Sept. 17, 1963 H. WETZER 3,103,878

COUNTING DEVICE AND PRINTING ATTACHMENT FOR CURRENT IMPULSES SUCCEEDING EACH OTHER AT HIGH SPEED

Filed Feb. 24, 1959 2 Sheets-Sheet 1

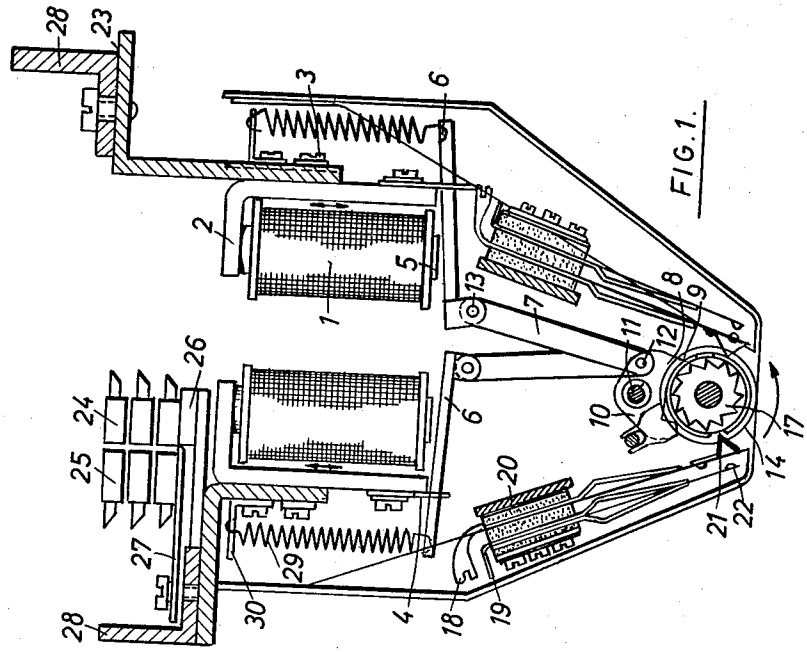


FIG. 1.

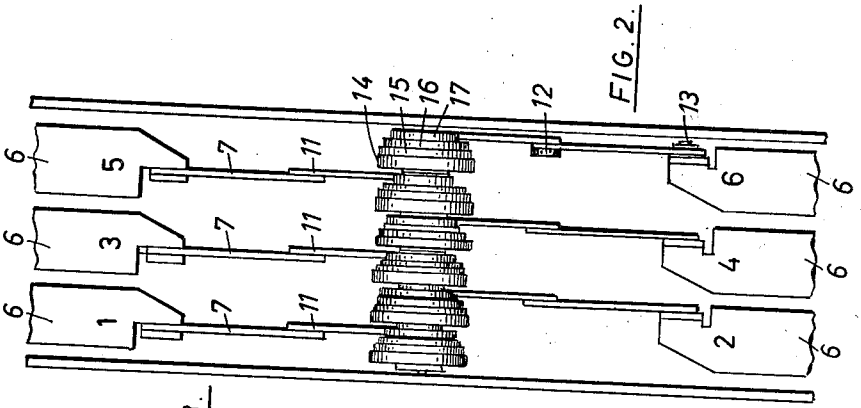


FIG. 2.

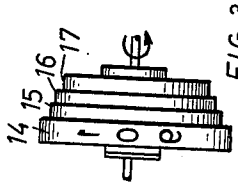


FIG. 3.

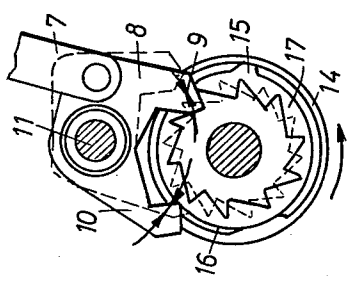


FIG. 1a.

