

Nov. 17, 1942.

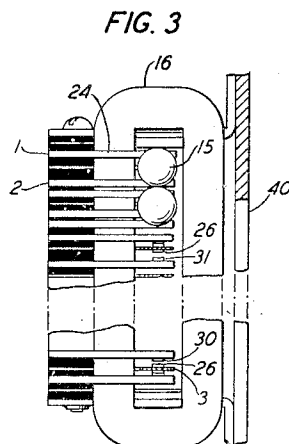
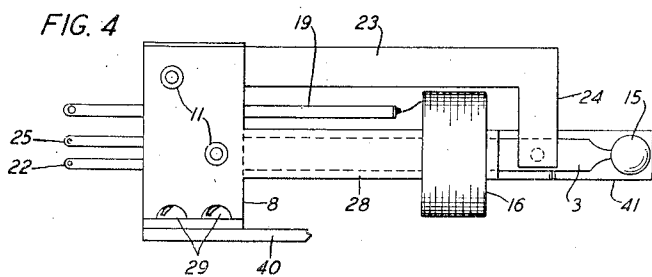
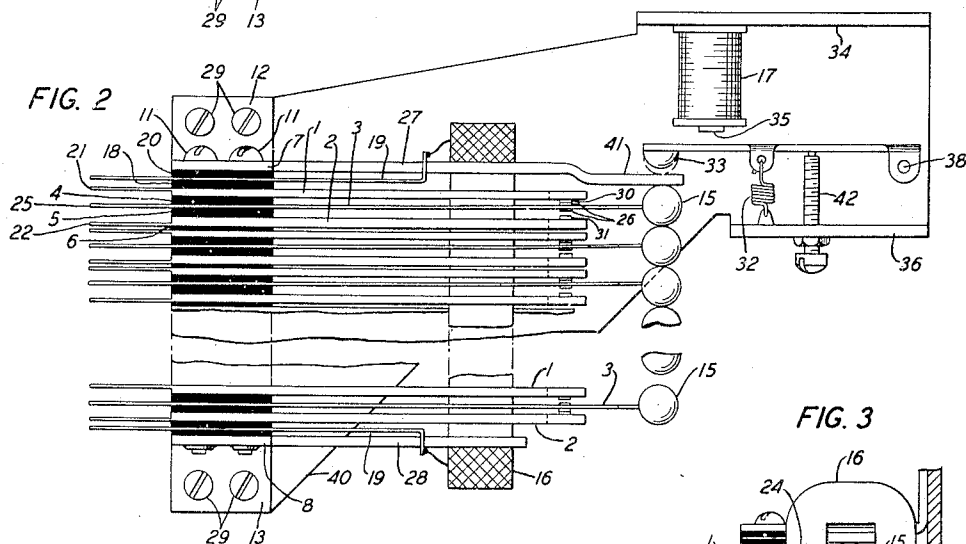
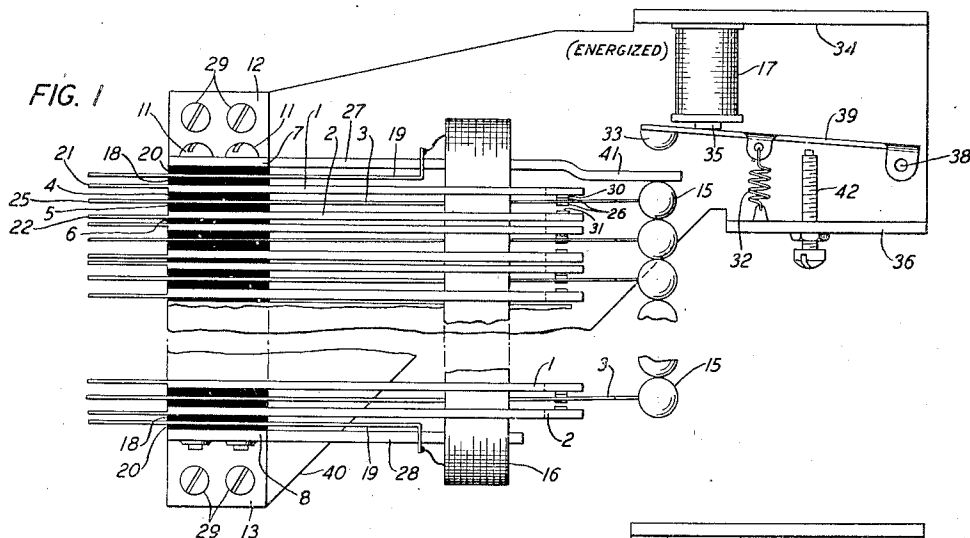
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2,302,128

