May 23, 1950 L. NAMENYI-KATZ 2,508,965

COUNTING APPARATUS

Filed April 3, 1945

Fig. 2.

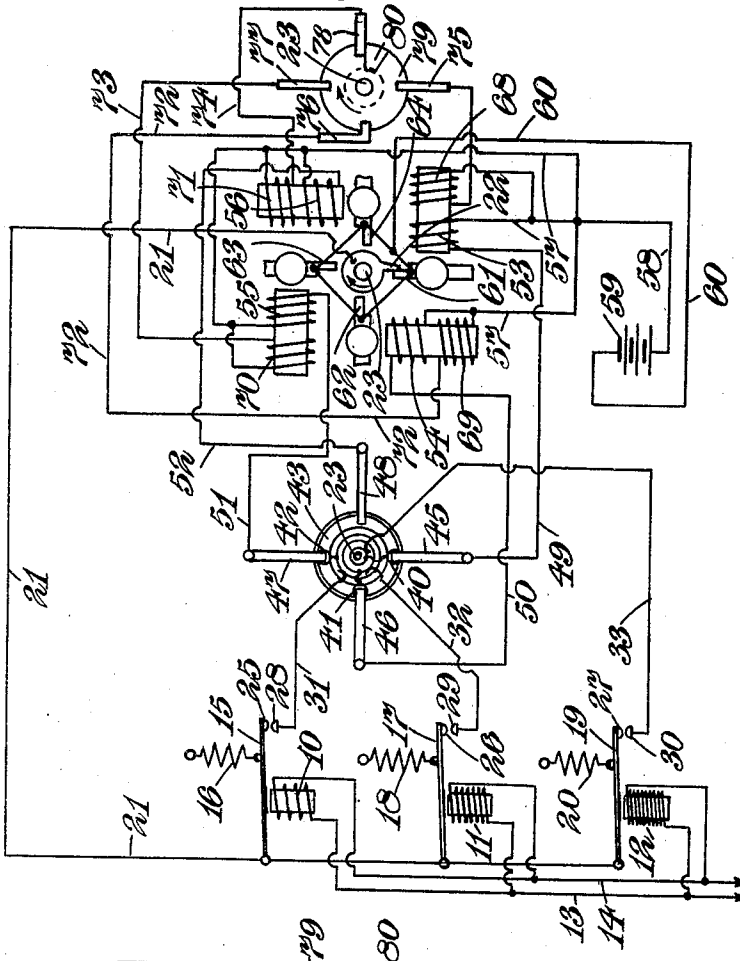
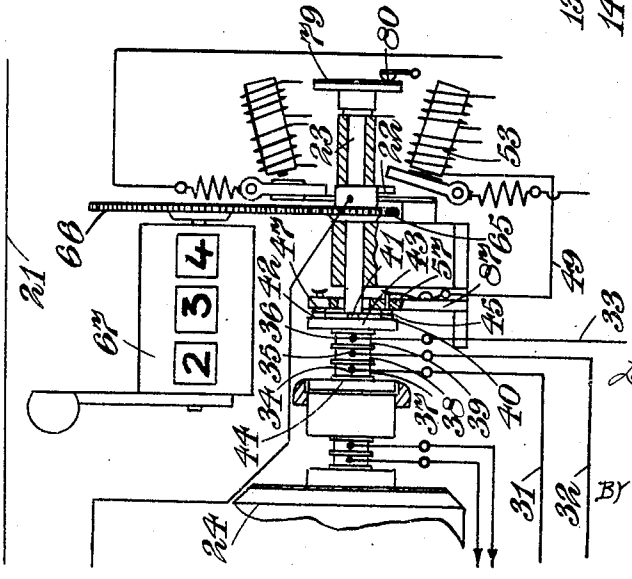


Fig. 1.



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COUNTING APPARATUS

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5 Claims. (Cl. 235—92)

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This invention relates to counting apparatus and particularly to apparatus for counting bank-notes.

According to this invention, a counting apparatus is arranged to be responsive to electrical impulses of different amplitudes so as to add a number proportional to the amplitude of the impulse, and comprises a discriminator having a number of responsive devices subjected simultaneously to the same electrical impulse, but which are so designed that different responsive devices become operative at different minimum impulse strength, and which are so coupled to the counter that for different impulse strength the extent of movement imparted to the counter is determined by that responsive device which would not have become operative should the particular impulse have been substantially weaker.