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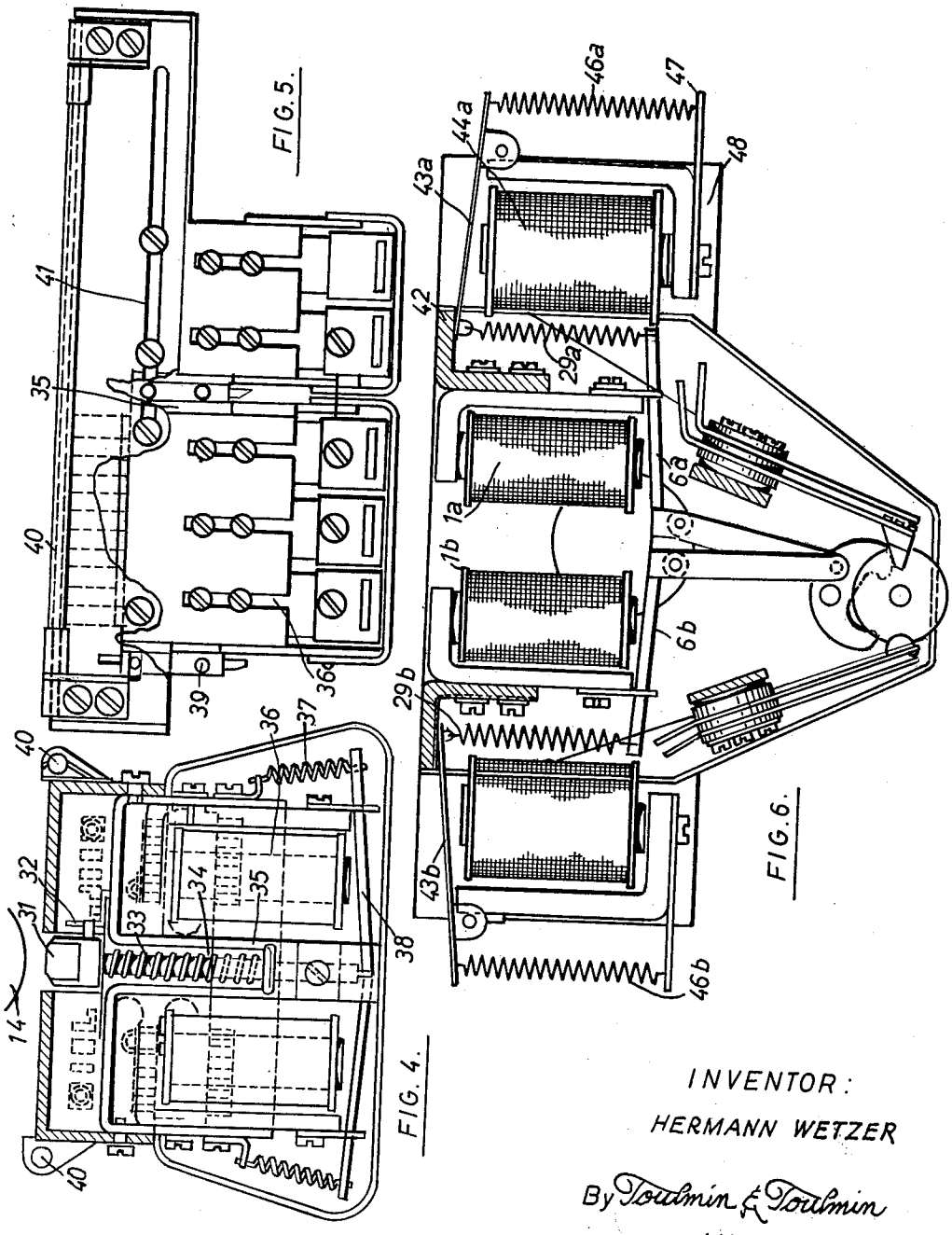


FIG. 5.

FIG. 6.

FIG. 4.

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COUNTING DEVICE AND PRINTING ATTACHMENT FOR CURRENT IMPULSES SUCCEEDING EACH OTHER AT HIGH SPEED

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4 Claims. (Cl. 101—93)

The present invention relates to a counting device with printing attachment to be actuated by electric current pulses following each other in rapid succession. These current pulses are to be counted either continuously or intermittently, depending upon the circuit connection of the counter, and they are indicated or recorded by means of printing.

The object of the present invention is a high speed counting device which may be used for different purposes, which can be manufactured economically and which is capable of carrying out subtractions as well as additions.

Counting devices with printing attachments are known. These known arrangements, however, either operate at too low a counting speed, or it is only possible to register and print continuously, and not individual groups of digits. Still further, these known arrangements are not built as units which can be assembled so as to vary the capacity of the complete counting device and printing attachment.