COUNTING DEVICE

Filed Nov. 26, 1941

2 Sheets-Sheet 1



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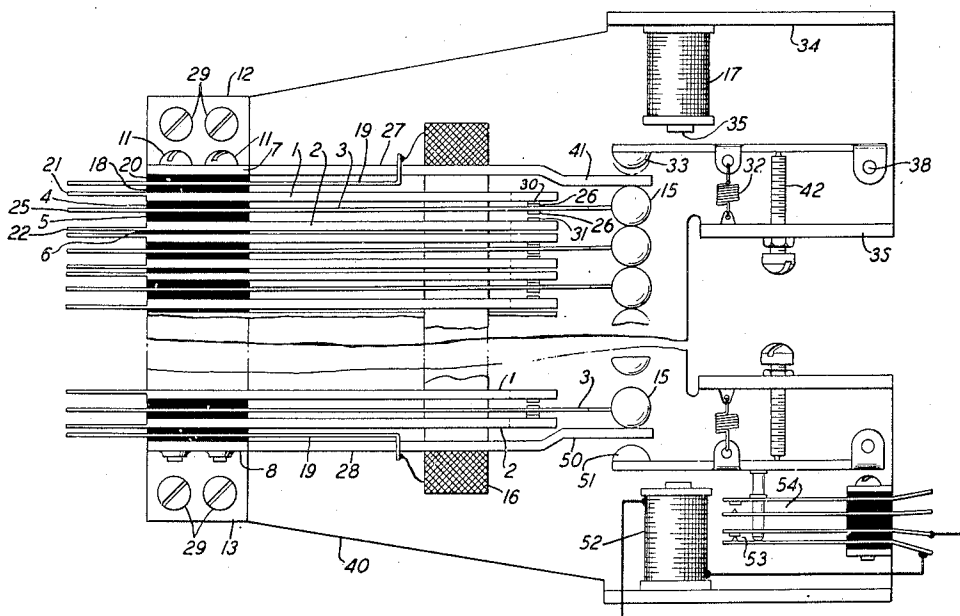
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FIG. 5



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COUNTING DEVICE

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Application November 26, 1941, Serial No. 420,538

7 Claims. (Cl. 177—353)

This invention relates to counting devices and more particularly to devices of the type disclosed in Patent No. 2,292,489, granted to G. R. Stibitz, August 11, 1942, in which counting is performed by impact against a series of members which in turn control means for indicating the result of the count.

More specifically, the invention contemplates the control by impact means of a counting device comprising a contact structure, built up of laminations of magnetic material separated by laminations of insulation.

In accordance with the invention, in a structure of the above type, certain of the magnetic laminations are extended to form tongues on which are mounted resilient balls which rest in contact with one another. A hammer is arranged to apply an impact to one end ball to drive the ball at the opposite end into its alternate position.

A feature of the invention lies in the provision of a magnet arranged in proximity to the free ends of the ball carrying laminations to set up a magnetic circuit by which the ball carrying laminations are retained in either of two positions in which contact may be made with fixed magnetic laminations.

This magnet would usually be an electromagnet so that deenergization of the coil would permit the balls to return to their normal position. For certain uses, however, a permanent magnet might be employed, the balls being returned to normal by other means.

The invention will be more clearly understood from a consideration of the following description read in connection with the drawings, in which:

Fig. 1 shows a top view of the device with the hammer in position to deliver the first blow;

Fig. 2 shows a top view of the device, with a part of the coil broken away, after the first blow has been received;

Fig. 3 is a front end view of the contact structure;

Fig. 4 is a side elevational view of the contact structure; and

Fig. 5 is a modification of Fig. 1 for use as a storing repeater.

The contact structure has been shown made up of transfer contact units, but it is obvious that either the back or front contact may be omitted, or may be rendered ineffective by simply leaving it unconnected.