In the case where the above arrangement is employed for counting bank-notes, if a succession of single bank-notes is fed through the apparatus to provide a succession of equal impulses, the same responsive device becomes operative and the counter has imparted to it a movement appropriate for recording a single unit. Should, however, a number of bank-notes be passed simultaneously through the apparatus, they are arranged to generate an impulse whose strength is proportional to that number, as described in United States patent application Serial No. 586,333 filed April 3, 1945, now Patent No. 2,474,156, whereupon a number of said responsive devices become operative simultaneously and the counter is moved to an extent proportional to the strength of the impulse.

The aforesaid responsive devices may comprise electromagnets controlling said counter, and having different resistances, which electromagnets are connected in parallel with the means for generating said impulses. Thus, one or more electromagnets are rendered operative, according to the strength of the impulse.

The aforesaid responsive devices may be arranged to operate means for arresting a rotatable driving shaft for the counter at different angular positions according to the number of the responsive devices which have become operable, whereby the extent of rotation of said shaft is proportional to the impulse strength.

The driving shaft for the counter may be driven through a slipping clutch or the like by a motor, and is provided with a finger or the like, and the arresting means may comprise abutments each movable into the path of travel of said finger by electromagnetic means, and the abutments

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and electromagnetic means exceed in number the electromagnetic responsive devices by one and said electromagnetic means may be connected with an equal number of evently-spaced brushes or the like fixed against rotation and engaging a commutator member rotating with the driving shaft and having the same number of contacts as said responsive devices, but which contacts are disposed apart at the same angle as said brushes, which contacts are connected through slip-rings and brushes, each with a pair of contacts controlled by one of said electromagnetic responsive means and thence to a source of supply through switch means which are arranged to be closed when the finger engages an abutment. By these means, in whatever position the aforesaid finger stops, the next impulse received will move the appropriate abutment for permitting and limiting the extent of rotation of the shaft in accordance with the strength of the next impulse.

A single unit impulse must necessarily be of shorter duration than the time taken for movement of the finger between two adjacent abutments in order that a succession of single unit impulses may appropriately control the counter.

In the case, however, where the strength of the impulse is such that a number of the responsive devices are rendered operative, it is necessary to maintain the electromagnetic means energised until such time as the finger reaches the appropriate abutment. This is effected by providing each electromagnetic means with a holding coil which is placed in circuit with supply means through a second commutator rotating with the driving shaft of the counter, which second commutator is provided with a number of equally-spaced brushes or the like connected with the respective electromagnetic means, and a conducting segment or the like so disposed and of such a size that it connects the appropriate holding coil in circuit with the source of supply after the finger has moved away from one abutment and shortly before it is about to engage with another abutment. This arrangement enables a number of such abutments to be maintained out of the path of the finger, although the impulse is of comparatively short duration. Also, in the case of a number of impulses of unit strength merging with one another, it enables the first said commutator to reach a new position where a fresh circuit is established for moving the succeeding abutment clear of the finger, whereby the operating shaft continues to rotate until the impulse has ceased.

The following is a description of one form of

construction according to this invention, reference being made to the accompanying diagrammatic drawings.

In the drawings,

Figure 1 is a diagrammatic side elevation showing some of the details of construction of the apparatus and indicating some of the wiring; and

Figure 2 is a circuit diagram for the novel apparatus.

Three relay coils 10, 11 and 12 are connected in parallel with supply lines 13 and 14, which are energized by electrical impulses, each impulse having an amplitude proportional to the quantity to be recorded by the counter. An impulse generator for producing such impulses is described in my aforementioned Patent No. 2,474,156. The coils have a different number of turns, the coil 11 having more turns than the coil 10, and the coil 12 more turns than the coil 11, so that for a weak impulse the armature 15 of the coil 10 will be moved against the action of its spring 16, while with a stronger impulse, in addition to the armature 15 being moved, the armature 17 of the coil 11 will be moved against its spring 18, while for a still stronger impulse the armatures 15 and 17 and the armature 19 associated with the coil 12, will also be moved against the action of the spring 20. It will be noted that all the armatures are connected by a conductor 21 with a finger 22 fixed to a shaft 23 driven from an electric motor 24. The armatures carry contacts 25, 26 and 27 respectively, which cooperate with fixed contacts 28, 29 and 30, which are connected by conductors 31, 32, 33, with brushes 34, 35, 36 which engage commutator rings 37, 38 and 39. The commutator rings are electrically connected with studs 40, 41 and 42, mounted on an insulated disc 43 carried by said shaft 23. The shaft 23 is coupled to the motor shaft through an electromagnetic clutch 44 which is capable of slipping when the shaft 23 is held. The contact studs 40, 41 and 42 are spaced 90 degrees apart on the disc 43, and during rotation are successively engaged by spring-pressed contact members 45, 46 and 47 and 48. These contact members are carried by a bracket 87 and connected respectively by conductors 49, 50, 51 and 52, to one end of the coils 53, 54, 55 and 56. The other ends of these coils are connected by a common conductor 57 to a line 58 leading to one side of a source of supply 59.