According to this invention, a high counting and printing speed can be obtained in that a selector magnet, an armature, a type wheel and a printing attachment are arranged in an aligned relationship.

The selector magnet has an armature which is mounted at a point located intermediate its ends so as to constitute a double arm lever. One arm thereof engages a recoiling spring for the armature and the other arm thereof engages a linkage for operating a stepping mechanism for the type wheel. The distance between the pole surface of the selector magnet and the armature is adjustable by a movable mounting of the selector magnet. The distance between the armature and the pole surface can be adjusted very precisely which is of great importance for high counting and printing speed.

The known arrangements are adjusted at the armature. This necessitates, however, a quite different construction. Since in the present invention, the armature is pivotally connected to a step mechanism controlling a type wheel, the armature itself cannot be changed in its distance from the magnet.

For this construction, it is important that the selector magnet acts on that one of the armature arms which is not connected to the recoiling or return spring.

According to another feature of the invention, the recoiling force of the return spring can be varied if the respective other end of that spring is secured to a movable member. Preferably, this end of the return spring is suspended from the armature of an additional magnet so that the return spring cannot exert a recoiling force when the armature of this additional magnet is being attracted.

It is possible to obtain intermediate positions of the step mechanism when the recoiling or return spring is partially relieved by the armature of the additional magnet. Since the selector magnet can be altered in its sensibility to respond, it is possible to adjust the response of the selector magnet to a particular amplitude and frequency of the current pulses fed to the magnet coil.

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention, it is believed that the invention, the objects of the invention and further objects and advantages thereof will be better understood

from the following description taken in connection with the accompanying drawing in which:

FIGURE 1 shows two selector magnets in a partial section;

FIGURE 1*a* illustrates in side view a detail of FIGURE 1;

FIGURE 2 is a front view where the arrangement of the selector magnet armature is shown schematically in respect to the type wheels;

FIGURE 3 shows the components of a type wheel;

FIGURE 4 is a sectional front view of a printing attachment;

FIGURE 5 is a side view of FIGURE 4; and

FIGURE 6 shows the additional arrangement for subtraction.

In FIGURE 1 a selector magnet **1** is attached to a yoke **2**. This yoke is displaceably attached to a frame **23** by means of screws **3**. The double arrow indicates how yoke **2** together with magnet **1** can be adjusted so that the distance between pole surface **5** of magnet **1** and its armature **6** can be adjusted precisely. Armature **6** is linked to an intermediate linkage member **7** and there is a pivot **13** for directly and pivotally connecting armature **6** to the upper end of member **7**. The step mechanism includes a rocking or swivel bridge **8** having projecting parts at **9** and **10** which actually carry out the desired step by step rotation of a ratchet wheel **17**. FIGURE 1*a* illustrates specifically that ratchet wheel **17** cooperates with the projections **9** and **10** of swivel bridge **8**. Swivel bridge **8** is pivoted at a pin **11**. The pivot point of swivel bridge **8** is located in almost the center of gravity thereof to reduce the amount of force necessary to pivot bridge **8**. The lower end of linking member **7** is pivoted to swivel bridge **8** eccentrically, at a pivot **12** thereof.

Upon moving linking member **7** up and down, swivel bridge **8** rocks about pin **11** counterclockwise and clockwise, respectively. The pivot connections at points **12** and **13** enable a transfer of power from armature **6** to the step mechanism as constituted by the swivel bridge.

FIGURE 3 shows that the type wheel **14** is connected to cams **15** and **16** as well as the ratchet wheel **17**.

In order to obtain rapidly succeeding switching operations, armature **6**, the intermediate linkage member **7** and the swivel bridge **8** must have small mass and inertia. Armature **6** then moves altogether a relatively small mass for causing the rocking of bridge **8** by an angle sufficient to rotate wheel **17** by an angle corresponding to one step movement of type wheel **14**. The linking member **7** and the armature **6** are made of thin sheet metal to permit advantageous transmission of power.