Each transfer unit comprises two fixed laminations 1 and 2 of magnetic material, with a

reed armature lamination 3, also of magnetic material, interposed between the fixed laminations and strips 4 and 5 of insulating material, such as hard rubber or fiber interposed between the fixed laminations and the armature lamination. The transfer units are assembled side by side as shown and insulated from each other by spacing strips 6 of insulating material. As many units as desired, preferably ten, are included in the contact assembly. Positioned in the assembly outside of the first and last fixed laminations, and insulated therefrom by an interposed strip 10 of insulating material, is a coil terminal 19 and positioned outside of each terminal lug is a further strip 20 of insulating material. This entire assembly is clamped between brackets 7 and 8 by screws 11 which extend through aligned holes in the bracket 7, coil terminal lugs 19, fixed laminations 1 and 2, armature laminations 3, and insulating strips 20, 10, 4, 5 and 6 and are threaded into tapped holes in bracket 8. Such screws may be insulated where they extend through the holes in the laminations 1, 2 and 3 and through the holes in the terminal lugs 19 in any suitable manner, as by sleeves of insulating material surrounding their shanks.

Each of the fixed laminations 1 and 2 is stamped from a sheet of suitable magnetic material into substantially an inverted U shape having a rear arm which serves as a means of attachment between the supporting brackets 7 and 8 and having soldering terminals 21 and 22 extending rearwardly therefrom, a horizontal portion 23 and a front or vertical arm 24 which serves as a pole-piece. Contact bars 30 and 31 are welded to the vertical arms of fixed laminations 1 and 2, respectively.

Each armature lamination 3 is substantially L shaped, having a rear or vertical arm which serves as a means of attachment between the supporting brackets 7 and 8, having a soldering terminal 25 extending rearwardly therefrom and a horizontal arm which is in the form of a spring reed. This reed carries a ball 15 on its outer end and has contact bars 26 welded to it in position to cooperate with the contact bars 30 and 31 carried by the fixed laminations 1 and 2. The insulating strips are rectangular in shape.

The brackets 7 and 8 are roughly T shaped, the cross portions of which serve to clamp the assembly as previously described and have out-turned flanges 12 and 13 by means of which the structure may be attached to a base 40 by screws 29. The horizontal arms 27 and 28 of the

brackets serve as supports for coil 16 which surrounds the ends of the armatures 3. Arm 27 has an offset portion 41 against which rests the ball 15 of the first transfer unit.

Normally, the balls 15 rest lightly against each other and against portion 41 of bracket 7. When coil 16 is energized, a magnetic flux is set up in the armature laminations 3 which causes them to be attracted to the nearest fixed lamination, which is lamination 1 when the structure is normal, causing a firm closure between contact bars 30 and 26.

Formed on the base 40 is a bracket 34 to which is fastened a core 35. On core 35 is wound coil 17. Connection to the coil may be made in any suitable manner (not shown). Rotatably mounted on pivot 38 is an armature 39 for coil 17. Armature 39 carries a hammer 33 which is aligned with the balls 15 of the contact structure. The action of the armature is controlled by spring 32 and back-stop 42 which are held in place by a second flange upturned from base 40.

Assuming that the device is to be used to count dial pulses, magnet coil 17 will be energized in the dialing circuit holding hammer 33 attracted as shown in Fig. 1. The same means which extends the pulsing circuit to magnet coil 17 will cause the energization of coil 16. At the first interruption of the dialing circuit by the dial, hammer 33 will be released to strike a blow against offset portion 41, and through it to the balls 15. This blow will be transmitted from ball to ball until the end ball 15 is reached, which will move into the position shown in Fig. 2. The force of the blow is adjusted to be just sufficient to break the magnetic attraction between the last armature 3 and the associated fixed lamination 1 and move the armature 3 toward the corresponding fixed lamination 2 where it is seized and held by the magnetic flux from lamination 2. Each pulse drives the then end ball into its alternate position so that the number of balls so moved is a measure of the number of pulses received.

The manner in which this device may be adapted for use as a storing repeater of pulses is shown in Fig. 5. In this figure an offset portion 50 is added to bracket 8, against which the end ball 15 would rest after having been moved by an impulse. A hammer 51, like hammer 33 is mounted in position to strike against the balls to return them to their original position. This hammer is controlled by magnet 52 which has a pair of self-interrupting contacts 53 and a pair of pulsing contacts 54 which at the same time transmit pulses to an outgoing circuit. With such an arrangement a permanent magnet might be substituted for coil 16.