The other side of the battery is connected by a conductor 60 with the armatures 61, 62, 63 and 64 of the respective coils 53, 54, 55, 56. These armatures are arranged to swing into and out of the path of movement of the finger 22, which, it will be remembered, is connected with each of the aforesaid contacts 25, 26 and 27. Thus, assuming the parts of the apparatus have stopped in the position shown in the drawing, and an impulse is received from the inputs 13 and 14 sufficient only to close the contacts 25, 28, then the only circuit to be energised will be 31, 34, 37, 40, 45, 49, 53, 57, 58, 59, 60, 61, 22, 21 and 15. Thus, the armature 61 will be moved out of the path of the finger 22, enabling the motor to rotate the finger into contact with the unmoved armature 62. Assuming the incoming impulse has in the meantime ceased, the finger will remain in contact with the armature 62. This movement will have resulted in the contact 40 moving away from 45 and coming opposite 46. Thus, should another single impulse be received the new circuits made will comprise 31, 34, 37, 40, 46, 50, coil 54, 57, 58, 59, 60, 62, 22, 21 and 15. Thus, it will be seen that in each case a single step movement of the shaft 23 of identical extent will have been made. The shaft is connected through suitable gearing 65, 66 to a counter 67 and a single step movement of the shaft turns the counter by one digit.

Assuming now, in the position of the parts shown in the drawing, that the incoming impulse is sufficiently strong to energise both the relays 10 and 11, two circuits will be energised in parallel, the circuit first referred to above and the circuit 26, 29, 32, 35, 38, 46, 50, 54, 57, 58, 59, 60, 61, 22, 21 and 17. Thus, both the coils 53, and 54 are energised, both armatures move out of the path of movement of the finger 22 which comes to rest against the armature 63, whereby the shaft 23 is rotated twice the amount than that for a single unit. The contact 49 will now be opposite the contact 47 and thus the coil 55 will be the first to be energised when next an impulse has been received.

Assuming a triple amplitude impulse is received when the parts are in the position shown in the figure, the coils 53, 54 and 55 will be energised, and the finger will then come to rest against the armature 64.

Assuming the controlling impulses are of comparatively short duration (they must necessarily be shorter than the time required for the finger 22 to move between two adjacent armatures) it may be that the second or third pair of contacts 26 and 29 or 27 and 30, will have again separated before the finger has had time to pass the armatures of the coils 54 and 55. Thus, associated with the coils 53, 54, 55 and 56 are holding coils 68, 69, 70 and 71. It will be noted that one end of each of these coils is connected with the line 58, leading to the battery 59, while the other ends are connected respectively through conductors 71, 72, 73 and 74 with brushes 75, 76, 77 and 78 which engage a commutator disc 79 mounted on the shaft 23 and having a comparatively small gap or insulating segment 80. The commutator 79 is connected through the shaft 23 with the reverse side of the battery 59 to which the first said ends of the coils 68, 69, 70, 71 are connected. The commutator segment 80 is so disposed on the disc that it enages one of the last-mentioned brushes shortly before the finger 22 reaches an armature associated with that particular coil. Aside from the insulating gap 80, the remaining part of the commutator disc 79 is conductive and conductively continuous with the shaft 23. The holding circuits for the solenoids are therefore all normally energised and the insulating segment 80 performs the function of breaking the holding circuit of each solenoid after the finger 22 has passed the corresponding armature 61, 62, 63, or 64 so as to reset the armature. The holding coils are not alone sufficient to move the armatures from their datum position, but it will be noted that the circuits are such that when each main coil is energised a part of the current will also flow through the associated holding coil which will maintain the armature out of the path of movement of the finger 43, should the commutator segment 80 by then have reached the appropriate brush. Thus, the size of the commutator segment 80 is selected in accordance with the duration of the impulse so that it is in engagement with a succeeding brush by the time the impulse is finished. The apparatus is particularly suitable for recording impulses set up by the passage of bank-notes with