There are further provided leaf springs **18** and **19** for resiliently supporting contacts **22** and having approximately triangular cam followers **21** running on cams **15** and **16**. The triangular shape for the cam follower of contacts **22** permits operation nearly free of rebouncing. These contacts perform various functions. Assuming the particular counter counts unit values, any of the cams **15** and **16** may close contacts **22** after "nine" on wheel **14'** has passed so as to actuate a counter for the next position of the number counted thus far. The switching action of these contacts **22** for actuating a decade counter as compared with known rotation counting device, enables elimination of the conventional mechanical catch which engages a follower of a decade counter. The contacts **22** can also be used for indicating or signaling the zero-position of a continuously transferred number. Any desired number of contacts can be so arranged; such contacts may further serve for the control of the magnets of a printing attachment as will be described below or for controlling additional recording steps.

By means of such an auxiliary cam operated contact it is also possible to count in a different manner; for example, a particular number is being preselected, and when the counter has reached that number, the cam (one of **15** and **16**) closes follower operated contacts to so signal that the preselected number has been reached.

Thus, besides serving as mere zero-position indicating contacts, or as transfer contacts for actuating the next position counter, the cam contacts **22** may be used for registering that type wheel **14** has reached a preselected position, or contacts **22** may serve as signal contacts for any intermediate position, etc.

An arrangement of several selector magnets is illustrated in FIGURE 2. It can be seen from this figure that the selector magnets **1** are arranged here in pairs. Six selector magnets form a group or unit, and they are arranged in a line and in pairs opposite to each other. They operate individually upon a corresponding type wheel, and the six type wheels pertaining to this group are placed along a single line. In FIGURE 2 the six units are further placed in a common frame **23**. This complete unit in one frame can be combined with other units to form larger systems. The frame **23** is also provided with contact plugs **24** providing for electrical connections to the energizing coils of the magnets, and they are attached at an intermediate layer **26**. There are further contact plugs attached to an intermediate layer **27**. Contact plugs **25** are provided as electrical connections to contacts **22**. Plugs **25** are attached to a shoulder piece **28** of frame **23**.

The return or recoiling spring **29** of a selector magnet is connected with its one end to the armature **6** and with the other to an angular member **30** which is adjustably secured to frame **23**.

Proceeding next to FIGURE 4 there is shown the printing attachment which cooperates with the selector magnets as shown in FIGURE 1. A type wheel **14** is being indicated to show cooperative relationship.

The printing attachment is provided with printing magnets **36**. A plunger **34** with printing head or platen **31** is arranged under type wheel **14**. This plunger **34** is actuated by an armature **38**. When magnet **36** is energized, armature **38** is attracted and plunger **34** moves upwardly therewith. An adjustable guide **32** places the head **31** of plunger **34** into the correct position for such printing. Armature **38** of magnet **36** is returned to its initial position by means of a tension spring **37**. The distance between magnet **38** and plunger **34** can be adjusted by moving printing magnet **36** up or down in a slot situated in the angular fastener **35**. The plunger **34** is provided with a separate compression spring **33** in order to ensure printing without rebouncing.

The operating speed of plunger **34** depends to a high degree upon the tension of spring **37**. The several printing units are individually movable in a slot **41** for properly positioning them exactly under the corresponding type wheel **14**. To each printing unit there is added a separable contact connection **39**. There are two transport rolls **40** for conveying the paper for printing between the respective type wheels **14** and the associated plunger head or platen **31**.

The current to the magnets **36** of the printing attachment can be controlled by contacts such as **22** (FIGURE 1) of the selector magnets. For example, after a certain number of current pulses has been processed by a selector magnet (FIGURE 1) printing is carried out immediately thereafter. It is, of course, preferable to move a small stamp, one for each digit, as compared with a big stamp simultaneously printing several digits.

With respect to the complete mounting it is preferable to have one frame such as **23** in FIGURE 1 for the counting units and a separate frame for the printing magnets.

FIGURE 6 illustrates how a selector unit can be modified so as to provide for forward as well as for a reverse motion of a type wheel. First of all, there are two similar units comprising selector magnets **1***a* and **1***b* with associated armatures **6***a* and **6***b*, respectively, and also linking unit, rocking bridge and two type wheels as was described with reference to FIGURE 1. However, the two juxtaposed type wheels are interconnected and move in unison. Always only one of the type wheels is effective for printing, one representing the result of subtracting the other one the result of adding at the same position.