What is claimed is:

1. In a counting device, a plurality of pairs of fixed laminations of magnetic material having pole-pieces, a magnetic tongue between each pair of fixed laminations, laminations of insulating material between said fixed laminations and between said fixed laminations and said tongues, contacts on said pole-pieces and said tongues, resilient non-magnetic balls mounted on said tongues, said balls having two positions of rest, impact means for moving said balls one at a time from one position of rest to the other, and a coil surrounding said pole-pieces and said tongues to hold said balls in said other position.

2. In a counting device, a plurality of pairs of fixed laminations of magnetic material having pole-pieces, a magnetic tongue between each pair of fixed laminations, laminations of insulat-

ing material between said fixed laminations and between said fixed laminations and said tongues, contacts on said pole-pieces and said tongues, resilient non-magnetic balls mounted on said tongues, said balls having two positions of rest, impact means for moving said balls one at a time from one position of rest to the other to close certain of said contacts, and a coil surrounding said pole-pieces and said tongues to insure the closure of said contacts.

3. In a counting device, a plurality of pairs of fixed laminations of magnetic material having pole-pieces, a magnetic tongue between each pair of fixed laminations, laminations of insulating material between said fixed laminations and between said fixed laminations and said tongues, contacts on said pole-pieces and said tongues, resilient non-magnetic balls mounted on said tongues and in contact with each other, impact means for moving said balls one at a time to move the corresponding tongue to close the contacts with one of said fixed laminations, and a coil surrounding said pole-pieces and said tongues to hold said contacts closed.

4. In a counting device, a plurality of pairs of fixed laminations of magnetic material having pole-pieces, a magnetic tongue between each pair of fixed laminations, laminations of insulating material between said fixed laminations and between said fixed laminations and said tongues, contacts on said pole-pieces and said tongues, said tongues having two positions in which the contact of said tongue engages the contact on the pole-piece of the associated fixed laminations, resilient non-magnetic balls mounted on said tongues and in contact with each other, impact means for moving said balls one at a time to move the corresponding tongue to close the contacts with one of said fixed laminations, and a coil surrounding said pole-pieces and said tongues to maintain the contacts closed by said tongue in either position.

5. In a counting device, a plurality of fixed laminations of magnetic material having pole-pieces, a magnetic tongue associated with one or more of said fixed laminations, laminations of insulating material between said fixed laminations and between said fixed laminations and said tongues, contacts on said pole-pieces and said tongues, said tongues having two positions in which the contact on said tongue may engage the contact on one of the associated pole-pieces, resilient non-magnetic balls mounted on said tongues and in contact with each other, impact means for moving said balls one at a time to move the corresponding tongue to open and close the contacts between said tongues and the associated pole-pieces and a coil surrounding said pole-pieces and said tongues to maintain said tongues in either of said positions.

6. In a counting device, a plurality of pairs of fixed laminations of magnetic material having pole-pieces, a magnetic tongue between each pair of fixed laminations, laminations of insulating material between said fixed laminations and between said fixed laminations and said tongues, contacts on said pole-pieces and said tongues, a magnet for setting up a magnetic flux for holding said tongues against the pole-piece with which they are in contact and means for moving said tongues one at a time out of contact with one of the associated pair of pole-pieces and into contact with the other of said pair of pole-pieces comprising a row of resilient balls mounted on said tongues and in contact with each other and

impact means for applying an impact to the ball at one end of said row to move the ball at the other end of said row to carry the attached tongue into contact with the other associated pole-piece.

7. In a counting device, a plurality of pairs of fixed laminations of magnetic material having pole-pieces, a magnetic tongue between each pair of fixed laminations, laminations of insulating material between said fixed laminations and between said fixed laminations and said tongues, 10

contacts on said pole-pieces and said tongues, resilient non-magnetic balls mounted on said tongues, said balls having two positions of rest, impact means for moving said balls one at a time from one position of rest to the other, a coil surrounding said pole-pieces and said tongues to hold said balls in either of said positions, and other impact means for restoring said balls one at a time to said one position.

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