metallic strip threads therein, past a responsive device, as described in United States patent application Serial No. 586,333 filed April 3, 1945, now Patent No. 2,474,156. In such an apparatus, if two bank-notes pass the responsive device simultaneously, so that the two threads are opposite one another, the amplitude of the impulse set up will be double that when a single note passes the responsive device. The apparatus above described will allow of three bank-notes passing simultaneously with their threads over one another. Assuming, however, that the threads are not one over the other, but are arranged side by side, the length of the impulse will be greater than for a single bank-note, although it will be of the same amplitude. Thus, an impulse of this kind will require to operate two of the armatures associated with the aforesaid finger **22**. For this purpose, the rate of rotation of the shaft **23** is such that by the time that a contact on the disc **43** has reached a position in which it is opposite another contact on the bracket **57**, the double impulse is still persisting, whereby two of the armatures associated with the finger **22** are operated.

I claim:

1. A counting device of the class described which is adapted to be responsive to electrical impulses of different amplitudes so as to add a number proportional to the amplitude of the impulse, and comprising a counter and a discriminator having a number of responsive devices adapted to be subjected simultaneously to the same electrical impulse, said discriminator being so constructed and arranged that different ones of said responsive devices become operative at different minimum impulse strengths, said responsive devices comprising electromagnets controlling said counter and having different resistances, means for connecting said electromagnets in parallel with the means for generating said impulse, a rotatable driving shaft for said counter, means for rotating said shaft and means operated by said responsive devices for arresting the rotation of said shaft after predetermined amounts of angular movement so that for different impulse strengths the extent of movement imparted to said counter is determined by that of the responsive devices which would not have become operative should the particular impulse have been substantially weaker, whereby the extent of rotation is proportional to the impulse strength.

2. A counting apparatus according to claim 1 in which the means for rotating the shaft for the counter comprises a motor and in which a slipping clutch is operatively disposed between the motor and said driving shaft.

3. A counting apparatus according to claim 1, wherein the means for rotating the driving shaft for the counter comprises a motor and a slipping clutch is operatively disposed between the motor and said driving shaft, and wherein said driving shaft is provided with a finger or the like; wherein the arresting means comprise abutments each movable into the path of travel of said finger by electromagnetic means, which abutments and electromagnetic means are one more in number than the responsive devices; and wherein the

magnetic means are connected with an equal number of evenly-spaced brushes or the like fixed against rotation with the shaft, and engaging a commutator member rotating with said shaft, which commutator member has the same number of contacts as said responsive devices, but which are disposed apart at the same angle as the aforesaid brushes, which contacts are connected through slip-rings and brushes, each with a pair of contacts controlled by one of said electromagnetic responsive means, and thence to a source of supply through switch means which are arranged to be closed when the finger engages an abutment.

4. A counting machine according to claim 3, wherein each electromagnetic means is provided with a holding coil which is placed in circuit with supply means through a second commutator rotating with the driving shaft of the counter, which second commutator is provided with a number of equally-spaced brushes or the like connected with the respective electromagnetic means, and a conducting segment or the like so disposed and of such a size that it connects the appropriate holding coil in circuit with the source of supply after the finger has moved away from one abutment and shortly before it is about to engage with another abutment.

5. A counting apparatus adapted to receive electric impulses of different amplitudes representing a number of different numerical values to be counted, comprising a plurality of conductors each corresponding to one of said different numerical values, means for supplying a momentary electrical impulse to each of said conductors only on reception of an impulse representing a numerical value equal to or greater than that to which said conductor corresponds, a rotatable member, uni-directional driving means for said member, a plurality of releasable stop devices positioned for arresting said member in a plurality of equi-spaced positions in the rotational movement thereof, the number of said stop devices being greater than the number of said conductors, electromagnetic means for releasing said stop devices, rotary distributing switch means driven by said rotary member for operatively connecting said conductors to said electromagnetic means in cyclic order advancing synchronously with the rotation of said member, holding means for said electromagnetic means and means responsive to the rotation of said member for releasing each of said electromagnetic means after said rotary member has passed the rotational position thereof corresponding to said electromagnetic means.

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