On a base plate **48** two auxiliary magnets **44***a* and **44***b* are mounted, one for each line of selector magnets. Auxiliary magnet **44***a* has an armature **43***a* provided with a lug **42** from which recoiling a spring **29***a* is suspended. Armature **43***a* itself is being recoiled to a rest position by a spring **46***a*. There is a corresponding armature **43***b* with recoiling spring **46***b* for magnet **44***b*.

The auxiliary magnets **44***a* and **44***b* when energized relieve return springs **29***a* and **29***b* respectively. Magnets **44***a* and **44***b* have attractive powers which is a multiple of that exerted by any of the selector magnets such as **1***a* and **1***b* upon their armatures **6***a*, **6***b* of FIGURE 1, so that one magnet such as **44***a* can relieve a plurality of coil springs **29***a* pertaining to a bank of selector magnets **1***a*. It is apparent, that there are several magnets **1***a* arranged perpendicularly to the plane of the drawing for adding, and similarly several magnets **1***b* are arranged oppositely thereto for subtracting. Relieving of the return springs **29***a* of several selector magnets **1***a* occurs when magnet **44***a* is energized. Now magnets **1***b* are ready for subtracting. Since one will either add or subtract, only one auxiliary magnet **44***a* is needed to relieve the springs **29***a* of all adding magnets during subtracting, and correspondingly only one magnet **44***b* is needed to relieve the springs **29***b* of all subtracting magnets during adding.

Additions and subtractions are being carried out selectively. This complete relieving of either recoiling springs **29***a* and **29***b* for the associated armature of the associated magnet which is then not energized, is a preliminary condition for the completion of any operation of the type wheel. If this relief was not complete, the type wheel could only move to and fro on a small scale. The adding is effected by selector magnets **1***a* when the recoiling springs **29***b* of the selector magnets **1***b* are relieved by the auxiliary magnet **44***b* thereof. The subtraction is being controlled as stated by energizing selector magnet **1***b* while recoiling spring **29***a* has been relieved due to energization of magnet **44***a*. A single ratchet switch wheel with symmetrical teeth can be used for rotation in both directions.

The idle running of one of two selector magnets operating upon joint type wheels for either adding or subtracting, may be obtained by different means, the relieving of the respective return springs by an additional or auxilary magnet being one of them. Such means can be effective at any point within the path of power transmission from the armature of the selector magnet to the swivel bridge of the step mechanism.

As this invention can be adapted to the very different kinds of counting processes and as the indexing speed is very high it embraces most of the interesting switch processes.

What I claim is:

1. In a counting and printing mechanism for processing electric current pulses occurring in rapid succession, the combination comprising a frame; an energizable magnet; an armature pivotally mounted on said frame intermediate its ends thus constituting a two arm lever with one arm thereof being attracted by said magnet upon energization thereof; means for adjustably mounting said magnet on said frame so as to adjust the distance between said magnet and said armature; a step mechanism linked to said one end of said armature; a type wheel rotatable by said step mechanism and a printing mechanism operatively associated with said type wheel; a tension spring connected with one end to the other arm of said

armature and urging said armature to its de-energized position; and controllable means connected to the other end of said spring for selectively relieving the tension thereof.

2. In a registering and printing mechanism, as claimed in claim 1, and further comprising a second selector magnet with armature and biasing tension spring and type wheel and the mechanism associated therewith, both said type wheels being connected for simultaneous rotation thereof, and magnetically actuated means including said controllable means for selectively relieving said springs.

3. In a counting and printing mechanism for processing electric current pulses occurring in rapid succession, the combination comprising: a frame; an electromagnet; an armature pivotally mounted with a point intermediate its ends at said frame and forming a two arm lever; means for adjustably positioning said magnet and said armature; a step mechanism linked to one arm of said armature; a second auxiliary magnet mounted on said frame; a second armature energized by said second magnet; a first spring interposed between the other arm of said first mentioned armature and said second armature for tensioning said first armature; and a second spring for tensioning said second armature against the tension force exerted upon said second armature by said first spring whereby energization of said auxiliary magnet relieves the tension of said first spring.

4. A registering and printing mechanism, as claimed in claim 2, wherein said auxiliary magnet has a force several times greater than that of the said electromagnet.

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