheel **105** is rotatable about the shaft **106** arranged parallel to the shaft **107**. The toothed wheel **105** and the shaft **106** correspond, respectively, to the wheels **22** and the shaft **21** disclosed in my co-pending application Serial No. 323,411, mentioned hereinabove, and have the same functions as these parts. The toothed wheel **105** serves for bringing the toothed portion **103** of the groove disk **104** into the zero position as described more in detail in my co-pending application Serial No. 323,411, mentioned hereinabove, and particularly in column 2, lines 56–70 thereof.

In order to impart a decade shift to the calculating mechanism the rocking lever **9** is tilted in clockwise direction in FIG. 2 so as to bring the teeth **43** thereof into the path of an intermediate tooth **47** formed in the part **45'** of the slide **45** so that the teeth **43** leave the marginal tooth **44** until the slide **45** has performed a half step towards the left so as to bring one of the teeth **43** to rest against the intermediate tooth **47**. When the rocking lever **9** is tilted in anti-clockwise direction the change of the teeth thereof is effected in the inverse sequence until the tooth **44** is in touch with that tooth **43** which is the next towards the left of the preceding tooth **43**. The rocking lever **9** is provided with a pin **108** corresponding to pin **70** of the rod **72** disclosed in my co-pending application Serial No. 323,411, mentioned hereinabove. In a certain position of the rocking lever **9** the pin **108** comes into contact with the end **109** of a swingable lever corresponding to the rocking lever **69** disclosed in my co-pending application Serial No. 323,411 mentioned hereinabove, the operation of which is described more in detail on page 8, lines 9 to 19 thereof.

As the key **1** is further depressed from the predetermined position shown in FIG. 1*a* to the final position shown in FIG. 1*b*, an arm **13** projecting from the key stem **1'** of the key **1** engages a stop member **116**, carried by an arm **5'** of a two-armed lever **5**, so that the two-armed lever **5** is pivoted on a stationary lug **114** on the frame **100**. The other arm **5''** of the lever **5** closes a switch **6**, bridging a gap **115**, in the normally open energizing circuit for the electromagnet **7**. Supply terminals **120** of an energy source are then connected to the electromagnet **7**.

The operation of this device is as follows:

On depressing the key **1** the corresponding stop face **12** is moved into the path of the stop bar **3**. Subsequently, the arm **13** protruding from the stem **1'** thereof makes contact with the stop member **116** so as to exert a downwardly directed pressure upon the same and to swing the two-armed lever **5** about the pivot thereof so that the other arm **5''** closes the contact **6** so as to energize the electromagnet **7**. The latter attracts, therefore, its armature **18** while tensioning the spring **11**. By the pin **16** attached to the angle **17** rigidly connected to the armature **18** the forked part **15** of the lever **8** is rotated which rotation is imparted through the helical spring **10** to the shaft **2**. The rockable rod **3**, connected at the ends thereof by the levers **14** with the shaft **2**, is thereby brought into the path of the stop face **12** arranged on the stem **1'** of the key **1**. A further rotary movement of the lever **8** is taken up by the helical spring **10**. According to the angular displacement of the shaft **2** and the rod **3** an adjusting segment **4**, rigidly connected at one end thereof with the shaft **2** and through the levers **14** with the rod **3**, is adjusted. The opposite end of the segment **4** is formed as a circular part **4'** having ten teeth **4''** engaging the circumferential teeth **103** of a wheel **104** loosely arranged on the shaft **107** supported by the slide **45**. Thus the angular position of the wheel **104** is representative of the numerical value set on the machine. The decade on which this value has been entered depends on the linear position of this wheel **104** which is determined by the position of the slide **45** on which the axle **107** for the wheel **104** is mounted. Decade shifts are controlled by the tripping mechanism operated by the arm **19** rigid with the armature **7**. At the end of its stroke armature **18** of the electromagnet **7** causes by its arm **19** a rotation about the pins **41** of the stop member **9***a* forming one piece with the lever **9** so that the same occupies the position thereof shown in FIGS. 2 and 5 in dotted lines, in which one of the teeth **43** is in contact with the intermediate tooth **47** of the part **45''** of the slide **45**. Thus a shifting of the decade slide **45** into the next decade position is effected in the manner described hereinabove.

When the key **1** is released the arm **13** is raised from contact with the stop member **116** so that the other arm **5''** of the two-armed lever **5** under action of a return spring (not shown) opens the contact **6**, thus deenergizing the electromagnet **7** so that the armature **18** thereof returns under the action of its return spring **11** into the initial position shown in FIG. 2.

Thus it is seen that by the present invention a light key touch is combined with a minimum key path.

I have described hereinabove preferred embodiments of my invention, but it should be understood that numerous changes may be made in the form, structure, and arrangement of the several parts of the calculating machine described hereinabove and illustrated in the accompanying drawings, without departing from the spirit and scope of my invention or sacrificing any of its attendant advantages, the calculating machine described herein being merely for the purpose of illustrating my invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is as follows:

An operation selecting and initiating mechanism for calculating machines having a frame comprising, a plurality of numeral keys, each numeral key having a stem displaceably held in the frame, each key stem being formed with a stop face, each stop face being moved to an operative position in response to a predetermined depression of said associated key stem; a rocking mechanism having an initial position, each of said stop faces when in its operative position being located in the path of said rocking mechanism, each of said stop faces defining a different one of a plurality of stopped positions of said rocking mechanism; an electromagnet having an armature, a normally open energizing circuit for said electromagnet, a switch to close said normally open energizing circuit in response to a final depression of any one of said keys exceeding said predetermined depression, a mechanical linkage extending between said armature and

said rockable mechanism, a resilient member forming part of said mechanical linkage, said armataure performing an equal excursion each time said electromagnet is energized, said resilient member permitting partial transmission of the excursion of said armature to said rocking mechanism, the rocking motion of said rocking mechanism being stopped by a stop face in its operative position; a numeral setting element, said numeral setting element being rockable with said rocking mechanism; a step-by-step ordinal shifting device, and an actuator for said ordinal shifting device, said actuator being operated by said armature at the end of its stroke.

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